SECTION 4.0
COAL GASIFICATION
(Areas 205, 206, 207, 208, 216, 218)

4.1 DESIGN BASIS

4.1.1 The gasifiers will be Winkler fluid bed units. Design operating pressure will be 58 psia.

4.1.2 A total of 8 gasifiers will be provided, each with a design capacity of 3.44 MM scfh of raw gas production. No spares will be provided.

4.1.3 One of the eight gasifiers, and its associated equipment, will be designed for future operation at 10 atmospheres.

4.1.4 The feed to the gasifiers will be crushed coal -3/8" dried to 8% total moisture.

4.1.5 The coal feed bins for each gasifier will have capacities of 108 tons each or 2.6 hours storage at normal rates.

4.1.6 Steam will be produced in the gasifier waste heat boilers at 855 psig and 840°F. Char from the waste heat boiler will be fed to offsite steam boilers for fuel.

4.1.7 The systems for pneumatic transport of char will handle dry material with a bulk density of 31 to 37.5 lbs/ft^3, a carbon content of 30 wt. %, and temperature of 350°F.

4.1.8 The systems for pneumatic transport of ash will handle dry material with a bulk density of 50 lbs/ft^3, a carbon content of 10 wt. %, and temperature of 350°F.

4.1.9 Total char production, based on 100% load, will be 142.7 tons per hour. This will be sent to the off-site boilers for use as fuel.

4.1.10 Total process ash production, based on 100% load, will be 55.9 tons per hour.

4.1.11 Total boiler ash production will be 141.2 tons per hour.

4.1.12 Ash will be hauled to the mines for disposition on a 6-trains-per-day, 7-days-per-week schedule.

4.1.13 Nitrogen will be used in the pneumatic transport systems. A nitrogen surge tank is provided to assure a constant flow on demand to each conveying system.

4.2 PROCESS DESCRIPTION

4.2.1 Gasification (Area 205, Dwg. 5530-205-Y-001)

The plant utilizes eight fluid-bed Winkler Gasifiers operating at 58 psia pressure. Coal is fed at 83.6 stph to each gasifier by means of lock hoppers and feed screws. The lock hoppers transport coal from storage at atmospheric pressure to a pressurized feed bin in the following batch type sequence: (1) Fill, (2) Pressurize; (3) Empty, and (4) Depressurize.

These functions are accomplished by using nitrogen for pressurization and by means of automatic controls which open and close the appropriate valves in the correct sequence. Lock hopper vent gases are scrubbed and then vented to the atmosphere.

Coal from the feed bin is fed to the gasifiers by the feed screws which are located near the bottom of each gasifier. The feeders are water jacketed to prevent damage due to the high temperature inside the gasifiers.

Two lock hopper trains and four feed screws are provided for each gasifier. Each lock hopper train supplies two feed screws so that the normal coal feed is 50% of capacity per train. Thus, each set of feed screws is capable of 100% capacity when one set is down for maintenance.

A mixture of oxygen and steam is fed into each gasifier, fluidizing and reacting with the coal. As a result of the high turbulence and intimate mixing, rapid reactions take place with the coal. The exothermic reaction of coal with oxygen provides the heat necessary for the endothermic reaction of coal with steam according to the following equations:

$$C + O_2 \longrightarrow CO_2 + \text{Heat}$$

$$C + H_2O + \text{Heat} \longrightarrow H_2 + CO$$

Due to the turbulent motion and shape of the bed, particles are segregated according to specific weight. The heavier particles consisting mostly of ash are withdrawn from the bottom of the gasifiers and returned to the mine for disposal. The lighter and smaller particles, consisting of 50-70 percent char are carried overhead by the raw gas. Potentially troublesome tar oils and higher gaseous hydrocarbons are converted into carbon oxides and hydrogen due to the relatively high temperature of gasification. Consequently a raw gas is produced consisting essentially of carbon monoxide and hydrogen, some carbon dioxide, a small amount of methane plus small amounts of hydrogen sulfide and carbonyl sulfides.

4.2.2 Waste Heat Recovery (Area 206, Dwg. 5530-406-Y-001)

The raw gas, carrying some unreacted char, leaves from the top of the gasifier and passes to the heat recovery unit where the waste heat in the gas is used to generate steam, at 870 psia and 840°F, for use in the plant.

Some of the entrained char in the gas is removed in the waste heat recovery unit. The majority of the particulate removal, however, is accomplished using a multiclone collector located downstream of the heat recovery unit. This collector consists of a number of vertical cyclones built into a bank within a single housing which makes a high efficiency mechanical collector. The char collected from the bottom of the waste heat recovery unit and the multiclone collector is sent to the off-site boilers as fuel.

4.2.3 Particulate Removal, Settling and Filtration (Areas 207, 208; Dwgs. 5530-207-Y-001, 208-Y-001)

The raw gas from the multiclone collector passes to a direct quench, venturi type scrubber where the remaining dust and fine particles are removed and the gas is cooled to approximately 104°F prior to compression and syngas upgrading. The particle laden water from the scrubbers is sent to a thickener where the solids settle out and are concentrated to a 15% slurry. The slurry is then pumped to rotary vacuum filters which form a filter cake of 30% solids which is sent to the mine for disposal. Clear water from the thickener is recycled to the scrubber.

4.2.4 Gasification at 10 Atmospheres (Areas 205, 206, 207; Dwgs. 5530-205, 206, 207-Y-10ATM)

Provision for operating at higher pressures, up to 10 atmospheres, has been incorporated into the design of one gasifier and its associated equipment. This includes provisions for supplying higher oxygen, nitrogen, steam and scrubbing water pressures. Gasifier throughput is a function of the gasifier operating pressure. Operating at 10 atmospheres can potentially increase the gasifier output 1.5 times.

The system has been designed, as shown on Drawing No. 5530-207-Y-10 Atm., so that the high pressure gasifier can be isolated by venting the raw product gas after scrubbing, to the low pressure flare system through a pressure letdown control valve. This will allow the rest of the gasifiers to operate without upset while changes in operating pressure are made on the high pressure unit. Likewise, upsets in gas quality can be isolated, adjustments made, data recorded and overall performance can be evaluated without affecting the rest of the plant. Upon extended operation of this unit the raw gas product could be used as supplemental boiler fuel.

4.2.5 DRY CHAR SYSTEMS (Area 216, Dwg. 5530-216-Y-001)

Two pneumatic char transport systems, both operating, are furnished with each gasifier train. One system transports dry char from the waste heat boiler; the other transports char from the cyclones. Each system is of a pressure tank-controlled feeding design, operating on a batch cycle.

The waste heat boiler char system has one pressure tank; the cyclone char system has two pressure tanks. Each system operates individually and automatically through a fill and transport cycle. In both systems the elapsed time for completion of a fill and transport cycle is one hour.

Char transported from the waste heat boilers and cyclones is collected in the char feed bin. Two rotary feed valves, both operating, control the rate of feed from the char feed bin to a belt feeder. The belt feeder transfers the char to the off-site boiler surge hopper conveyor where it is dumped on top of boiler feed coal previously placed on the conveyor.

A fabric dust collector removes dust from the transporting gas before the gas is discharged to the atmosphere. The collected dust is stored in a hopper at the bottom of the collector and periodically discharged to the char feed bin. A rotary valve in the dust leg from the collector to the char bin provides a gas seal. Purging with ambient air is provided for servicing the collector.

4.2.6 ASH SYSTEM (Area 218, Dwg. 5530-218-Y-001)

One pneumatic dry ash conveying system is furnished for each gasifier train. The system is of a dual pressure tank - controlled feed design, operating on a batch cycle.

Each pressure tank operates automatically through a fill and transport cycle, and while one is filling the other is transporting. The total elapsed time for completion of a fill and transport cycle is one hour.

Ash transported from the gasifiers is collected in ash load-out silos. Ash transferred from the offsite boilers is also collected in the ash silos. Three rotary drum mixerconditioners, all operating, control the rate of feed from the silos. Water is added to the ash in the mixerconditioner to control dust during ash unloading from the silos and ash transporting. The ash is discharged to collecting conveyors which dump it into railroad cars. Ash is hauled to the mines by six trains per day operating seven days per week.

Fabric dust collectors remove ash dust from the transporting gas before the gas is discharged to the atmosphere. Three collectors, all operating, are providing one on top of each ash silo. The collected dust is stored in a hopper at the bottom of the dust collector and periodically discharged into the ash silos. A rotary valve in the dust leg from collector to silo provides a gas seal. Purging with ambient air is provided for servicing the dust collectors.

4.3 ENGINEERING DESIGN DATA

Design data pertinent to gasification is detailed in the Process Flow Diagrams immediately following this page, in the Equipment List beginning on page 4/10, and in the Drawings following page 4/31.

DRAWINGS RELATED TO GASIFICATION

DRAWING NO.	TITLE
5530-205-Y-001	Gasification
5530-205-Y-10 ATM	Gasification
5530-206-Y-001	Waste Heat Recovery & Dry Cyclone
5530-206-Y-10 ATM	Waste Heat Recovery & Dry Cyclone
5530-207-Y-001	Particulate Removal
5530-207-Y-10 ATM	Particulate Removal
5530-208-Y-001	Gasification Char & Coal Dryer Particulate Settling & Filtration
5530-216-Y-001	Dry Char System
5530-218-Y-001	Ash System

EQUIPMENT LIST

5530-205-P-001	Gasification, Waste Heat Recovery, Particulate Removal -- General Arrangement
5530-205-P-002	Gasification, Waste Heat Recovery, Particulate Removal -- General Arrangement
530-205-P-003	Gasification, Waste Heat Recovery, Particulate Removal -- Plan Above Grade
5530-205-P-004	Gasification, Waste Heat Recovery, Particulate Removal -- Plan above 14'-9"
5530-205-P-005	Gasification, Waste Heat Recovery, Particulate Removal -- Upper Plans
5530-205-P-006	Gasification, Waste Heat Recovery, Particulate Removal -- Elevation
5530-205-P-007	Gasification, Waste Heat Recovery, Particulate Removal -- Elevation
5530-205-P-008	Gasification, Waste Heat Recovery, Particulate Removal -- Elevation

EQUIPMENT LIST	TITLE
5530-205-P-009	Gasification, Waste Heat Recovery, Particulate Removal--Elevation
5530-208-P-001	Gasification, Char & Coal Dryer Particulate Settling & Filter--General Arrangement
5530-208-P-002	Gasification, Char & Coal Dryer Particulate Settling & Filter--Plan at Grade
5530-216-P-001	Raw Coal & Dry Char Blending--Char Bin
5530-218-P-001	Ash Blending & Disposal--Ash Load Out Station--Plan & Sections

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CORRECTIONS

Process Flow Diagram

Drawing Number	Stream No.	Reads	Should Read
5530-205-Y-001	11	2,825,030 scfh 214,776 lb/hr	3,880,000 scfh 294,980 lb/hr
5530-206-Y-001	5 & 6	300°F	392°F
5530-205-Y-10ATM	11 12	2,825,032 scfh 148,000 scfh	970,000 scfh 18,500 scfh
5530-206-Y-10ATM	3	55 psia	137 psia
5530-206-Y-10ATM	5 & 6	300°F	392°F

Equipment List

5530-205-1301	Capacity Drive	11,770 scfm 250 hp	16,200 scfm 350 hp

STREAM NO.		1		2		3		4		5		6		7		8	
STREAM DESCRIPTION		DRIED COAL TO GASIFIERS		RAW GAS		RAW GAS FROM GASIFIERS		SLURRY TO SETTLER		OXYGEN TO GASIFIERS		REACTION STEAM		ASH FROM GASIFIERS		RECIRCULATION WATER	
PHASE		S		V/S		V/S		L		V		V		S		L	
COMPONENT	MOL. WT.	WT%	LB/HR	MOL%	LB.MOL/HR	MOL%	LB.MOL/HR	WT%	LB/HR	MOL%	LB.MOL/HR	WT%	LB/HR	WT%	LB/HR	WT%	LB/HR
CARBON	12.011	48.97	655,708											2.89	11,054		
HYDROGEN	2.016	3.61	[illegible]	25.83	26,186.92	25.83	26,186.92										
NITROGEN	28.014	0.64	8,661	1.01	1027.88	1.01	1027.88			0.50	96.97						
SULFUR	32.080	0.18	2,408														
OXYGEN	32.000	13.50	180,597							99.50	19,312.67						
CHLORINE	35.453	0.04	535	0.02	15.09	0.02	15.09										
ASH	–	25.06	335,246											90.11	100,653		
WATER	18.016	8.00	107,022	28.46	28,851.90	28.46	28,851.90	100.00	32,940			100.00	535,006			100.00	33,500
CARBON MONOXIDE	28.011			28.90	29,304.46	28.90	29,304.46										
CARBON DIOXIDE	44.011			13.51	13,697.24	13.51	13,697.24										
METHANE	16.043			2.22	2245.64	2.22	2245.64										
HYDROGEN SULFIDE	34.076			0.05	50.70	0.05	50.70										
CARBONYL SULFIDE	60.071			72 PPM	7.25	72 PPM	7.25										
SULFUR DIOXIDE	64.066																
METHANOL	32.043																
DIMETHYL ETHER	46.068																
HIGHER ALCOHOL	74.120																
(SOLIDS CARRY OVER)	GR/SCF DRY			(7.2)		(7.2)											
(SOLIDS CARRY OVER)	LB/HR			(335,687)		(335,687)											
TOTAL (WET)		100.00	1,337,773	100.00	101,387.10	100.00	101,387.10	100.00	32,940	100.00	19,409.64	100.00	535,006	100.00	111,707	100.00	33,500
FLOW (DRY)	SCFH			27,520,654		27,520,654				7,365,760							
TOTAL FLOW	LB/HR	1,337,773		2,399,473		2,399,473		32,940		620,758		535,006		111,707		33,500	
PRESSURE	PSIA			58		58		60		90		115		58		100	
TEMPERATURE	°F	AMB		2100		< 2100		100		257		338		350		85	
HHV	BTU/LB	8306															
HHV. (DRY)	BTU/SCF																

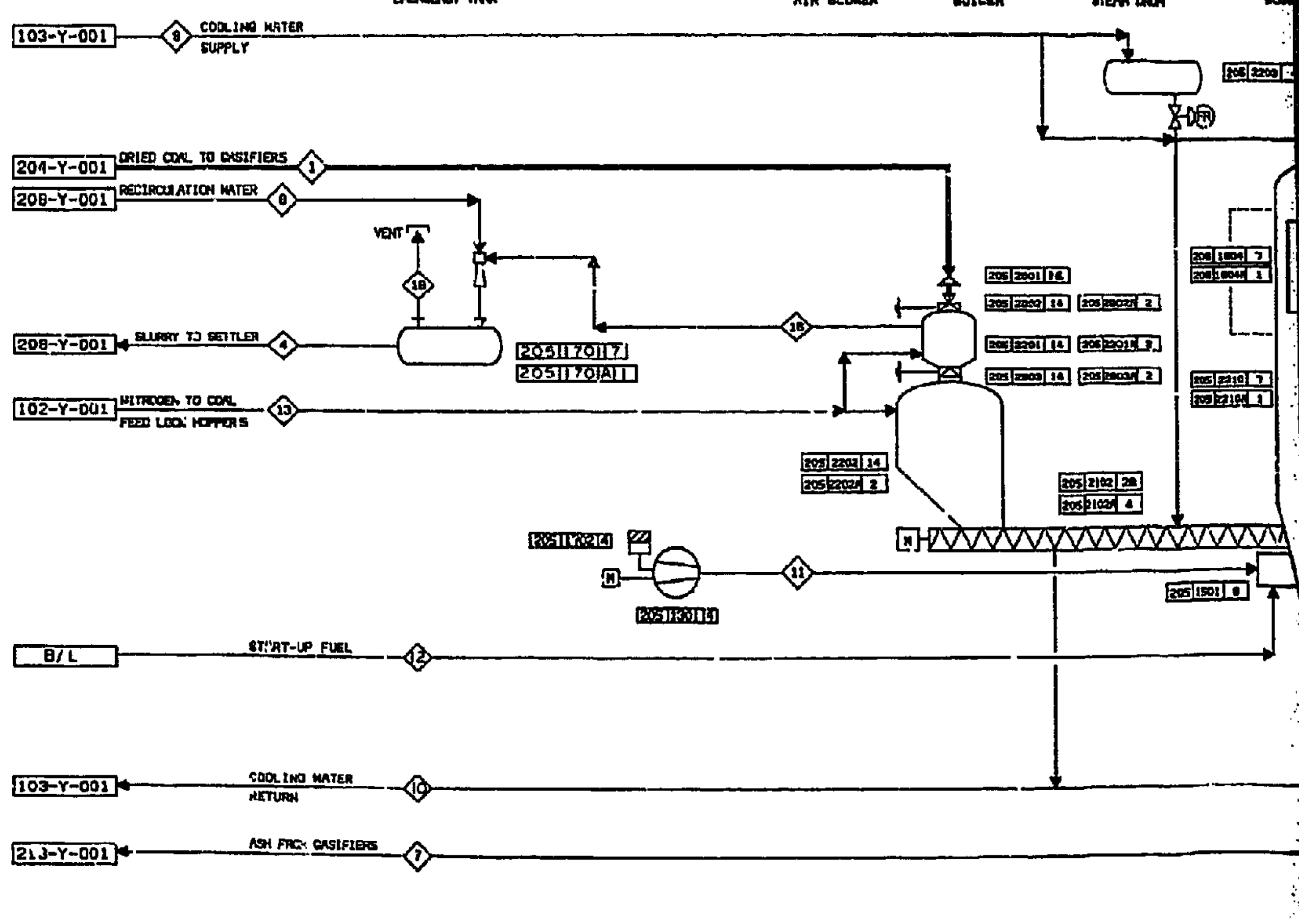
205-2203 COOLING WATER EMERGENCY TANK

205-1702 AIR FILTER

205-1301 START-UP AIR BLOWER

206-1604 RADIANT SHIELD BOILER

206-2202 RADIANT BOILER STEAM DRUM



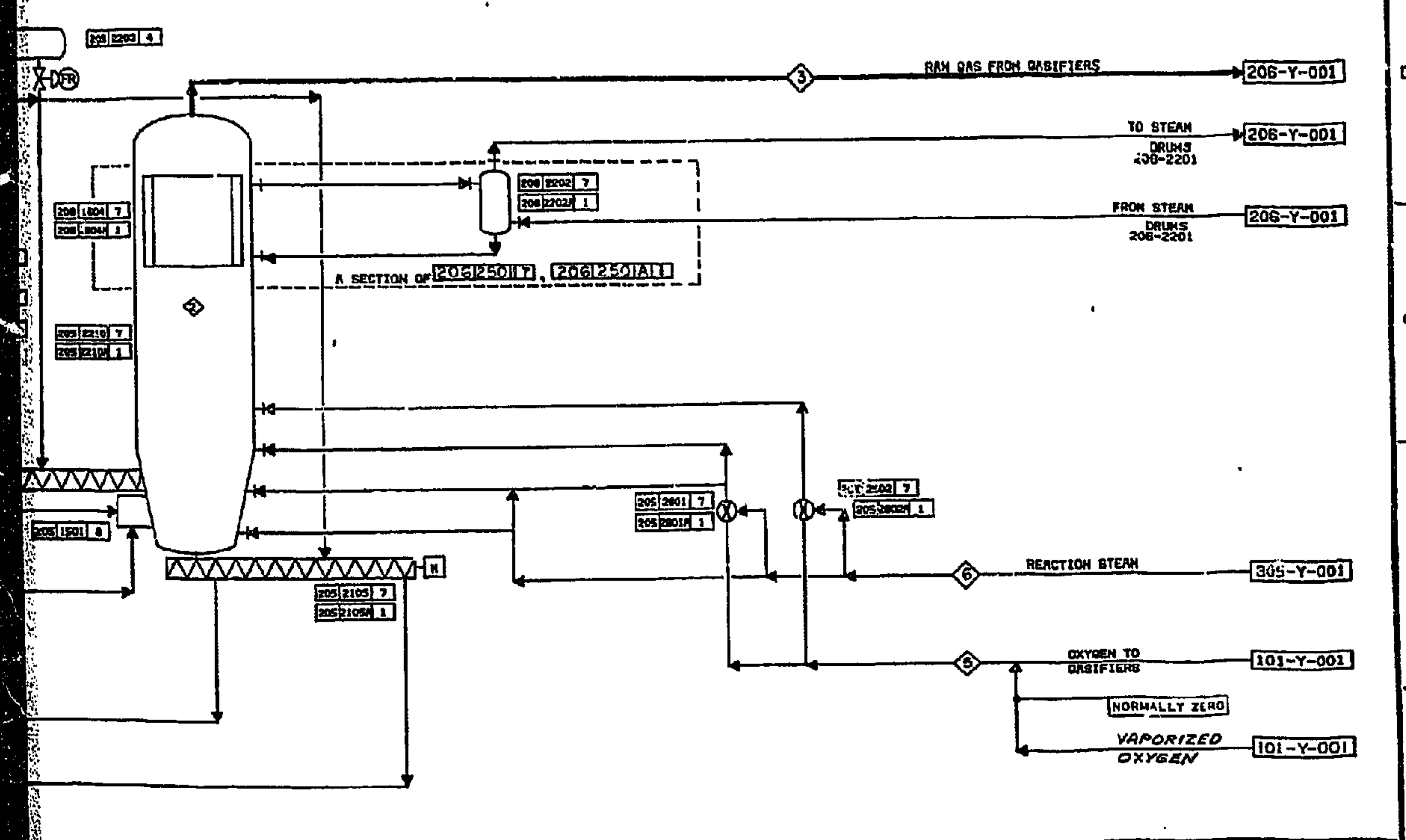
205-2901 SLEEVE VALVE

205-2902 LOCK HOPPER INLET VALVE

205-2903 LOCK HOPPER DISCHARGE VALVE

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE	NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
A	ISSUED FOR FINAL REPORT	T.D.									

	8 CIRCULATION WATER		9 COOLING WATER SUPPLY		10 COOLING WATER RETURN		11 START-UP AIR		12 START-UP FUEL	13 NITROGEN TO COAL FEED LOCK HOPPERS		14	15	16 NITROGEN VENT FROM COAL LOCK HOPPERS		17	18 VENT GASES	
	L		L		L		G		G	G				G			G	
	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	MOL %	LB MOL/HR		MOL%	LB.MOL/HR			MOL%	LB.MOL/HR		MOL %	LB MOL/HR
							79.00	5841.00		100.00	1160.30			100.00	549.28		94.64	549.22
							21.00	1563.28										
	[illegible].00	33500	100.00	460,000	100.00	464000											5.36	31.08
	[illegible].00	33,500	100.00	460,000	100.00	460,000	100.00	7444.28		100.00	1160.30			100.00	549.22		100.00	580.30
							2,455,030		140,800	447,913				208,424			208,424	
	33,500		460,000		460,000		214,776			31,065				15,386			15,946	
	100		90		90		14.67 - 17.38		40 MIN.	105				25			20	
	85		65		95		-50 - 70		AMB.	100				100			100	
									850 (CNV)								8	



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CLIENT: CIRI/PLACER BELUGA METHANOL PLANT COOK INLET, ALASKA

Davy McKee ENGINEERS AND CONSTRUCTORS

TITLE: GASIFICATION

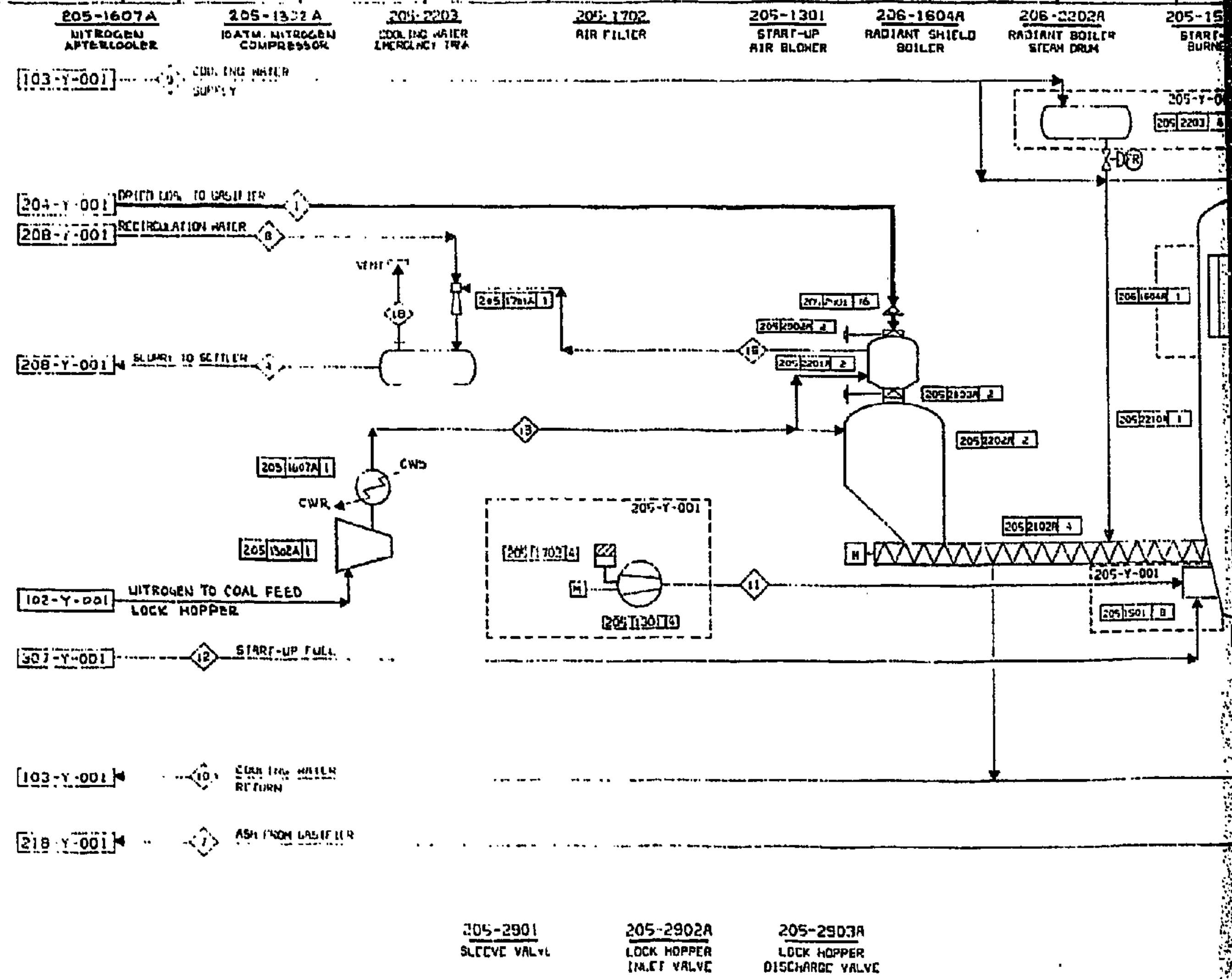
5530-205-Y-001 Revision 0

	BY	DATE
DESIGNED		
DRAWN	MAS	[illegible]
CHECKED	EPL	7/8
APPROVED 1	TRS	7/8/81
APPROVED 2		
APPROVED 3		

ACO877

SCALING RULES 1/8" 1/4"

STREAM NO.		1		2		3		4		5		6		7		8	
STREAM DESCRIPTION		DRIED COAL TO GASIFIER		RAW GAS		RAW GAS FROM GASIFIER		SLURRY TO SETTLER		OXYGEN TO GASIFIER		REACTION STEAM		ASH FROM GASIFIER		RECIRCULATION WATER	
PHASE		S		S-G		S-G		L		G		G		S		L	
COMPONENT	MOL. WT.	WT%	LB/HR	MOL%	LB.MOL/HR	MOL%	LB.MOL/HR	WT%	LB/HR	MOL%	LB.MOL/HR	WT%	LB/HR	WT%	LB/HR	WT%	LB/HR
CARBON	12.011	48.97	123,076											9.94	2066		
HYDROGEN	2.016	3.61	9075	33.97	4575.09	33.97	4575.09										
NITROGEN	28.014	0.64	1608	1.75	551.50	1.75	551.50			0.5	17.59						
SULFUR	32.060	0.18	452														
OXYGEN	32.000	15.50	38,929							99.5	3460.72						
CHLORINE	35.453	0.04	101	0.02	2.85	0.02	2.85										
ASH	-	25.06	63,085											90.06	18500		
WATER	18.016	8.00	20,106	28.75	5535.41	28.75	5535.41	100.00	6185			100.00	100,529			100.00	6293
CARBON MONOXIDE	28.011			27.56	5115.06	27.56	5115.06										
CARBON DIOXIDE	44.011			14.26	2644.96	14.26	2644.96										
METHANE	16.043			4.00	742.42	4.00	742.42										
HYDROGEN SULFIDE	34.076			0.05	9.30	0.05	9.30										
CARBONYL SULFIDE	60.071			54 PPM	1.00	54 PPM	1.00										
SULFUR DIOXIDE	64.066																
METHANOL	32.043																
DIMETHYL ETHER	46.068																
HIGHER ALCOHOL	74.120																
(SOLIDS CARRY OVER)	#/SCF DRY			(8.8)		(8.8)											
(SOLIDS CARRY OVER)	LB/HR			(63084)		(63084)											
TOTAL (WET)		100.00	251,527	100.00	18555.15	100.00	18551.53	100.00	6185	100.00	3478.11	100.00	100,529	100.00	20,986	100.00	6293
FLOW (DRY)	SCFH			5,016,144		5,016,144				1,319,908							
TOTAL FLOW	LB/HR	251,527		449,284		449,284		6185		111,250		100,529		20,986		6293	
PRESSURE	PSIA			145		145		20		189		218		50		65	
TEMPERATURE	°F	AMB.		2100		≤ 2150		122		250		482		350		100	
HHV	BTU/LB	8606															
HHV. (DRY)	BTU/SCF																



NO.	DESCRIPTION	BY	CH.	APPROVED	DATE	NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
	ISSUED FOR FINAL REPORT	T.D.			7/1/86						

REVISIONS · REVISIONS · REFERENCES

1 2 3 4 5

	9		10		11		12	13		14	15	16		17	18	
...ATION	COOLING WATER SUPPLY		COOLING WATER RETURN		START-UP AIR		START-UP FUEL	NITROGEN TO COAL FEED LOCK HOPPERS				NITROGEN VENT FROM COAL LOCK HOPPERS			VENT GASES	
	L		L		G		G	G				G			G	
LB/HR	WT %	LB/HR	WT %	LB/HR	MOL %	LB.MOL/HR		MOL %	LB.MOL/HR			MOL %	LB.MOL/HR		MOL %	LB.MOL/HR
												100.00	105.08		94.64	103.78
								100.00	359.89							
					79.00	5,881.00										
					21.00	1563.28										
															5.36	5.84
6293	100.00	30,820	100.00	30,820												
6293	100.00	30,820	100.00	30,820	100.00	7444.28		100.00	359.89			100.00	105.08		100.00	109.62
					2,825,032		148,000	136,575				39,118			41,360	
	30,820		30,820		214,776			10,082				2,868			2936	
95	90		80		14.67–17.58		40 MIN.	165				25			20	
	65		65		-50 - 70		AMB.	100				100			100	
															6	
							850 (LHV)									

205-1501 START-UP BURNER

205-1701A EJECTOR

205-2201A COAL LOCK HOPPER

205-2202A FEED BIN

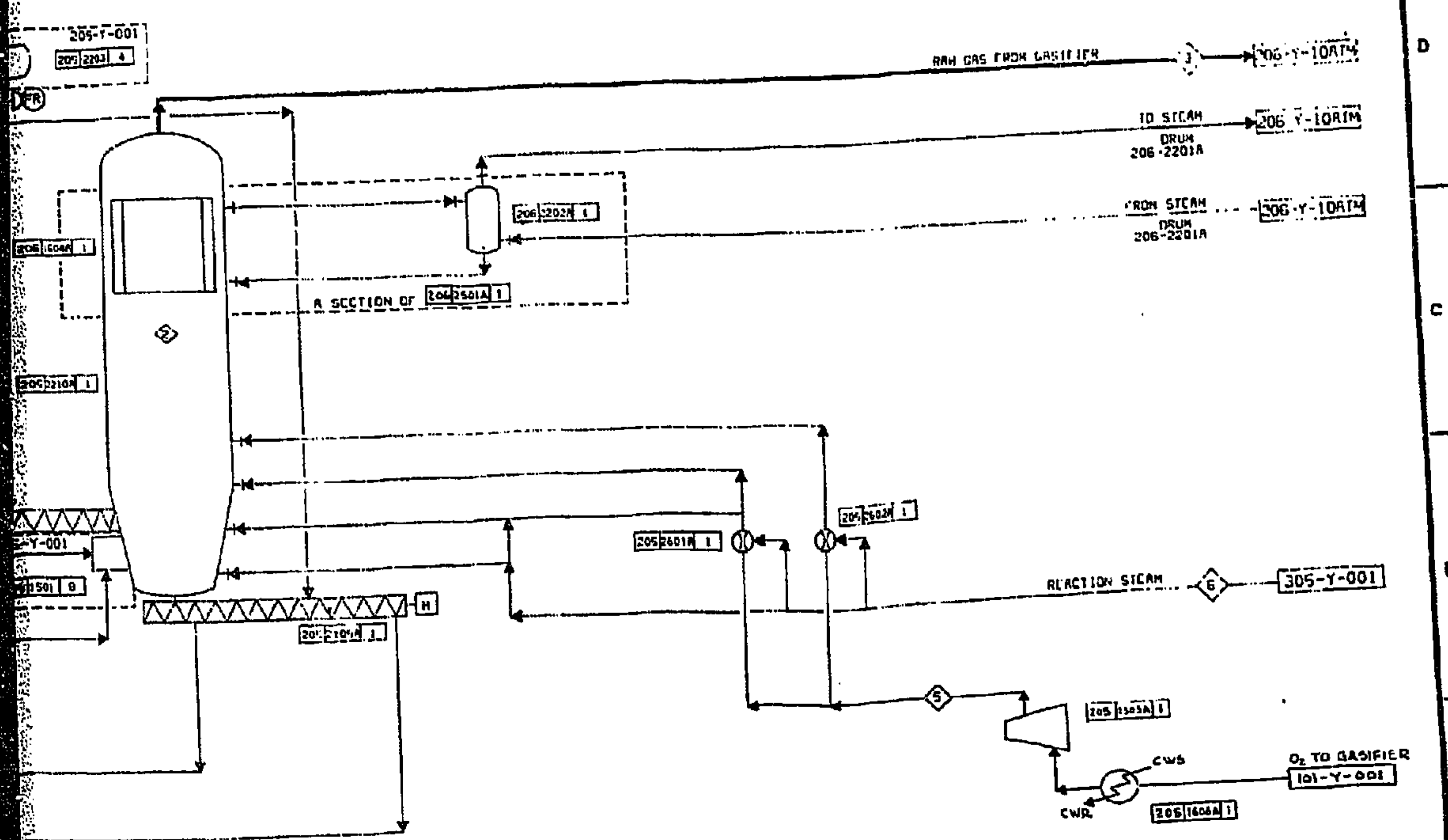
205-1303A 10 ATM. OXYGEN COMPRESSOR

205-2210A WINKLER GASIFIER

205-2601A STEAM-OXYGEN MIXER I

205-2603A STEAM-OXYGEN MIXER II

205-1606A OXYGEN COOLER



205-2102A GASIFIER FEED SCREW

205-2105A ASH DISCHARGE SCREW

CLIENT: CIRI/PLACER BELUGA METHANOL PLANT COOK INLET, ALASKA

Davy McKee ENGINEERS AND CONSTRUCTORS

DESIGNED	BY	DATE
DRAWN	MGS	6-2-81
CHECKED	GAL	7/...
APPROVED 1	TKS	7/15/81
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT / FIELD

TITLE: GASIFICATION

SCALE ______ DR NO. ______

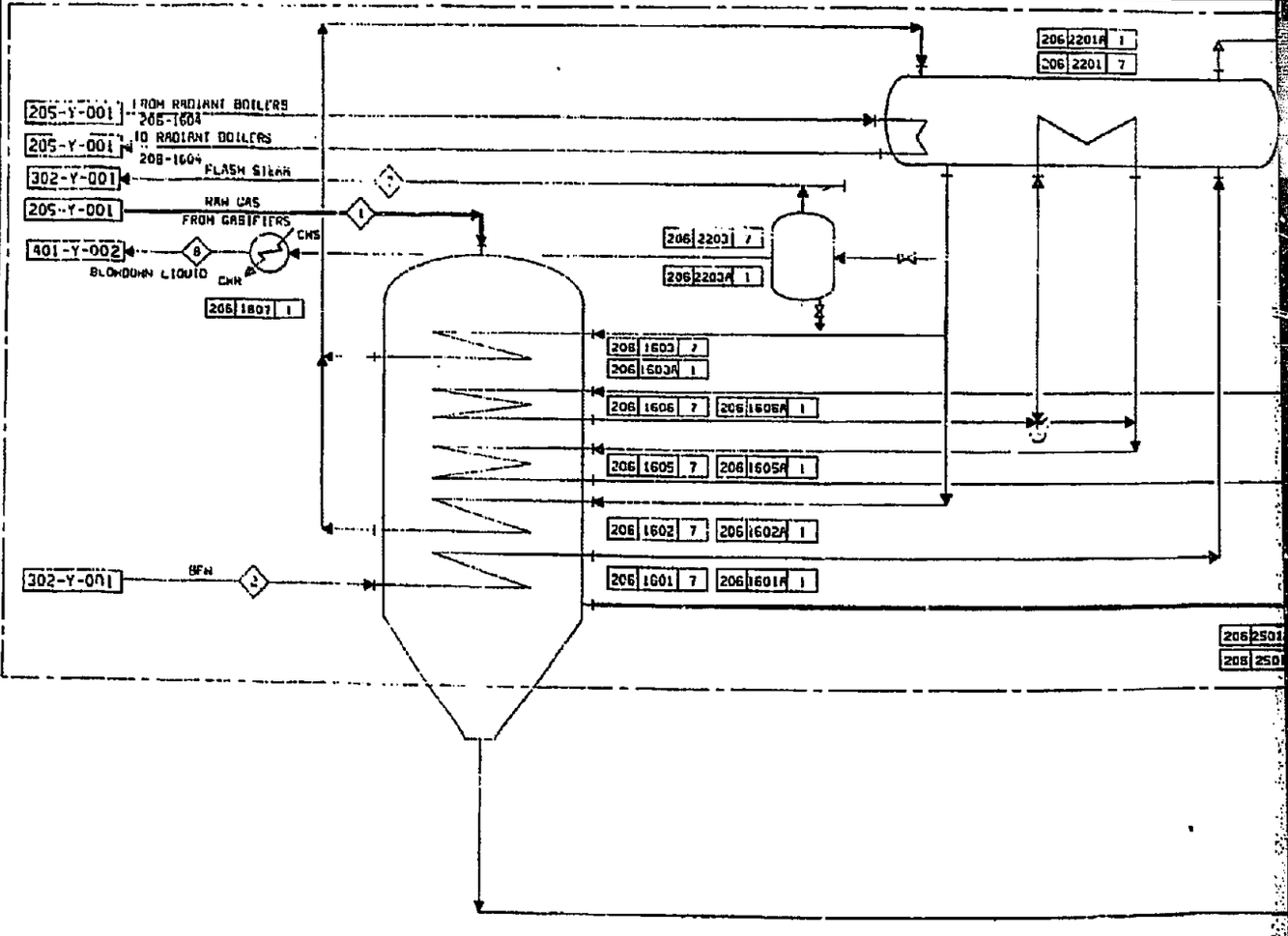
5530-205-Y-10ATM

REVISION 0

AC1417

SCALING RULES 1/8" 1/4"

STREAM NO.		1		2		3		4		5		6	
STREAM DESCRIPTION		RAW GAS FROM GASIFIERS		BOILER FEED WATER		RAW GAS FROM CYCLONES		WASTE HEAT RECOVERY STEAM		CHAR FROM HHA		CHAR FROM CYCLONES	
PHASE		S/G		L		S/G		G		S		S	
COMPONENT	MOL. WT.	MOL%	LB.MOL/HR	MOL%	LB/HR	MOL%	LB.MOL/HR	MOL%	LB/HR	MOL%	LB/HR	MOL%	LB/HR
CARBON	12.011									69.03	17,091	28.69	68,378
HYDROGEN	2.016	35.83	26,786.92			25.83	26,179.64			52 PPM	9	42 PPM	16
NITROGEN	28.014	1.01	1027.68			1.01	1027.68			35 PPM	5	42 PPM	8
SULFUR	32.060									0.16	93	0.16	374
OXYGEN	32.000												
CHLORINE	35.453	0.02	15.09			0.02	15.09						
ASH	-									69.75	39,881	69.75	159,522
WATER	18.016	28.46	28,851.90	100.00	1,246,762	28.46	28,843.84	100.00	1,222,512	0.05	29	0.05	115
CARBON MONOXIDE	28.011	28.90	29,304.98			28.90	29,296.34			0.08	46	0.08	182
CARBON DIOXIDE	44.011	13.51	13,697.24			13.51	13,693.44			0.06	33	0.06	134
METHANE	16.043	2.22	2245.62			2.22	2245.02			35 PPM	2	35 PPM	8
HYDROGEN SULFIDE	34.076	0.05	50.70			0.05	50.68					4 PPM	1
CARBONYL SULFIDE	60.071	72 PPM	7.25			72 PPM	7.25						
SULFUR DIOXIDE	64.066												
METHANOL	32.043												
DIMETHYL ETHER	46.068												
HIGHER ALCOHOL	74.120												
SOLIDS CARRY OVER	GRAIN DR	(72)				(13)							
SOLIDS CARRY OVER	LB/HR	(335,687)				(50,354)							
TOTAL (WET)		100.00	101,387.1	100.00	1,246,762	100.00	101,354.97	100.00	1,222,512	100.00	57,180	100.00	228,725
FLOW (DRY)	SCFM	27,520,385				27,518,740							
TOTAL FLOW	LB/HR	2,399,473		1,246,762		2,111,568		1,222,512		57,180		228,725	
PRESSURE	PSIA	58		1100		55		870		50		50	
TEMPERATURE	°F	≤ 2100		228		392		890		900		300	
HHV	BTU/LB												
HHV (DRY)	BTU/SCF												



206-2201
STEAM DRUM

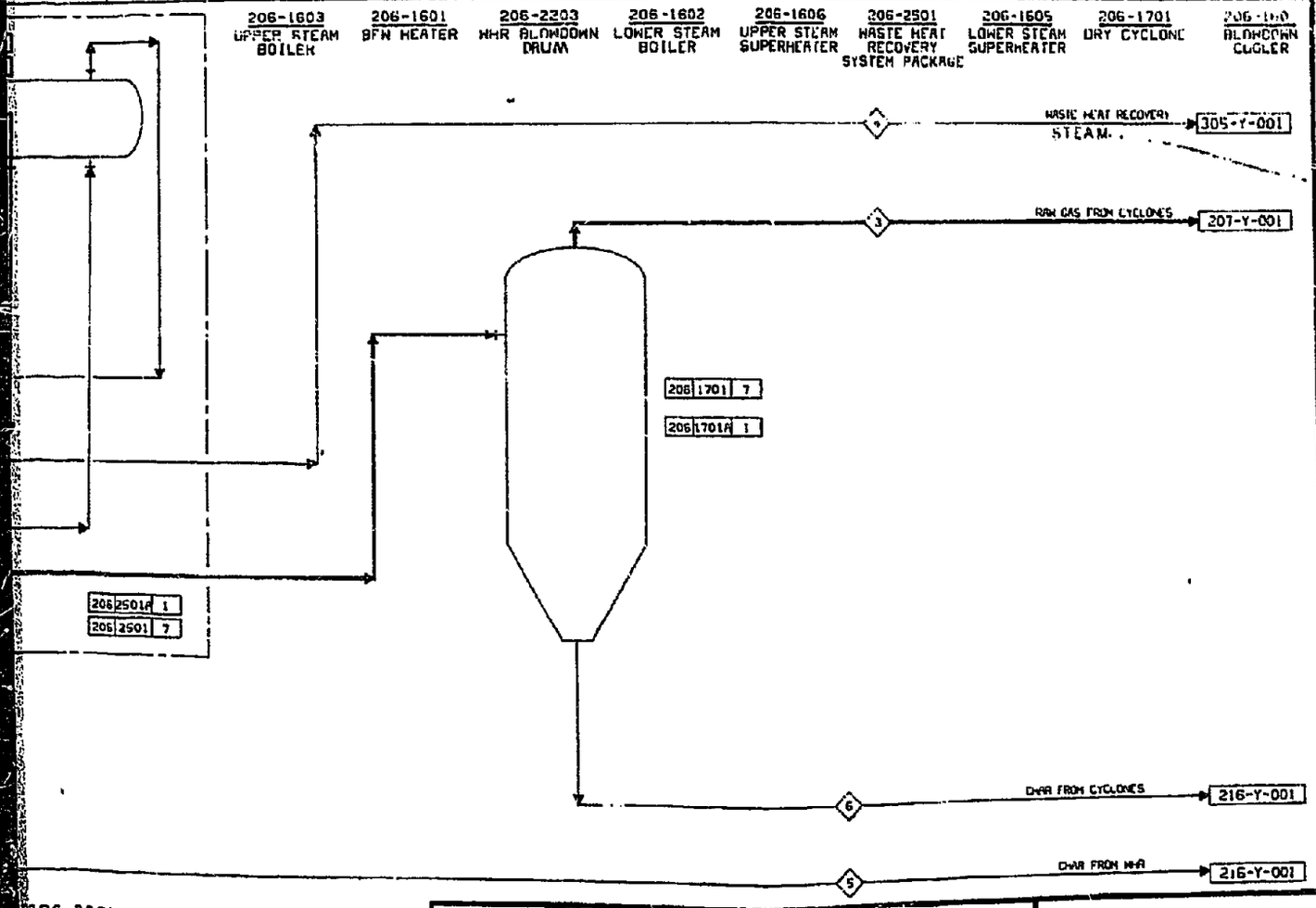
REVISIONS NO.	DESCRIPTION	BY	CHK.	APPROVED	DATE
A	ISSUED FOR FINAL REPORT	T.D.			11/1981

REVISIONS NO.	DESCRIPTION	BY	CHK.	APPROVED	DATE

REFERENCES

7 FLUSH STEAM		9 BLOWDOWN LIQUID		11	12	13	14	15	16	17	18
WT%	LB/HR	WT%	LB/HR								
100.00	5937	100.00	18,513								
120.00	5937	100.00	18,513								
	5937		18,513								
	100		50								
	338		100								

206-1603	206-1601	206-2203	206-1602	206-1606	206-2501	206-1605	206-1701	206-1[illegible]
UPPER STEAM BOILER	BFW HEATER	WHR BLOWDOWN DRUM	LOWER STEAM BOILER	UPPER STEAM SUPERHEATER	WASTE HEAT RECOVERY SYSTEM PACKAGE	LOWER STEAM SUPERHEATER	DRY CYCLONE	BLOWDOWN COOLER



206-2201
STEAM DRUM

CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE	DATE TO
DESIGN			
DRAWN	[illegible]	[illegible]	CLIENT
CHECKED	[illegible]	7/21	FIELD
APPROVED 1	[illegible]	7/23	
APPROVED 2			
APPROVED 3			

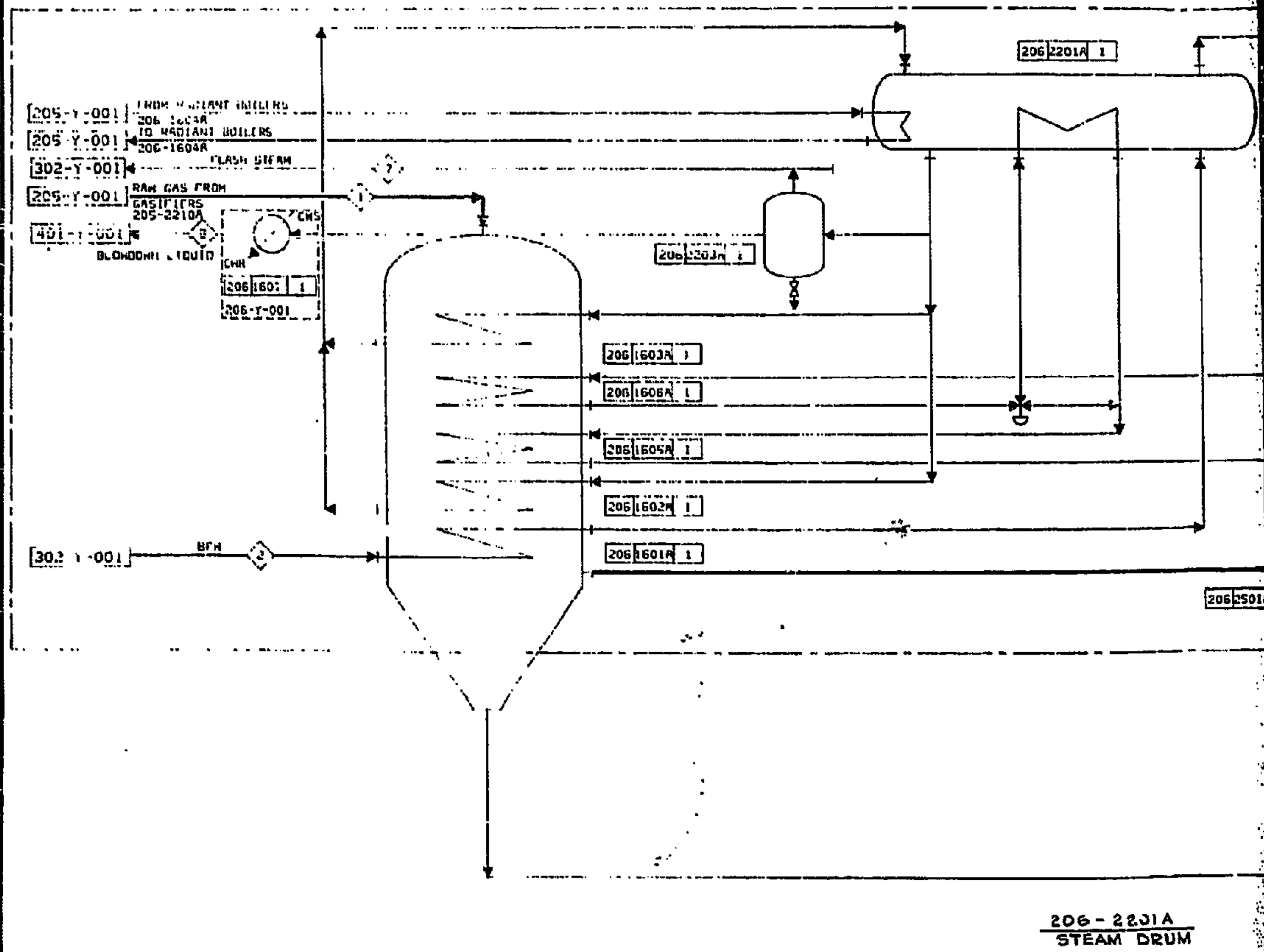
TITLE: WASTE HEAT RECOVERY & DRY CYCLONE

5530-206-Y-001

REVISION 0

SCALING RULES 1/8" 1/4"

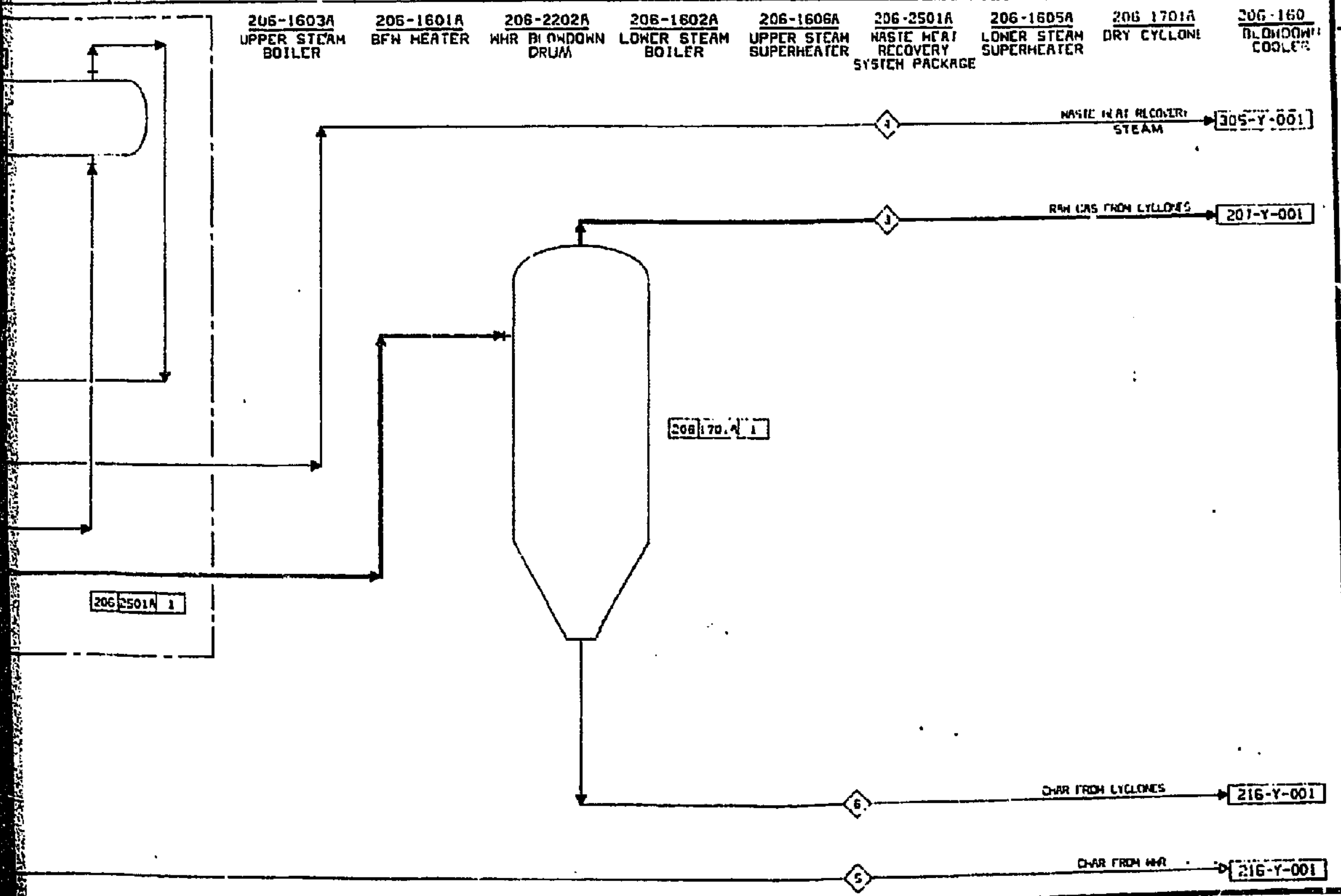
STREAM NO.		1		2		3		4		5		6	
STREAM DESCRIPTION		RAW GAS FROM GASIFIER		BOILER FEED WATER		RAW GAS FROM CYCLONE		WASTE HEAT RECOVERY STEAM		CHAR FROM HHR		CHAR FROM CYCLONE	
PHASE		S/G		L		S/G		G		S		S	
COMPONENT	MOL. WT.	MOL%	LB.MOL/HR	WT%	LB/HR	MOL%	LB.MOL/HR	WT%	LB/HR	WT%	LB/HR	WT%	LB/HR
CARBON	12.011									29.95	3767	29.95	12,249
HYDROGEN	2.016	23.57	4375.09			23.57	4375.09						
NITROGEN	28.014	1.79	331.50			1.79	331.50						
SULFUR	32.060									0.19	24	0.19	79
OXYGEN	32.000												
CHLORINE	35.453	0.02	2.85			0.02	2.88						
ASH	-									69.88	8795	69.88	28,585
WATER	18.016	28.75	5335.41	100.00	242,506	28.76	5335.41	100.00	238,097				
CARBON MONOXIDE	28.011	27.56	5115.00			27.56	5113.00						
CARBON DIOXIDE	44.011	14.26	2644.55			14.26	2644.56						
METHANE	16.043	4.00	742.42			4.00	742.42						
HYDROGEN SULFIDE	34.076	0.05	9.5			0.05	9.5						
CARBONYL SULFIDE	60.071	54 PPM	1.00			54 PPM	1.00						
SULFUR DIOXIDE	64.066												
METHANOL	32.043												
DIMETHYL ETHER	46.068												
HIGHER ALCOHOL	74.120												
(SOLIDS CARRY OVER)	GR/SCF DRY	(88)				(13.1)							
(SOLIDS CARRY OVER)	LB/HR	(63082)				(9587)							
TOTAL (WET)		100.00	1855.53	100.00	242,506	100.00	1855.53	100.00	238,097	100.00	12586	100.00	40,911
FLOW (DRY)	SCFH	5,016,144				5,016,144							
TOTAL FLOW	LB/HR	449,292		242,506		395,795		238,097		12586		40,811	
PRESSURE	PSIA	145		1100		55		870		137		137	
TEMPERATURE	°F	< 2100		228		392		840		300		300	
HHV	BTU/LB												
HHV (DRY)	BTU/SCF												



NO.	DESCRIPTION	BY	CK.	APPROVED	DATE	NO.	DESCRIPTION	BY	CK.	APPROVED	DATE
0	ISSUED FOR FINAL REPORT	I.O.			7/76						

1 2 3 4 5

	7		8		11	12	13	14	15	16	17	18
	FLASH STEAM		BLOWDOWN LIQUID									
	G		L									
	WT%	LB/HR										
	100.00	1071	100.00	3338								
	100.00	1071	100.00	3338								
	1071		3338									
	100		50									
	338		100									



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CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

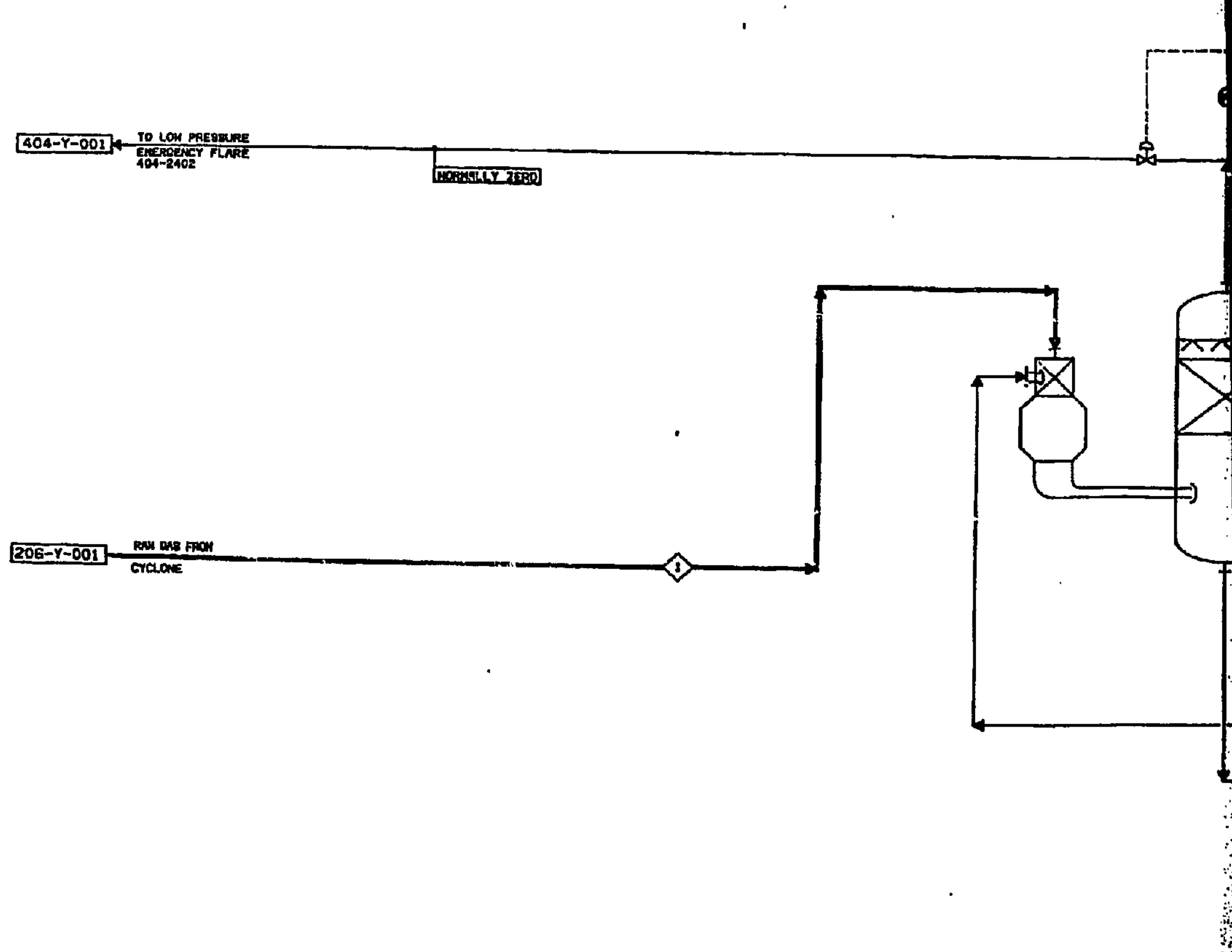
	BY	DATE
DESIGNED		
DRAWN	MPS	
CHECKED	BPL	7/81
APPROVED I	TKL	7/31/81
APPROVED II		
APPROVED III		

TITLE
WASTE HEAT RECOVERY & DRY CYCLONE

SCALE NONE

5530-206-Y-108TM
0

STREAM NO.		1		2		3		4	
STREAM DESCRIPTION		RAW GAS FROM CYCLONE		RAW GAS TO COMPRESSION		RECIRCULATION WATER		SLURRY TO SETTLERS	
PHASE		G		G		L		L	
COMPONENT	MOL. WT.	MOL%	LB.MOL/HR	MOL%	LB.MOL/HR	WT%	LB/HR	WT%	LB/HR
CARBON	12.011							0.12	15002
HYDROGEN	2.016	25.83	26,178.64	35.18	26,168.65			2 PPM	22
NITROGEN	28.014	1.01	1027.62	1.38	1027.32			1 PPM	8
SULFUR	32.060							6 PPM	83
OXYGEN	32.000								
CHLORINE	35.453	0.02	15.69					41 PPM	535
ASH	-							0.27	35189
WATER	18.016	28.46	28,843.87	2.65	1958.13	100.00	12,680,000	99.59	13,164,194
CARBON MONOXIDE	28.011	28.50	22,276.34	39.36	22,276.36			42 PPM	560
CARBON DIOXIDE	44.011	13.57	11,693.44	18.33	11,637.50			0.02	2462
METHANE	16.043	2.22	2245.02	3.02	2243.50			1 PPM	18
HYDROGEN SULFIDE	34.076	0.05	50.69	0.07	50.68				
CARBONYL SULFIDE	60.071	72 PPM	7.25	0.01	7.25				
SULFUR DIOXIDE	64.060								
METHANOL	32.043								
DIMETHYL ETHER	46.068								
HIGHER ALCOHOL	74.120								
(SOLIDS CARRYOVER)	GR/SCF DRY	(1.3)							
(SOLIDS CARRYOVER)	LB/HR	(50,354)							
						(SOLIDS 200 MG/LIT)			
TOTAL (WET)		100.00	101,358.97	100.00	74,379.79	100.00	12,680,000	100.00	13,218,153
FLOW (DRY)	SCFH	27,518,748		27,479,601					
TOTAL FLOW	LB/HR	2,113,568		1,575,415		12,680,000		13,218,153	
PRESSURE	PSIA	55		40		100		40	
TEMPERATURE	°F	392		104		82		152	
HHV	BTU/LB								
HHV, (DRY)	BTU/SCF								



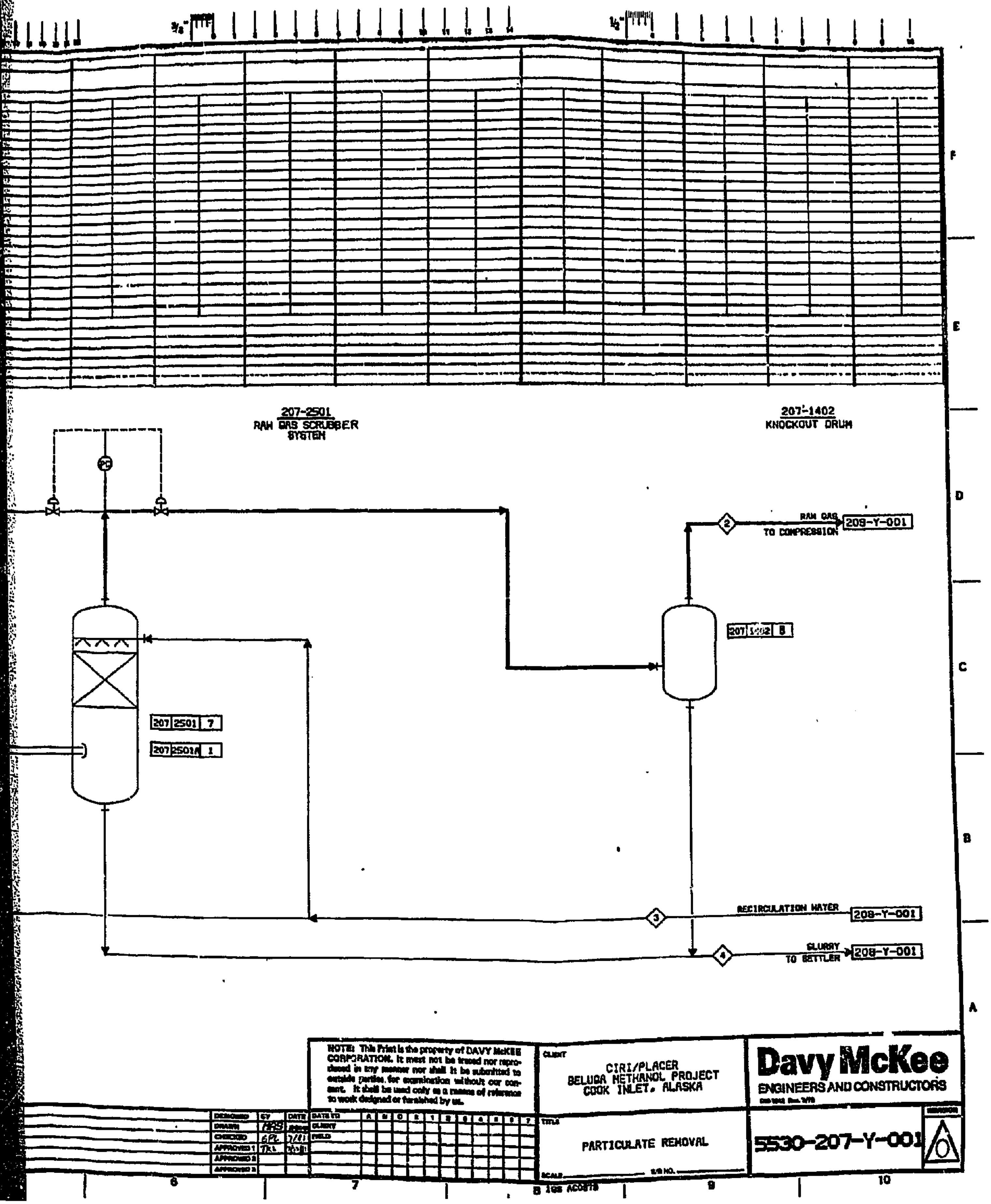
NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
	ISSUED FOR FOR FINAL REPORT	I.O.			7/78

REVISIONS

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

REVISIONS

REFERENCES



207-2501
RAW GAS SCRUBBER SYSTEM
207-1402
KNOCKOUT DRUM
PC
207 2501 7
207 2501A 1
RAW GAS TO COMPRESSION
208-Y-001
RECIRCULATION WATER
208-Y-001
SLURRY TO SETTLER
208-Y-001
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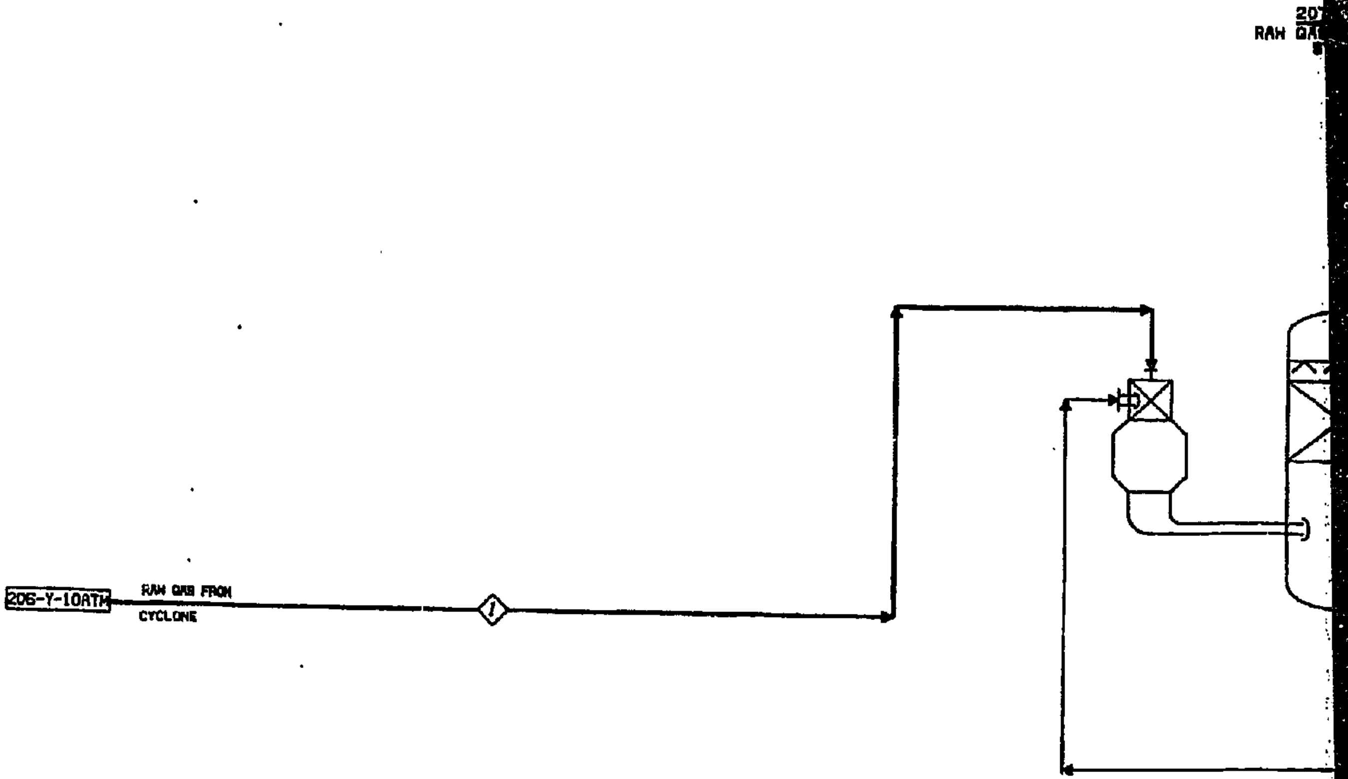
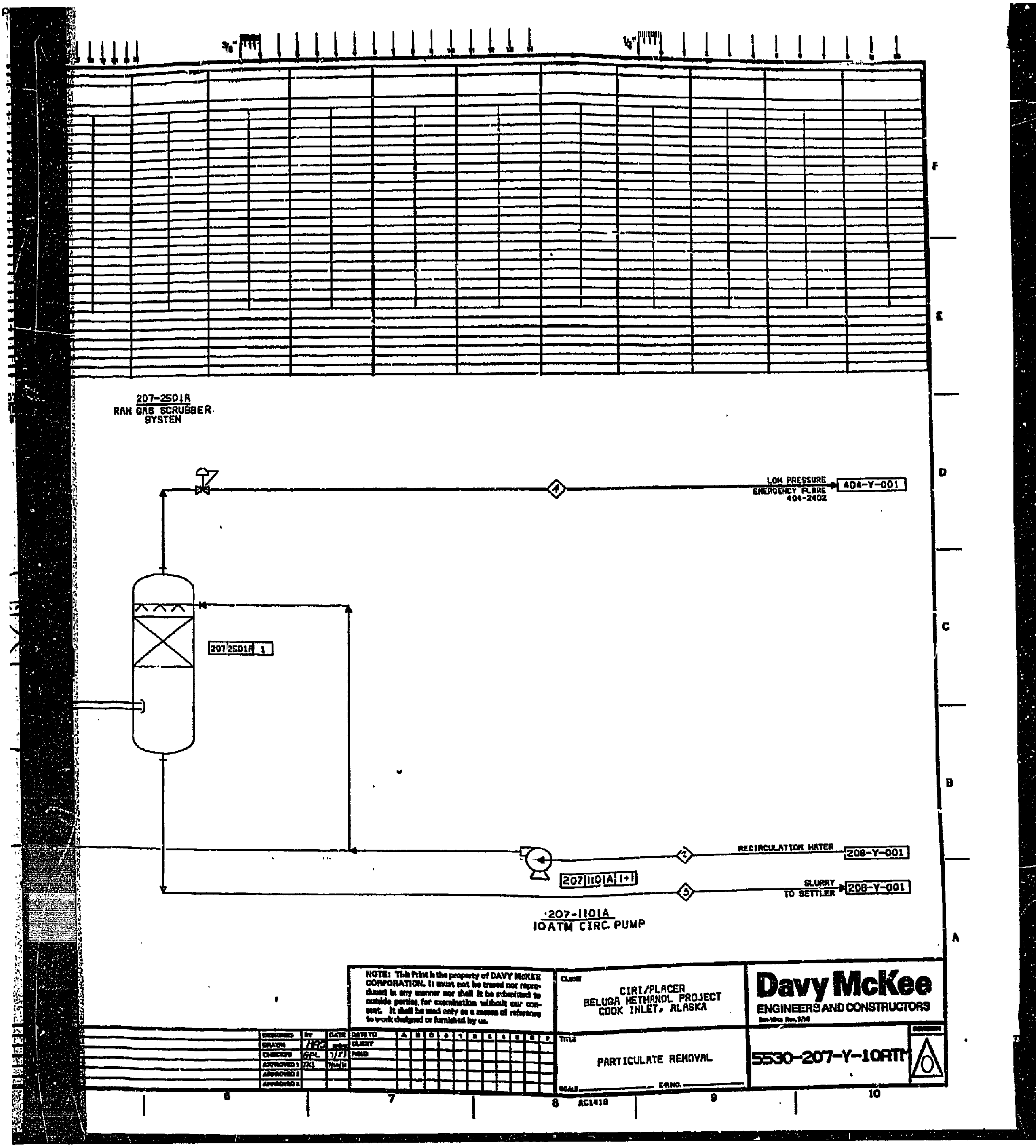
CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA
Davy McKee
ENGINEERS AND CONSTRUCTORS
TITLE
PARTICULATE REMOVAL
5530-207-Y-001
DESIGNED
DRAWN
CHECKED
APPROVED 1
APPROVED 2
APPROVED 3
DATE ISSUED
CLIENT
FIELD
SCALE

STREAM NO.		1		2		3		4		5
STREAM DESCRIPTION		RAW GAS FROM CYCLONE		RECIRCULATION WATER		SLURRY TO SETTLER		GAS TO LOW PRESS. EMER.RAM		
PHASE		G		L		L		G		
COMPONENT	MOL. WT.	MOL %	LB-MOL/HR	WT %	LB/HR	WT %	LB/HR	MOL. %	LB-MOL/HR	
CARBON	12.011					0.12	2871			
HYDROGEN	2.016	23.57	4573.09			2 PPM	4	38.80	1871.10	
NITROGEN	28.014	1.77	931.50			1 PPM	2	2.49	581.45	
SULFUR	32.060					6 PPM	10			
OXYGEN	32.000									
CHLORINE	35.453	0.02	2.65			41 PPM	101			
ASH	-					0.27	6698			
WATER	18.016	38.25	6333.41	100.00	8,412,045	99.59	8,005,055	0.70	12,346	
CARBON MONOXIDE	28.011	27.56	5112.00			42 PPM	107	34.34	5109.10	
CARBON DIOXIDE	44.011	14.26	2614.92			0.02	469	19.77	2616.90	
METHANE	16.043	4.90	766.40			1 PPM	3	5.57	265.05	
HYDROGEN SULFIDE	34.076	0.05	8.90					0.09	8.30	
CARBONYL SULFIDE	60.071	64 PPM	1.00					0.01	1.00	
SULFUR DIOXIDE	64.066									
METHANOL	32.043									
DIMETHYL ETHER	46.098									
HIGHER ALCOHOL	74.120									
(SOLIDS CARRYOVER)	GR/SCF DRY	(18.1)								
(SOLIDS CARRYOVER)	LB/HR	(9585)								
TOTAL (WET)		100.00	18551.53	100.00	8,418,045	100.00	8,516,106	100.00	19,326	
FLOW (DRY)	SCFH	5,100,144.						5,008,714		
TOTAL FLOW	LB/HR	395,796		8,412,045		8,516,106		591,734		
PRESSURE	PSIA	137		175		187		187		
TEMPERATURE	°F	396		81		162		104		
HHV	BTU/LB									
HHV. (DRY)	BTU/SCF									



NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
0	ISSUED FOR FINAL REPORT	LD			7/78

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE


207-2501A
RAW GAS SCRUBBER SYSTEM
LOW PRESSURE
EMERGENCY FLARE
404-2402
404-Y-001
207 2501A 1
RECIRCULATION WATER
208-Y-001
SLURRY
TO SETTLER
208-Y-001
207 1101A 1+1
207-1101A
10ATM CIRC. PUMP
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CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA
Davy McKee
ENGINEERS AND CONSTRUCTORS
TITLE
PARTICULATE REMOVAL
5530-207-Y-10ATM
DESIGNED
DRAWN
CHECKED
APPROVED 1
APPROVED 2
APPROVED 3
BY
DATE
DATE TO
CLIENT
FIELD
SCALE
DWG NO.
AC1418
A
B
C
D
E
F
6
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8
9
10

STREAM NO.		1		2		3		4		5		6		7		8		9
STREAM DESCRIPTION		SLURRY FROM RAW GAS SCRUBBER		WTR. FROM FEED LOCK HOPPER SCRUB.		EVOLVED GASES TO FLARE		CHAR THICKENER BOTTOMS		WATER TO RAW GAS SCRUBBERS		WTR. TO FEED LOCK HOPPER DUST SCRUB.		SLURRY FROM COAL DRYER SCRUBBER		COAL DRYER THICKENER BOTTOMS		WTR... DRYE...
PHASE		S/L		L		G		S/L		L		L		S/L		S/L		
COMPONENT	MOL. WT.	WT %	LB/HR	WT %	LB/HR	MOL %	LB.MOL/HR	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	WT
CARBON	12.011	0.18	15,086					2.83	15,088									
HYDROGEN	2.016	2 PPM	28			7.81	10.99											
NITROGEN	28.014	1 PPM	8			0.21	0.20											
SULFUR	32.060	6 PPM	82					0.02	83									
OXYGEN	32.000																	
CHLORINE	35.453	41 PPM	635					0.10	535									
ASH		0.27	35,189					6.69	35,189					9.90	22,236	14.92	22,236	
WATER	18.016	99.59	13,164,194	100.00	32,940	37.23	52.40	90.46	482,690	100.00	12,680,000	100.00	33,500	90.10	202,400	85.08	126,800	100.
CARBON MONOXIDE	28.011	42 PPM	560			14.20	19.90											
CARBON DIOXIDE	44.011	0.02	2468			39.75	55.94											
METHANE	16.043	1 PPM	18			0.80	1.12											
HYDROGEN SULFIDE	34.076																	
CARBONYL SULFIDE	60.011																	
SULFUR DIOXIDE	64.066																	
METHANOL	32.043																	
DIMETHYL ETHER	46.068																	
HIGHER ALCOHOL	74.120																	
SOLIDS CARRIED (L.R)	[illegible]																	
SOLIDS CARRIED (L.P)	MMHR																	
TOTAL (WT %)		100.00	13,218,153	100.00	32,940	100.00	140.73	100.00	533,579	100.00	12,680,000	100.00	33,500	100.00	224,636	100.00	149,036	100
FLOW (SCFH)	SCFH					33,513												
TOTAL FLOW	LB/HR	13,218,153		32,940		4014		533,579		12,680,000		33,500		224,636		149,036		
PRESSURE	PSIA	40		20		20		50		100		100		50		50		
TEMPERATURE	°F	152		100		100		130		82		82		120		120		
HHV	BTU/LB																	
HHV (DRY)	BTU/SCF																	

208-2201 CHAR SLURRY LET-DOWN DRUM

208-1601 CHAR SLURRY COOLER

208-2501 CHAR SLURRY THICKENER

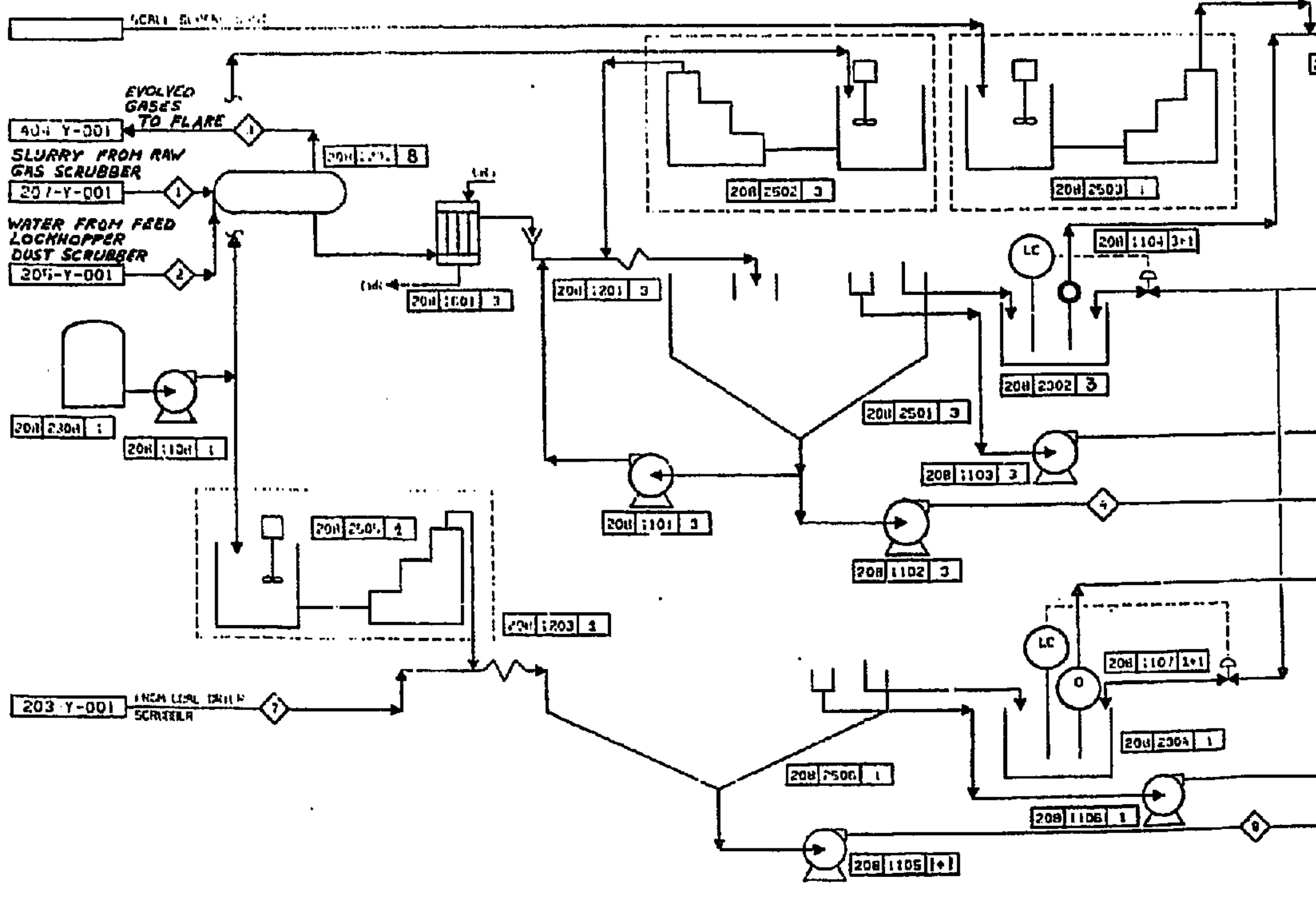
208-2502 CHAR SETTLER POLYMER FEED PACKAGE

208-2503 SCALE SUPPRESSANT FEED MODULE PACKAGE

208-2302 RAW GAS SCRUBBER WATER SUMP

208-1602 RECIRCULATION WATER COOLER

208-2504 FILTER PACKAGE



208-1108 RAW POLYMER FEED PUMP

208-1203 STATIC MIXER

208-1105 COAL DUST SLUDGE PUMP

208-1106 COAL DUST SETTLER SCUM PUMP

208-1102 CHAR SLURRY PUMP

208-1101 CHAR SLURRY RECIRCULATION PUMP

208-1107 DRYER SCRUBBER WATER SUMP PUMP

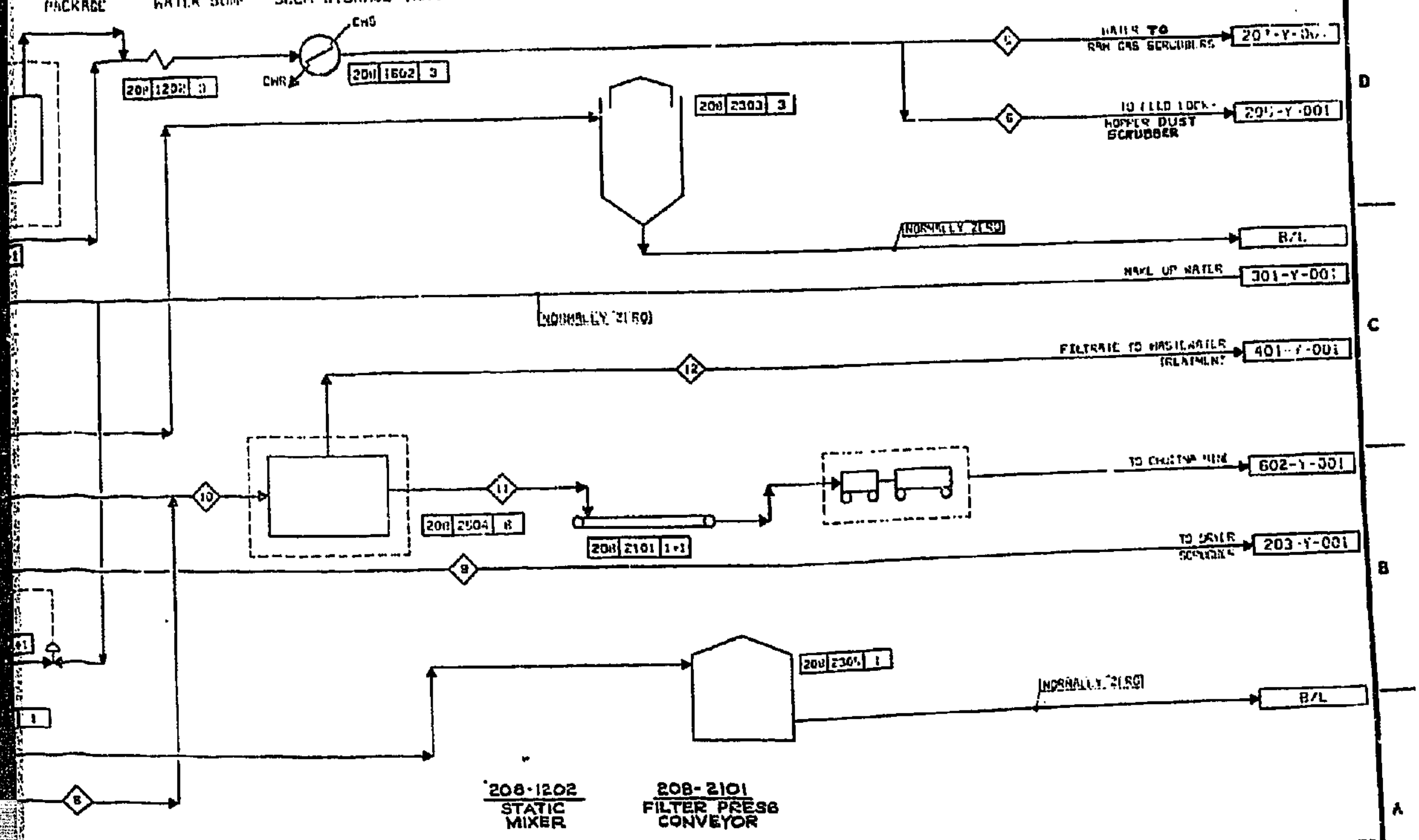
208-1201 STATIC MIXER

208-1... SCUM P...

REVISIONS NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
△	ISSUED FOR FINAL REPORT	E.D.			[illegible]

1 2 3 4 5

	8 DRYER THICK BOTTOMS S/L		9 WTR. TO COAL DRYER SCRUBBER		10 SLURRY TO FILTER S/L		11 SLUDGE TO MINE S		12 FILTRATE TO W.W.T. L	
	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR	WT %	LB/HR
					2.21	15,086	6.12	15,086		
					0.01	83	0.03	83		
					0.08	535	0.22	535		
					8.41	57,425	23.56	57,425		
	[illegible]28	22,236	100.00	75,600	89.29	609,490	70.00	170,687	100.00	438,863
	[illegible]08	126,800								
	[illegible].00	149,036	100.00	75,600	100.00	682,615	100.00	243,752	100.00	438,863
	149,036		75,600		682,615		243,752		438,843	
	50		60		40		ATM			
	120		160		100		100			



CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

DESIGNED	BY	DATE
DRAWN	[illegible]	[illegible]
CHECKED	[illegible]	[illegible]
APPROVED 1	TKS	[illegible]
APPROVED 2		
APPROVED 3		

DATE TO: A B C D E F G H I J K L
CLIENT
FIELD

TITLE
GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION

SCALE — E/W NO.

5530-208-Y-001

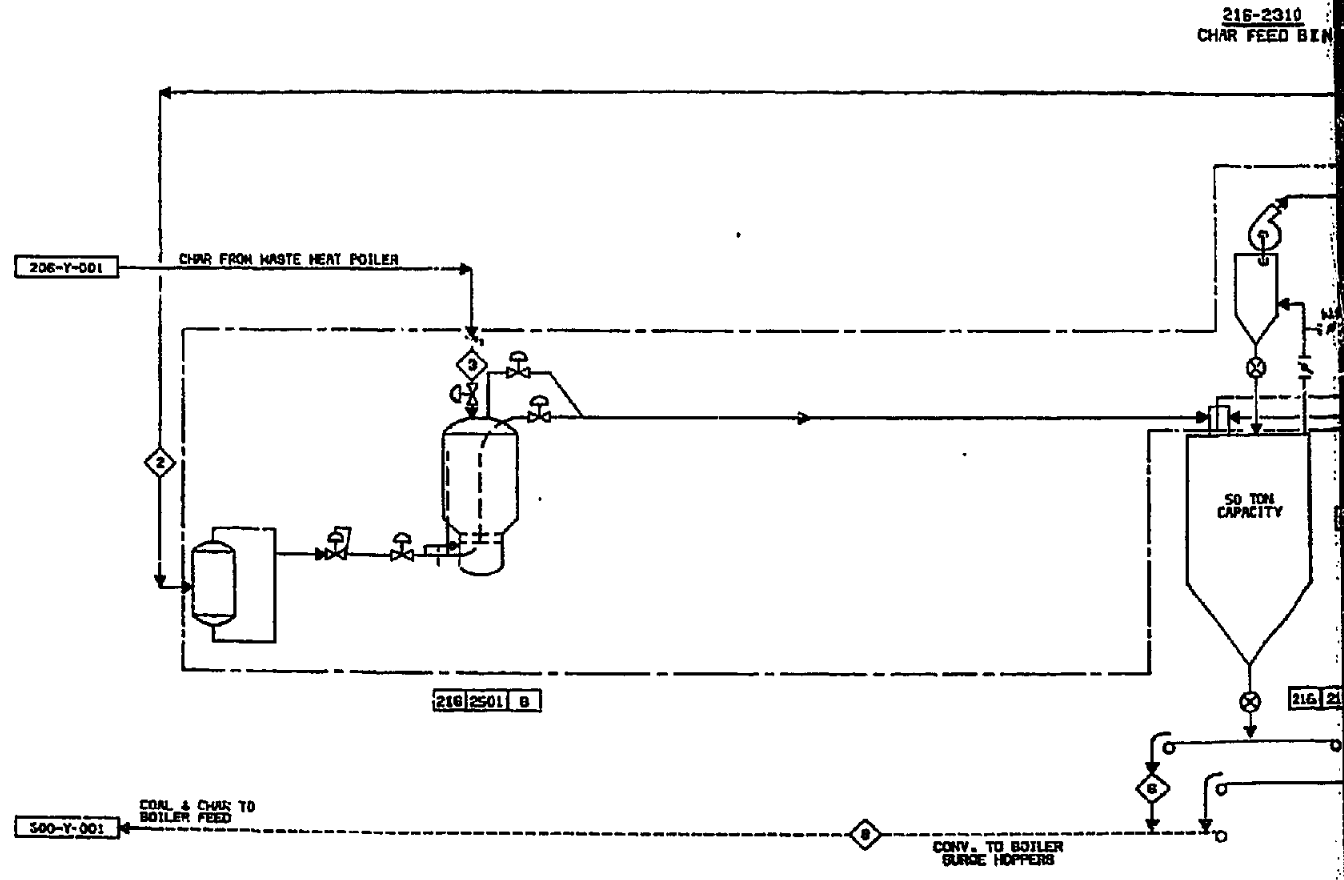
REVISION 0

AC1425

6 7 8 9 10

SCALING RULES

STREAM NO.		1		2		3		4		5		6		7		8		9
STREAM DESCRIPTION		N_2 TO CHAR CONV. SYSTEM		N_2 TO WASTE HEAT BOILER CONV. SYSTEM		CHAR FROM WASTE HEAT BOILERS		N_2 TO CYCLONE CONV. SYSTEM		CHAR FROM CYCLONES		CHAR TO BOILER FEED		COAL TO BOILER FEED		COAL & CHAR TO BOILER FEED		VE[illegible] ATM[illegible]
PHASE																		
COMPONENT	MOL. WT.	SCFH		SCFH		STPH	WT. %	SCFH		STPH	WT. %	STPH	WT. %	STPH	WT. %	STPH	WT. %	SCFM
CARBON	12.011					8.5	30.0			34.1	30.0	42.6	30.0	48.5	24.24	91.2	26.62	
HYDROGEN	2.016					TRACE				TRACE								46.0[illegible]
NITROGEN	28.014	8850		1600		TRACE		6050		TRACE								8851.6[illegible]
SULFUR	32.080													0.3	0.15	0.3	0.09	
OXYGEN	32.000																	
CHLORINE	35.453																	
ASH	–					20.0	70.0			80.0	70.0	100.0	70.0	41.5	20.75	141.4	41.28	
WATER	18.016					TRACE				TRACE				47.8	23.90	47.8	13.94	50.65
CARBON MONOXIDE	28.011					TRACE				TRACE								51.47
CARBON DIOXIDE	44.011					TRACE				TRACE								24.05
METHANE	16.043					TRACE				TRACE								3.92
HYDROGEN SULFIDE	34.076					TRACE				TRACE								0.13
CARBONYL SULFIDE	60.071																	
SULFUR DIOXIDE	64.066																	
METHANOL	32.043																	
DIMETHYL ETHER	46.068																	
HIGHER ALCOHOL	74.120																	
VOLATILE MATTER														61.9	30.98	61.9	18.06	
SIZE						-500MESH				-500MESH		-500MESH		-1/4"x0"		-1/4"x0"		
TOTAL (DRY)	STPH					28.5	100.0			114.1	100.0	142.6	100.0					
TOTAL (WET)														200.0	100.0	342.6	100.0	
FLOW (DRY)	SCFH	531000		168000				363000										541[illegible]
TOTAL FLOW	LB/HR																	
PRESSURE	PSIA	115		115		59		115		59								
TEMPERATURE	°F	AMBIENT		AMBIENT		390		AMBIENT		390				AMBIENT				
HHV	BTU/LB																	
HHV. (DRY)	BTU/SCF																	



216-2501
WASTE HEAT BOILER
CHAR CONVEYING SYSTEM

216-2150
ROTARY FEEDER

AC1445

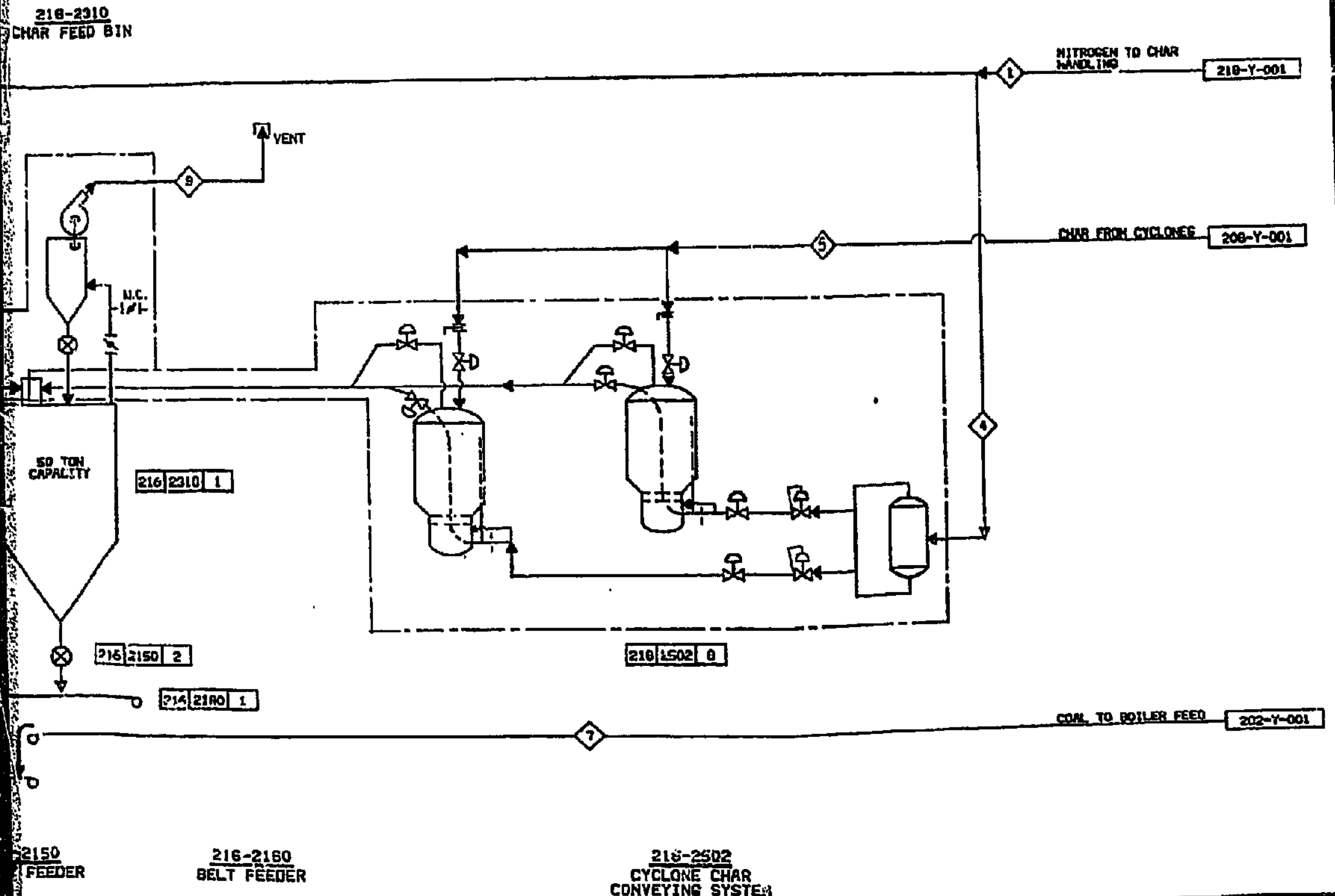
NO.	DESCRIPTION	BY	CH.	APPROVED	DATE	NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
0	ISSUED FOR REPORT										

REVISIONS — REVISIONS — REFERENCES

1 2 3 4 5

A B C D E

8 CHAR TO ...R FEED	9 VENT TO ATMOSPHERE
WT. %	SCFM
24.63	
	46.05
	181.64
0.05	
41.20	
13.94	60.65
	61.47
	14.05
	5.92
	6.18
18.06	
100.0	141,672



CLIENT: CIRI/PLACER BELUGA METHANOL PROJECT COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

DESIGNED	BY	DATE
DRAWN		
CHECKED		7-2-81
APPROVED 1		7/3/81
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT / FIELD

TITLE: DRY CHAR SYSTEMS

5530-216-Y-001

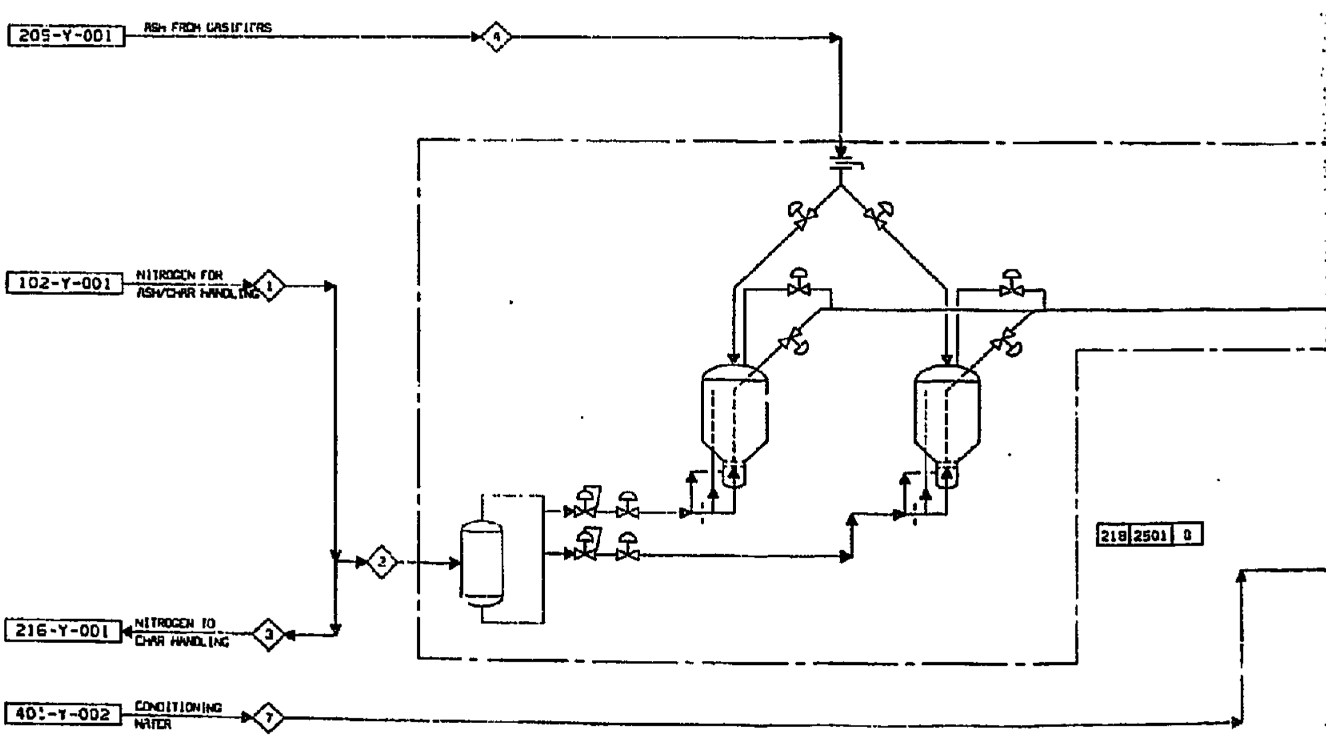
REVISION 0

SCALING RULES 1/8" 1/4"

STREAM NO.		1		2		3		4		5		6		7		8	
STREAM DESCRIPTION		NITROGEN FOR ASH/CHAR HANDLING		NITROGEN FOR GASIFIER ASH HANDLING		NITROGEN TO CHAR HANDLING		ASH FROM GASIFIERS		ASH FROM BOILERS		CONDITIONED ASH TO MINE		CONDITIONING WATER		VENT TO ATMOSPHERE	
PHASE																	
COMPONENT	MOL. WT.	SCFM		SCFM		SCFM		STPH	WT%	STPH	WT%	STPD	WT%	STPD	WT%		
CARBON	12.011							5.58	10.0								
HYDROGEN	2.016																
NITROGEN	28.014	13150		4300		8850										4300	
SULFUR	32.060																
OXYGEN	32.000																
CHLORINE	35.453																
ASH	-							50.27	90.0			4729.2	80.0				
WATER	18.016											945.8	20.0	845.2	100.0		
CARBON MONOXIDE	28.011																
CARBON DIOXIDE	44.011																
METHANE	16.043																
HYDROGEN SULFIDE	34.076																
CARBONYL SULFIDE	60.071																
SULFUR DIOXIDE	64.066																
METHANOL	32.043																
DIMETHYL ETHER	46.060																
HIGHER ALCOHOL	74.120																
SIZE								-500 MESH									
TOTAL DRY	STPH							55.85	100.0	141.2	100.0						
TOTAL (WET)	STPD											5675.0	100.0	945.2	100.0		
FLOW (DRY)	SCFH	789000		250000		531000										850000	
TOTAL FLOW	LB/HR																
PRESSURE	PSIA	115		115		115											
TEMPERATURE	°F	AMBIENT		AMBIENT		AMBIENT		350									
HHV	BTU/LB																
HHV, (DRY)	BTU/SCF																

E

218-2501
PNEUMATIC CONVEYING SYSTEM



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C

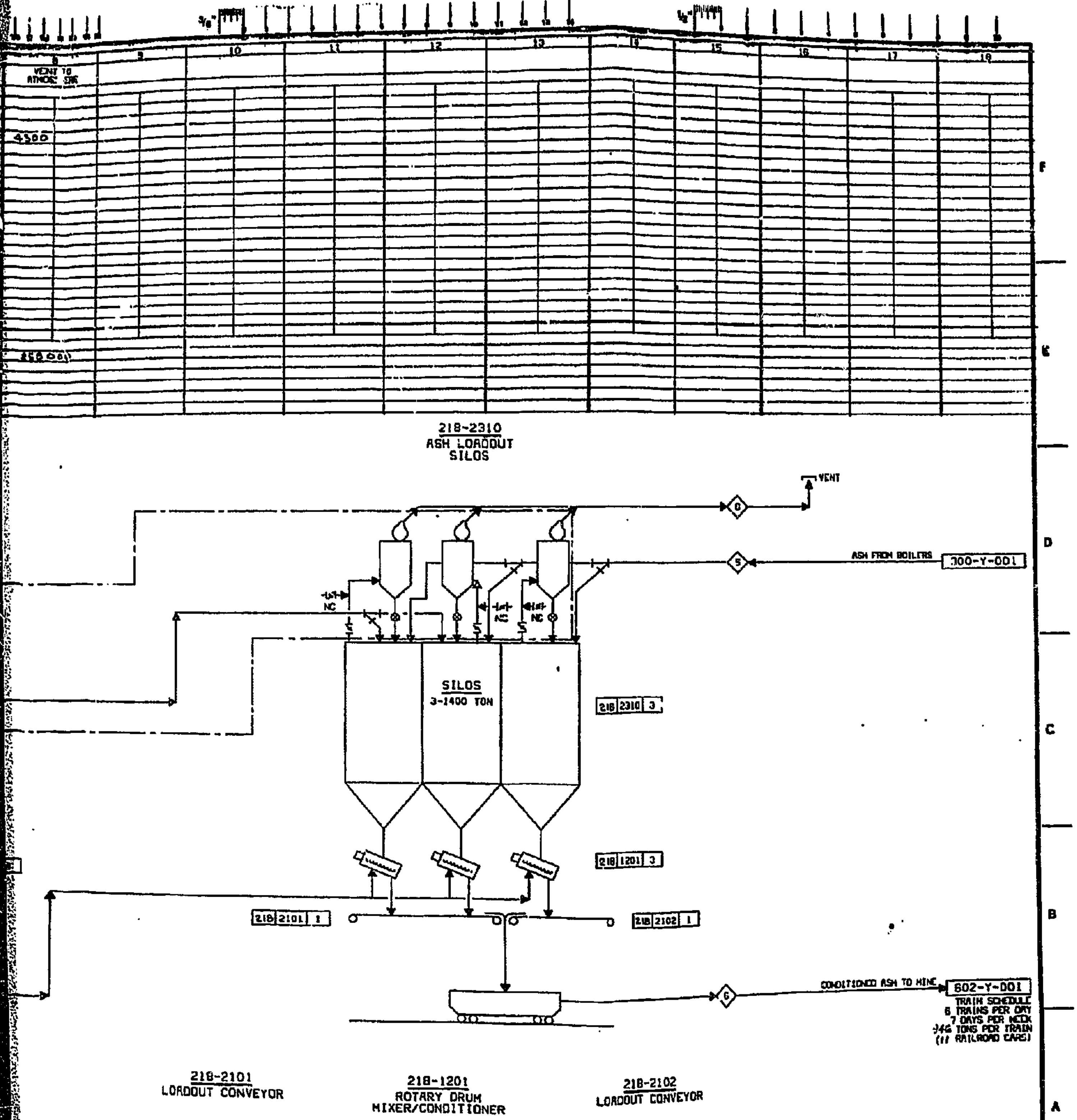
B

A

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE	NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
	ISSUED FOR REPORT										

REVISIONS REVISIONS REFERENCES

1 2 3 4 5



CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: ASH SYSTEM

5530-218-Y-001

REVISION: 0

	BY	DATE
DESIGNED		
DRAWN	HAS	
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT / FIELD

SCALE — DWG NO.

RC1446

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
WT - WEIGHT
ACC - ACCESSORIES

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-1301	4	Start-Up Air Blower
		T - Centrifugal Blower
		C - 11,771 SCFM
		S - 34" Dia. Blade-24"/18" Inlet/Outlet
		P/T - 14.67 to 17.38 psia/70° to -50°F Inlet
		M - CS-CI
		D - Electric Motor - 250 hp
205-1302A	1	10 ATM Nitrogen Compressor
		T - Centrifugal
		S - 250 hp
		C - 570 ICFM
		Pi/Ti - 85 psig/100°F
		Po/To - 150 psig/240°F
		D - Electric
205-1303A	1	10 ATM Oxygen Compressor
		T - Centrifugal
		S - 2030 hp
		C - 4560 ICFM
		Pi/Ti - 75 psig/100°F
		Po/To - 175 psig/230°F
		D - Electric
205-1501	8	Start-Up Burner
		T - Gas Burner
		C - 310 SCFM Fuel of LHV=853 Btu/scf
		P/T - 25 psig Min./Amb
205-1606A	1	Oxygen Cooler
		T - Shell and Tube
		C - 375 MM Btu/hr
		S - 1600 sq.ft.
		M - Shell-Carbon Steel Tubes- Carbon Steel
		Des P/T - Shell-75 psig/125°F Tubes-125 psig/300°F

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-1607A	1	Nitrogen Aftercooler
		T - Shell and Tube C - 0.46 MM Btu/hr S - 350 sq.ft. M - Shell-Carbon Steel Tubes-Carbon Steel Des P/T - Shell 75 psig/150°F Tubes-200 psig/300°F
205-1701	7	Ejector
		T - Jet Type Ejector C - 208,424 SCFH Dry Gas with entrained solids MW=28 P/T - 10 psig/100°F M - Carbon steel: Motive force for ejector to be water at 65 psia and 100°F.
205-1701A	1	Ejector
		T - Jet Type Ejector C - 521,060 SCFH Dry Gas with Entrained Solids MW=28 P/T - 35 psig/100°F M - Carbon Steel: Motive force for ejector to be water at 65 psia and 100°F.
205-1702	4	Air Filter
		T - Air Intake with Silencer C - 11,771 SCFM S - 64" x 64" x 24" High P/T - Atm/Amb M - CS - Synthetic Fibers

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-2102	28	Gasifier Feed Screw T - Horizontal - Tubular Housing P/T - 45 psig/1,625°F at discharge end M - Carbon Steel - stainless steel - Spec. CI D - Electric Acc - Variable gear motor, transmission
205-2102A	4	Gasifier Feed Screw T - Horizontal-Tubular Housing P/T - 135 psig/1,625°F at discharge end M - Carbon Steel - Stainless Steel - Spec. CI D - Electric Acc - Variable gear motor, transmission
205-2105	7	Ash Discharge Screw T - Double Screw (in series) -20° Inclined - Tubular Housing - Water cooled P/T - 45 psig/1115°F M - Carbon Steel - stainless steel - Spec. CI D - Electric Acc - Variable gear motor, transmission

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-2105A	1	Ash Discharge Screw T - Double Screw (in series)-20° Inclined - Tubular Housing - Water Cooled P/T - 135 psig/1,115°F M - Carbon Steel - Stainless Steel - Spec. CI D - Electric Acc - Variable Gear Motor, Transmission
205-2201	14	Coal Lock Hopper T - Cylindrical with Conical Bottom C - 2,825 cu ft S - 13.75' ID x 26.25' High P/T - 45 psig/150°F M - Carbon Steel - ASTM A516-Gr. 60 Acc - Stainless Steel lining in conical bottom
205-2201A	2	Coal Lock Hopper T - Cylindrical with Conical Bottom C - 2,825 cu ft S - 13.75' ID x 26.25' High P/T - 135 psig/150°F M - Carbon Steel-ASTM A516-Gr.60 Acc - Stainless Steel lining in conical bottom
205-2202	14	Feed Bin T - Cylindrical with Conical Bottom C - 6990 cu ft S - 16.42' ID x 48.58' High P/T - 45 psig/150°F M - Carbon Steel - ASTM A516-Gr. 60 Acc - Stainless Steel lining in conical bottom

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-2202A	2	Feed Bin
		T - Cylindrical with Conical Bottom C - 6990 cu ft S - 16.42' ID x 48.58' High P/T - 135 psig/150°F M - Carbon Steel-ASTM A516-Gr.60 Acc - Stainless Steel lining in conical bottom
205-2203	4	Cooling Water Emergency Tank
		T - Cylindrical, Horizontal C - 636 cu ft S - 8.25' ID x 16.5' Long P/T - Atm/Amb M - Carbon Steel
205-2210	7	Winkler Gasifier
		T - Vertical, Cylindrical with Conical Bottom S- 18' ID x 71.75' High P/T - 45 psig/2,200°F M - Carbon Steel - ASTM A516-Gr. 60 Acc - Brick Lining - Injection and Instrumentation nozzles
205-2210A	1	Winkler Gasifier
		T - Vertical, Cylindrical with Conical Bottom S - 18' ID x 71.75' High P/T - 135 psig/2,200°F M - Carbon Steel-ASTM A516-Gr.60 Acc - Brick Lining - Injection and Instrumentation Nozzles

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-2601	7	Steam Oxygen Mixer I T - Cylindrical, Vertical C - Steam - 13.2 STPH Oxygen - 10,512 SCFM P/T - Steam - 101 psig/482°F Oxygen - 77 psig/257°F M - Stainless Steel
205-2601A	1	Steam Oxygen Mixer I T - Cylindrical, Vertical C - Steam-38.5 STPH Oxygen-14,292 SCFM P/T - Steam-202 psig/482°F Oxygen-173 psig/257°F M - Stainless Steel Note: This item is also to meet the specifications of item 205-2601
205-2602	7	Steam Oxygen Mixer II T - Cylindrical, Vertical C - Steam - 3.3 STPH Oxygen - 5.647 SCFM P/T - Steam - 101 psig/482°F Oxygen - 77 psig/257°F M - Stainless Steel
205-2602A	1	Steam Oxygen Mixer II T - Cylindrical, Vertical C - Steam-9.1 STPH Oxygen-7,678 SCFM P/T - Steam-202 psig/482°F Oxygen-173 psig/257°F M - Stainless Steel Note: This item is also to meet the specifications of item 205-2602

GASIFICATION - AREA 205

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
205-2901	16	Sleeve Valve T - Slide Gate C - 2,012 cu ft/5 min - once per hour P/T - Atm/250°F M - Carbon Steel D - Pneumatic
205-2902	14	Lock Hopper Inlet Valve T - Bell Valve C - 2012 cu ft/5 min - once per hour P/T - 45 psig/250°F M - Carbon Steel D - Pneumatic
205-2902A	2	Lock Hopper Inlet Valve T - Bell Valve L - 2012 cu ft/5 min - once per hour P/T - 135 psig/250°F M - Carbon Steel D - Pneumatic
205-2903	14	Lock Hopper Discharge Valve T - Bell Valve C - 2012 cu ft/8 min - once per hour P/T - 45 psig/250°F M - Carbon Steel D - Pneumatic
205-2903A	2	Lock Hopper Discharge Valve T - Bell Valve C - 2012 cu ft/8 min - once per hour P/T - 135 psig/250°F M - Carbon Steel D - Pneumatic

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

WASTE HEAT RECOVERY AND DRY CYCLONE - AREA 206

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
206-1607	1	Blowdown Cooler T - Shell and Tube C - 4.45 MM Btu/hr M - Shell - Carbon Steel Tubes - Carbon Steel S - 500 sq ft P/T - Shell - 125 psig/350°F Tubes - 75 psig/150°F
206-1701	7	Dry Cyclone T - Multiclone C - 55,225 SCFM Dry; Moisture/Gas Ratio = 0.398 Mol/Mol Dust Loading = 13.2 STPH M - Carbon Steel - ASTM A516-Gr. 60 P/T - 45 psig/392°F Acc - Stainless Steel-lined lower part of cyclone; cyclone will have char inventory of 848 cu ft to permit two 15 min discharges per hour
206-1701A	1	Dry Cyclone T - Multiclone C - 83,500 SCFM Dry; Moisture/Gas Ratio = 0.4036 Mol/Mol Dust Loading = 20.4 STPH M - Carbon Steel-ASTM A516-Gr.60 P/T - 135 psig/392°F Acc - Stainless Steel - lined lower part of cyclone; cyclone will have char inventory of 1310 cu ft discharge per hour
206-2203	7	Waste Heat Recovery Blowdown Drum T - Vertical, Cylindrical S - 4' ID x 6' T-T M - Carbon Steel P/T - 75 psig/325°F

WASTE HEAT RECOVERY AND DRY CYCLONE - AREA 206

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
206-2203A	1	Waste Heat Recovery Blowdown Drum T - Vertical, Cylindrical S - 5' ID X 6' T-T M - Carbon Steel P/T - 75 psig/325°F
206-2501	7	Waste Heat Recovery System Package T - Water Tube Boiler, Refractory Lined Vessel C - 189 MM Btu/hr M - Carbon Steel Des P/T - 75 psig/650°F Shell 1200 psig/950°F Tube Acc - Radiant Boiler 206-1604 Radiant Boiler Steam Drum 206-2202 BFW Heater 206-1601 Lower Steam Boiler 206-1602 Upper Steam Boiler 206-1603 Lower Steam Superheater 206-1605 Upper Steam Superheater 206-1606 Steam Drum 206-2201 206-1601, 1602, 1603, 1605, 1606 are enclosed in a single shell refractory lined vertical vessel 1604 is located in the top section of the gasifier 205-2210

WASTE HEAT RECOVERY AND DRY CYCLONE - AREA 206

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
206-2501A	1	Waste Heat Recovery System Package

T - Water Tube Boiler
C - 285 MM Btu/hr
M - Carbon Steel
Des P/T - 105 psig/650°F Shell
1200 psig/950°F Tube
Acc - Radiant Boiler 206-1604A
Radiant Boiler Steam Drum 206-2202A
BFW Heater 206-1602A
Upper Steam Boiler 206-1603A
Lower Steam Superheater 206-1605A
Upper Steam Superheater 206-1606A
Steam Drum 206-2201A
206-1601A, 1602A, 1603A, 1605A, 1606A are enclosed in a single shell refractory lined vertical

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

PARTICULATE REMOVAL - AREA 207

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
207-1101A	1 + 1	10 ATM Circulation Pump
		T - Centrifugal C - 3200 GPM 82°F, @ 75 psig ΔP = 80 psi M - Carbon Steel D - 210 hp, Electric
207-1402	8	Knockout Drum
		T - Vertical, Cylindrical S - 8' ID x 16' T-T M - Carbon Steel P/T - 75 psig/150°F
207-2501	7	Raw Gas Scrubber System
		T - Wet Scrubbing C - 55,225 SCFM Dry; Moisture/Gas Ratio = 0.398 Mol/Mol - Dust Loading: Inlet: 13.3 GR/SCF Dry Outlet: 0.02 GR/SCF Dry M - Carbon Steel-ASTM A516-Gr. 60 P/T - 45 psig/392°F Inlet Acc - All auxiliaries, including controls and instrumentation, necessary for full operating system.

PARTICULATE REMOVAL - AREA 207

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
207-2501A	1	Raw Gas Scrubber System

T - Wet Scrubbing
C - 83,500 SCFM Dry; Moisture/Gas Ratio = 0.4036 Mol/Mol
- Dust Loading: Inlet: 18.5 GR/SCF Dry
Outlet: 0.02 GR/SCF Dry
M - Carbon Steel - ASTM A 516 - Gr.60
P/T - 135 psig/392°F Inlet
Acc - All auxiliaries, including controls and instrumentation, necessary for full operating system.

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/ TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
208-1101	3	Char Slurry Recirculation Pump T - Centrifugal, Open Impeller, Horizontal C - 100 GPM @ 2.0 psig, 120°F, ΔP=20 psi M - Rubber Lined, Cast Iron D - 3 hp, Electric
208-1102	3	Char Slurry Pump T - Centrifugal, Open Impeller, Horizontal C - 450 GPM @ 2.0 psig, 120°F, ΔP=40 psi M - Rubber Lined, Cast Iron D - 25 hp, Electric
208-1103	3	Raw Gas Scrubber Water Scum Pump T - Diaphragm C - 25 GPM @ 2.0 psig, 100°F, ΔP=20 psi M - Cast Iron/Viton Diaphragm D - 3 hp, Electric
208-1104	3+1	Raw Gas Scrubber Water Sump Pump T - Horizontal, Centrifugal C - 10,600 GPM @ 2.0 psig, ΔP=100 psi M - Cast Steel D - 900 hp, Electric

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
208-1105	1 + 1	Coal Dust Sludge Pump T - Centrifugal, Open Impeller C - 362 GPM @ 2.0 psig, 135°F, ΔP=40 psi M - Rubber Lined Cast Iron D - 20 hp, Electric
208-1106	1	Coal Dust Settler Scum Pump T - Diaphragm C - 50 GPM @ 13 psia, 135°F, ΔP=40 psi M - Carbon Steel/Viton Diaphragm D - 7 1/2 hp, Electric
208-1107	1 + 1	Dryer Scrubber Water Sump Pump T - Horizontal, Centrifugal C - 151 GPM ΔP= 55 psi M - Cast Iron D - 6.0 hp, Electric
208-1108	1	Raw Polymer Feed Pump T - Reciprocating Piston C - 5 GPM M - Stainless Steel D - 1.0 hp, Electric
208-1201	3	Static Mixer T - In-Line C - 10,000 GPM, ΔP = 1.5 psi S - 3' ID M - Fiberglass Reinforced Plastic

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
208-1202	3	Static Mixer T - In-Line C - 10,000 GPM @ 110 psig, ΔP = 12 psi S - 4.5' ID M - Fiberglass Reinforced Plastic
208-1203	1	Static Mixer T - In-Line C - 500 GPM, ΔP = 2.1 psi S - 8 in. ID M - Fiberglass Reinforced Plastic
208-1601	3	Char Slurry Cooler T - Plate and Frame C - 147.39 MM Btu/hr S - 4000 sq ft M - Heresite TH Resin P/T - 50 psig/200°F
208-1602	3	Recirculation Water Cooler T - Shell and Tube C - 159.78 MM Btu/hr S - 5500 sq ft M - Heresite TH Resin P/T - 150 psig/150°F
208-2101	1 + 1	Filter Press Conveyor T - Belt C - 122 STPH S - 30" Wide x 200 fpm D - 8.0 hp

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
208-2201	8	Char Slurry Let-Down Drum T - Horizontal, Cylindrical, Baffled S - 4' ID x 10' L M - Carbon Steel P/T - 50 psig/200°F
208-2204	1	Polymer Storage Tank T - Vertical, Cylindrical C - 4860 Gal. S - 8'ID x 15' T-T M - Carbon Steel
208-2302	3	Raw Gas Scrubber Water Sump Wet Well T - Rectangular, Open C - 80,784 gal S - L=48', W=15', Water Depth=15', Free Board-2' M - Concrete Dry Well T - Rectangular, Housed, Vented S - L=48', W=15', Depth=17' M - Concrete
208-2303	3	Char Settler Scum Storage Tank T - Cone bottomed, Vertical w/floating roof C - 26,654 gal S - 18' ID x 11' SWD, 9.0' cone depth M - Carbon Steel Acc - Heated to 160°F and insulated

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
208-2304	1	Dryer Scrubber Water Sump T - Vertical, Housed C - 16,978 gal S - 17' ID x 12' Deep, 10' water depth M - Concrete
208-2305	1	Coal Dust Settler Scum Storage T - Vertical, Covered, Cone bottom C - 1,775 gal S - 7' ID x 5' SWD M - Carbon Steel
208-2501	3	Char Slurry Thickener T - Circular - to include sludge and scum collection C - 8,862 GPM S - 150' ID x 16' center depth, 3' free board M - Concrete Acc - Variable Speed Rake
208-2502		Char Settler Polymer Feed Package Package consists of: . Blend and Storage Tanks . Agitators . Feed Pump

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
	3	Blend/Storage Tanks T - Vertical, Cylindrical C - 517 gal. S - 4' ID x 5.5' T-T M - Fiberglass Reinforced Plastic
	3	Agitator T - Propeller S - 10 in. dia. @ 350 rpm M - Stainless Steel D - 1.0 hp, Electric
	3	Feed Pump T - Diaphragm C - 10 GPM @ 12 psia, 100°F, ΔP=50 psi M - Stainless Steel/Poly Vinyl Chloride D - 3 hp, Electric
	1	Raw Polymer Feed Pump T - Reciprocating Piston C - 5 GPH, 10 psia, 120°F, ΔP=50 psi M - Stainless Steel D - 1.0 hp, Electric
208-2503		Scale Suppressant Feed Module Package Package consists of: . Storage Tank . Agitator . Feed Pump

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
	1	Storage Tank T - Vertical, Cylindrical C - 1,007 gal, ATM S - 6' ID x 5' T-T M - Fiberglass Reinforced Plastic
	1	Agitator T - Propeller S - 6.5 in. diameter @ 1,150 rpm M - Stainless Steel D - 1 1/2 hp, Electric
	1	Feed Pump T - Reciprocating Piston C - 80 GPH @ 12 psia, 100°F, ΔP=50 psi M - Stainless Steel D - 1.0 hp, Electric
208-2504	8	Filter Package T - Rotary Drum Belt C - 182 GPM, 9,912 lb/hr SS S - 12' Diameter, 24' long M - Carbon Steel D - 400 hp Overall Acc - Vacuum System, Belt Conveyor, Heat Exchanger
208-2505		Coal Dryer Polymer Feed Package . Storage Tank . Agitator . Feed Pump

GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING AND FILTRATION - AREA 208

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
	1	Storage Tank T - Vertical, Cylindrical C - 517 gal S - 4' ID x 5.5' T-T M - Fiberglass Reinforced Plastic
	1	Agitator T - Propeller S - 10 in. Dia. @ 350 rpm M - Stainless Steel D - 1.0 hp, Electric
	1 + 1	Feed Pump T - Diaphragm C - 400 GPH @ 12 psia, 130°F, ΔP=50 psi M - Stainless Steel, Poly Vinyl Chloride D - 2.0 hp, Electric
	1	Raw Polymer Feed Pump T - Reciprocating Piston C - 5 GPH M - Stainless Steel D - 1.0 hp, Electric
208-2506	1	Coal Dust Thickener T - Circular - to include sludge and scum collection C - 440 GPM S - 120' ID, 15' center depth, 3' freeboard M - Concrete

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

DRY CHAR SYSTEM AREA 216

EQUIPMENT LIST

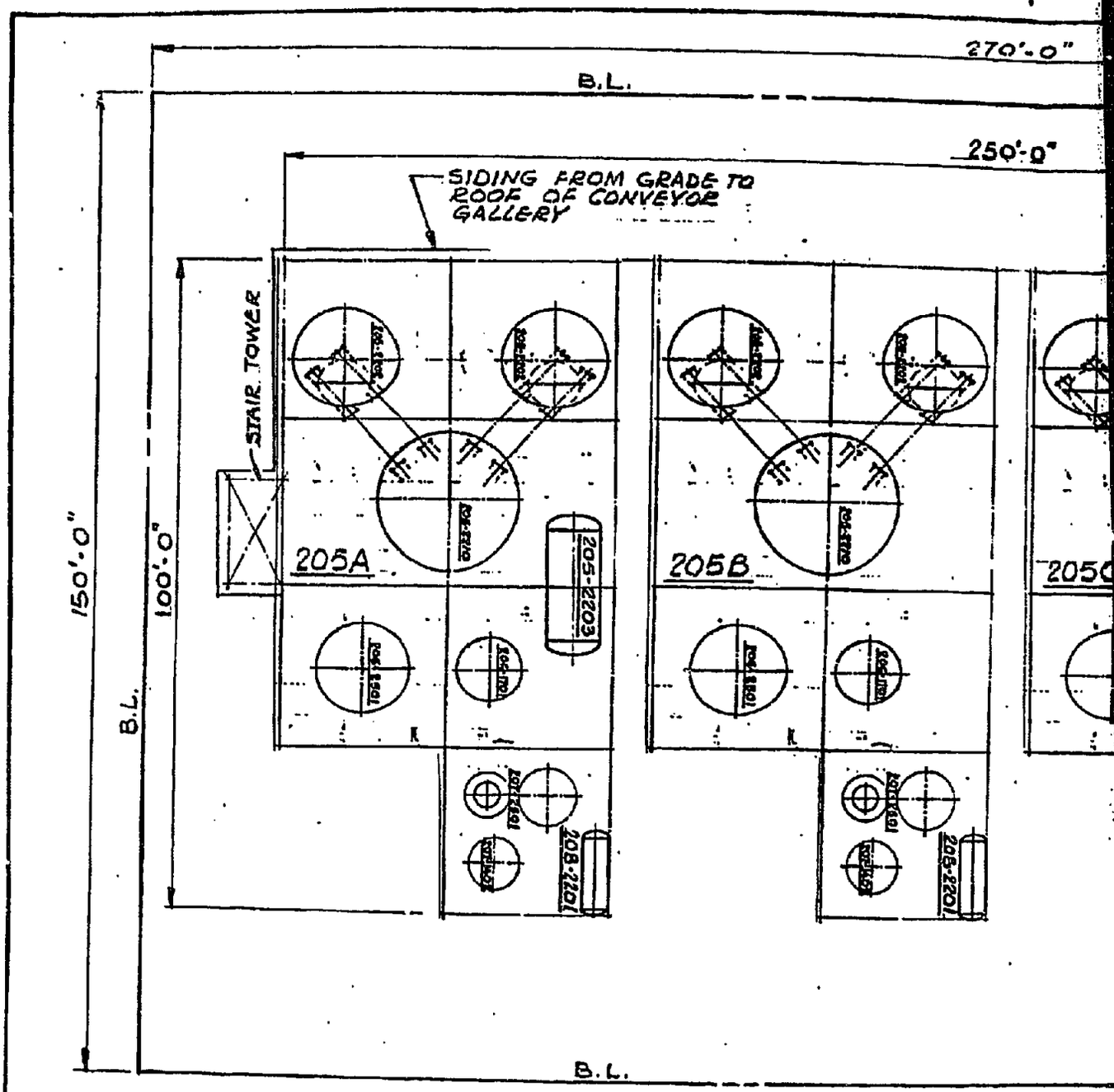
ITEM	NO. REQUIRED	DESCRIPTION
216-2501	8	Waste Heat Boiler Char Pneumatic Conveying System C - 3.56 STPH Char/400 SCFM N_2 Includes: 2-N_2 Receiving & Header, Pressure Vessel, Contr. Valves & Shut-Off Valves, Bag House, Bag House Fan & Bag House Rotary Air Lock
216-2502	8	Cyclone Char Pneu. Conv. System C - 14.29 STPH Char/900 SCFM N_2 Includes: 2-N_2 Receiver & Header, 2-Pressure Vessel, Contr. Valves & Shut-Off Valves
216-2150	2	Feeder T - Rotary C - 72 STPH Norm. D - 5 hp
216-2160	1	Feeder T - Belt C - 143 STPH Norm. S - 30" Wide D - 10 hp
216-2310	1	Char Bin T - 50 ton
216-1301	1	Fan T - Centrifugal C - 7500 ACFM @ 10" W.C. & 230°F D - 20 hp
216-1701	1	Dust Collector T - Bag, Pulse Air 6:1 Air/Cloth C - 7500 ACFM @ 230°F

NOMENCLATURE:
T - TYPE
C - CAPACITY
S - SIZE
P/T - OPERATING PRESSURE/ TEMPERATURE
M - MATERIAL
CS - CARBON STEEL
SS - STAINLESS STEEL
CI - CAST IRON
D - DRIVE
W - WEIGHT
ACC - ACCESSORIES

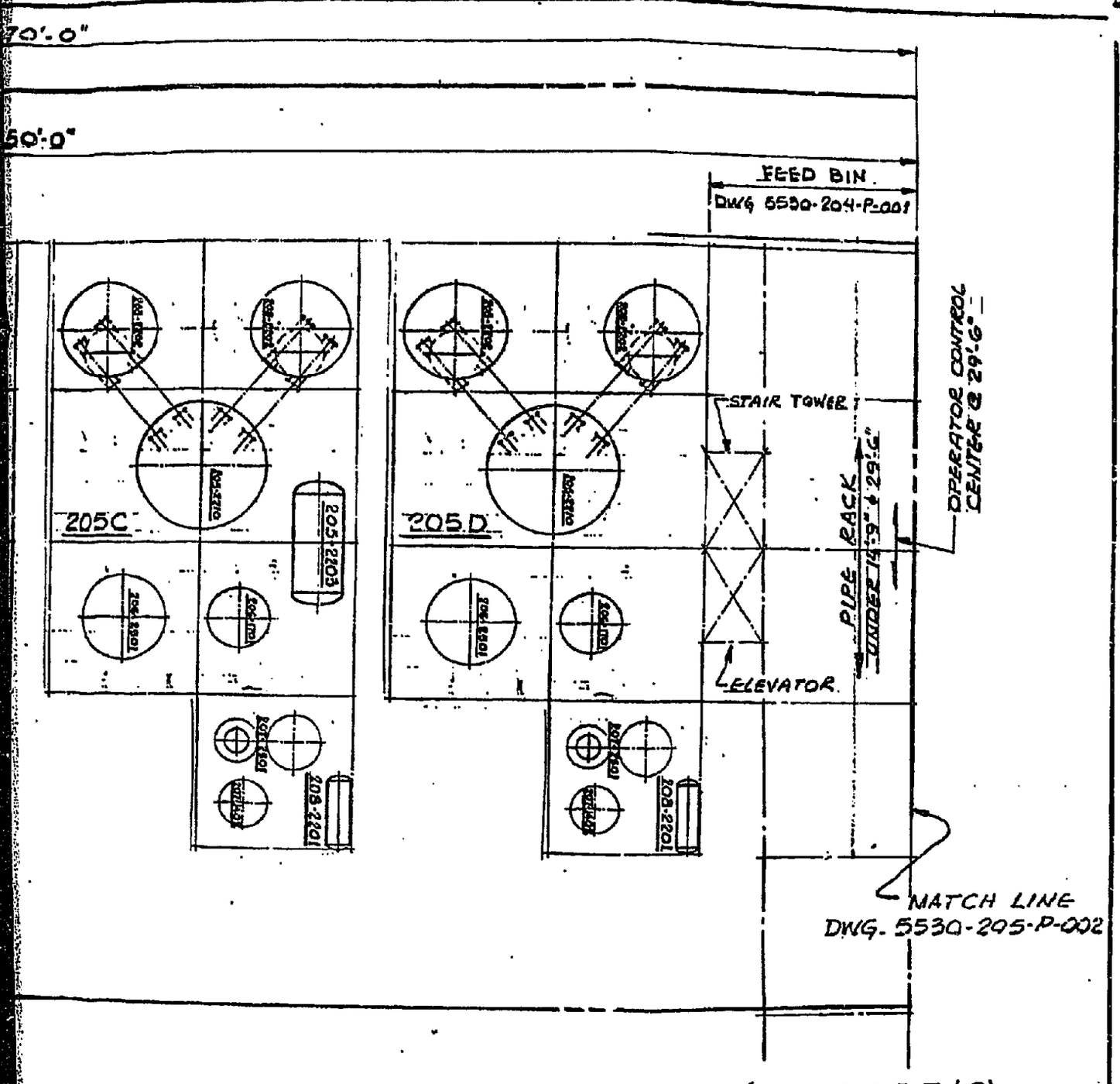
ASH SYSTEM AREA 218

EQUIPMENT LIST

ITEM	NO. REQUIRED	DESCRIPTION
218-2501	8	Pneumatic Conveying System C - 6.92 STPH Ash/600 SCFM N_2 Includes: 2-N_2 Receiver & Header, 2-Pressure Vessels, Control Valves & Shut-Off Valves, Bag House, Bag House Fans & Bag House Rotary AirLocks
218-2101	1	Ash Loadout Conveyor T - Belt C - 500 STPH Norm. D - 10 hp
218-2102	1	Ash Loadout Conveyor T - Belt C - 250 STPH Norm. M - 5 hp
218-1201	3	Rotary Drum Mixer/Conditioner T - Screw C - 250 STPH Norm. M - 10 hp
218-2310	3	Ash Loadout Silo T - Cylindrical - Concrete Stave C - 1400 ton



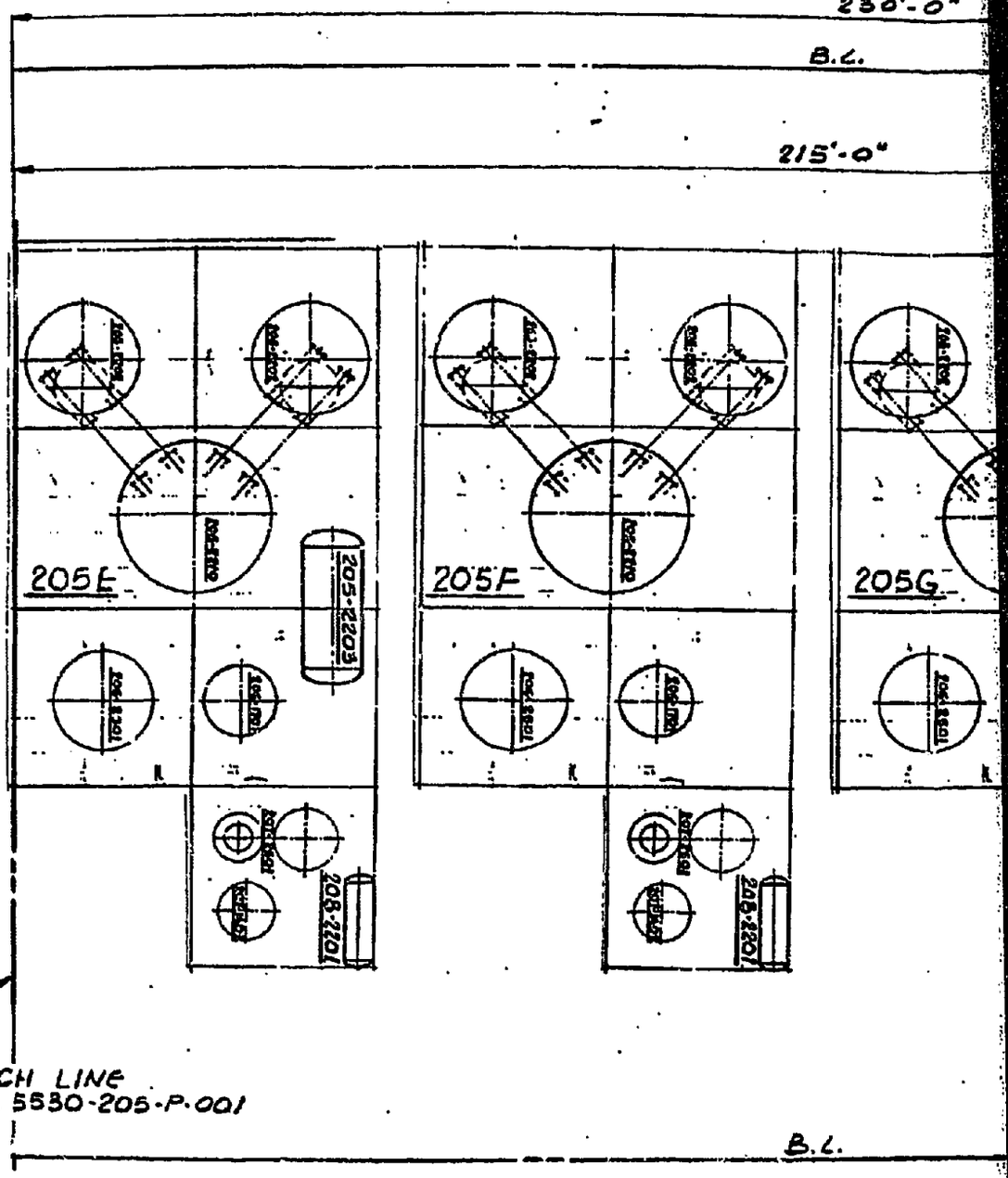
REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PRELIM. REVIEW	EDK		4/10/81	0	ISSUED FOR FINAL REPORT	GW		7-20-81		
B	ADDED B.L.	EDK		5/25/81							



MODULES 205A, B, C & D (AREAS 205, 6, 7 & 8)

CLIENT: CIRI / PLACER BELUGA METHANOL PROJECT COOK INLET, ALASKA			Davy McKee ENGINEERS AND CONSTRUCTORS
TITLE: GASIFICATION, WASTE HEAT RECOVERY, PARTICULATE REMOVAL GENERAL ARRANGEMENT	SCALE: 1" = 20'-0"		REV.
	DRAWING NO. 5530-205-P-001		A

	BY	DATE
DES		
DRWN		
CK'D		
APP	wjs	7/20/81
APP		



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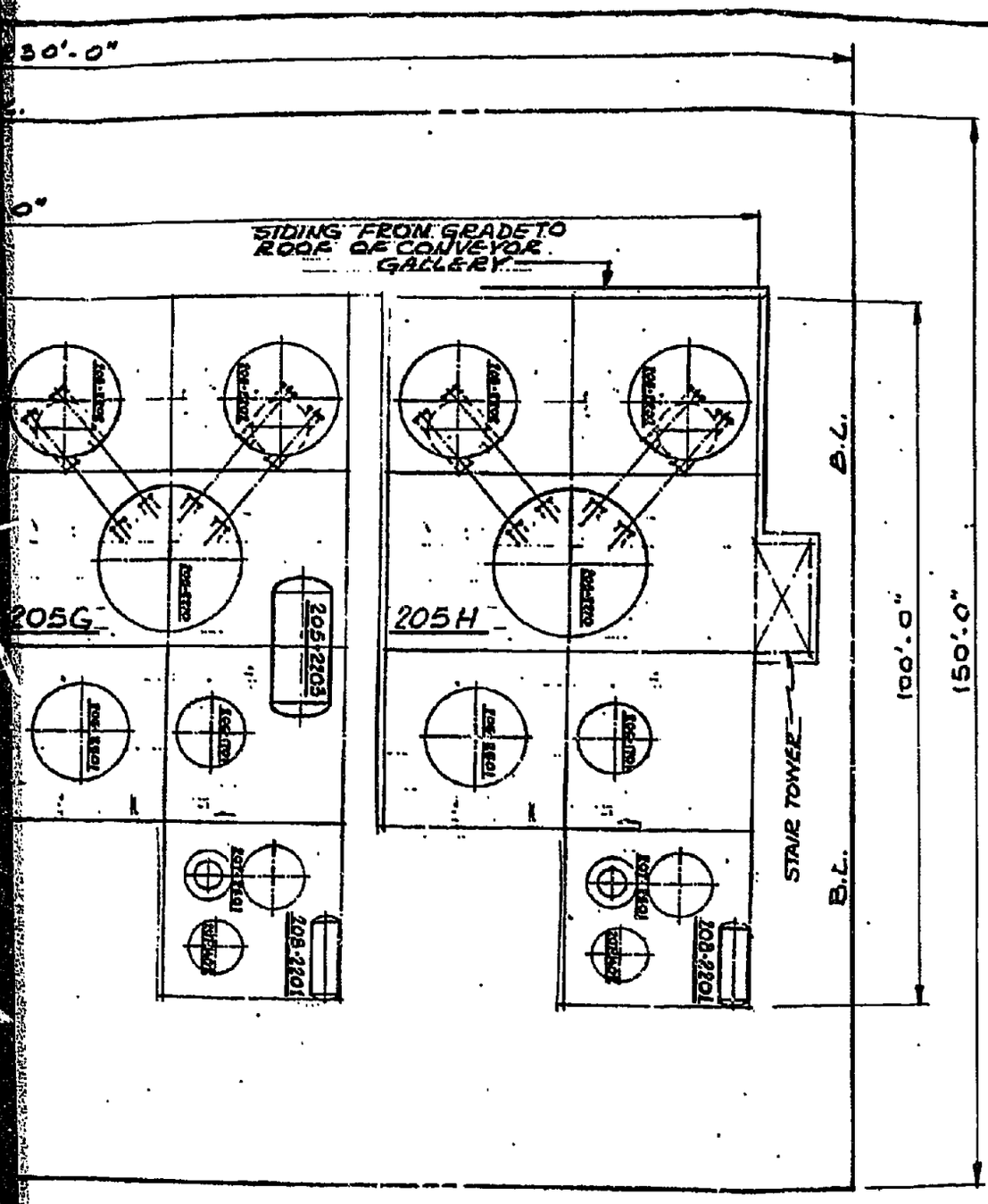
A	PRELIM. REVIEW	EOK		4/8/81	0	ISSUED FOR FINAL REVIEW	GW		7-24-81		
B	ADDED B.L.	EOK		7/24/81							



MODULES 205 E, F, G & H (AREAS 205, 6, 7 & 8)

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

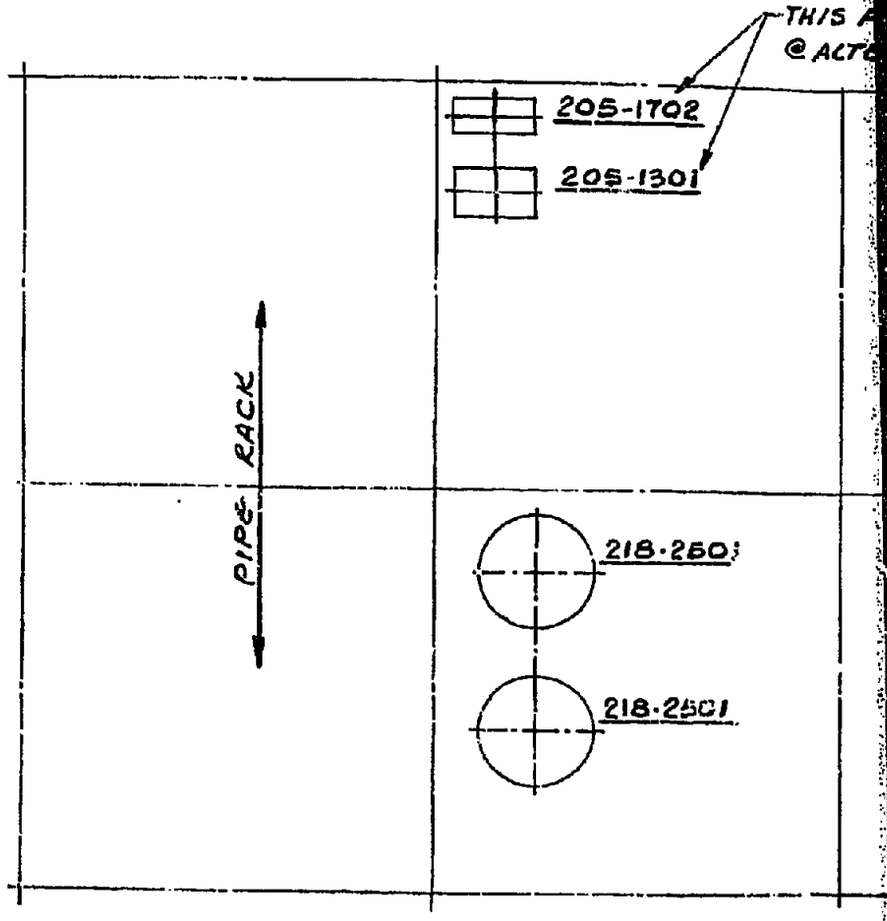
	BY	DATE
DES		
DRWN		
CK'D		
APP	mjs	7/20/81
APP		

TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
GENERAL ARRANGEMENT

SCALE 1" = 20'-0"

DRAWING NO.
5530-205-P-002

REV. D



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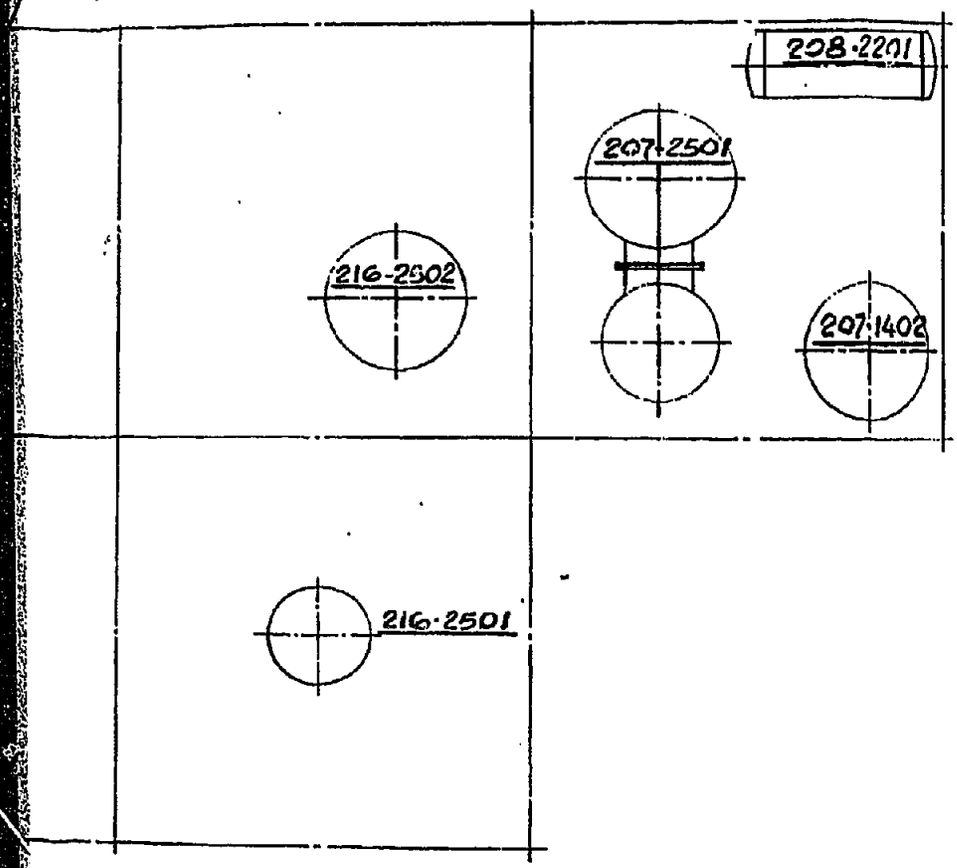
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PRELIM. REVIEW	EDK		6/10/81	0	ISSUED FOR FIUAL REPORT	GW		7-26-31		
B	REV. TAG No.'S	EDK		6/24/81							

DM-1380-1 REV. 4/80

THIS FILTER & BLOWER @ ALTERNATE TRAINS



CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

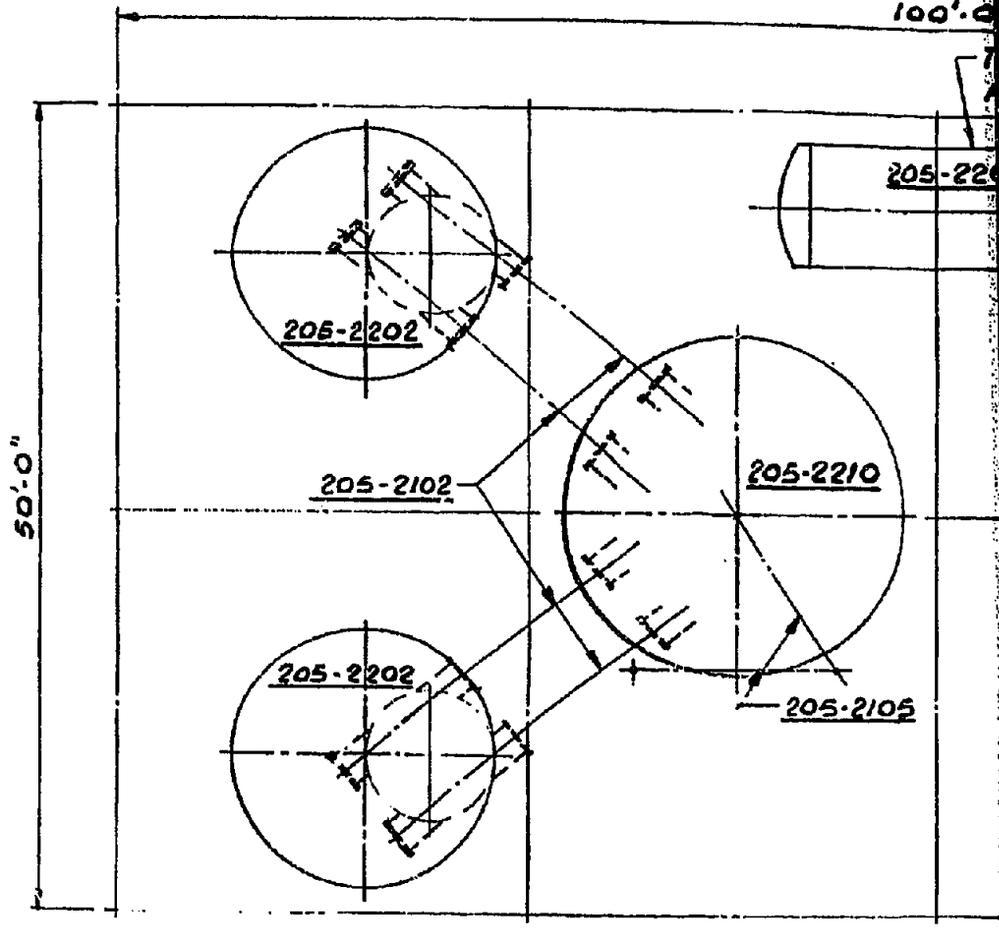
	BY	DATE
DES		
DRWN		
CK'D		
APP	mjs.	7/20/81
APP		

TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
PLAN ABOVE GRADE

SCALE 1"=10'-0"

DRAWING NO.
5530-205-P-003

REV. 0



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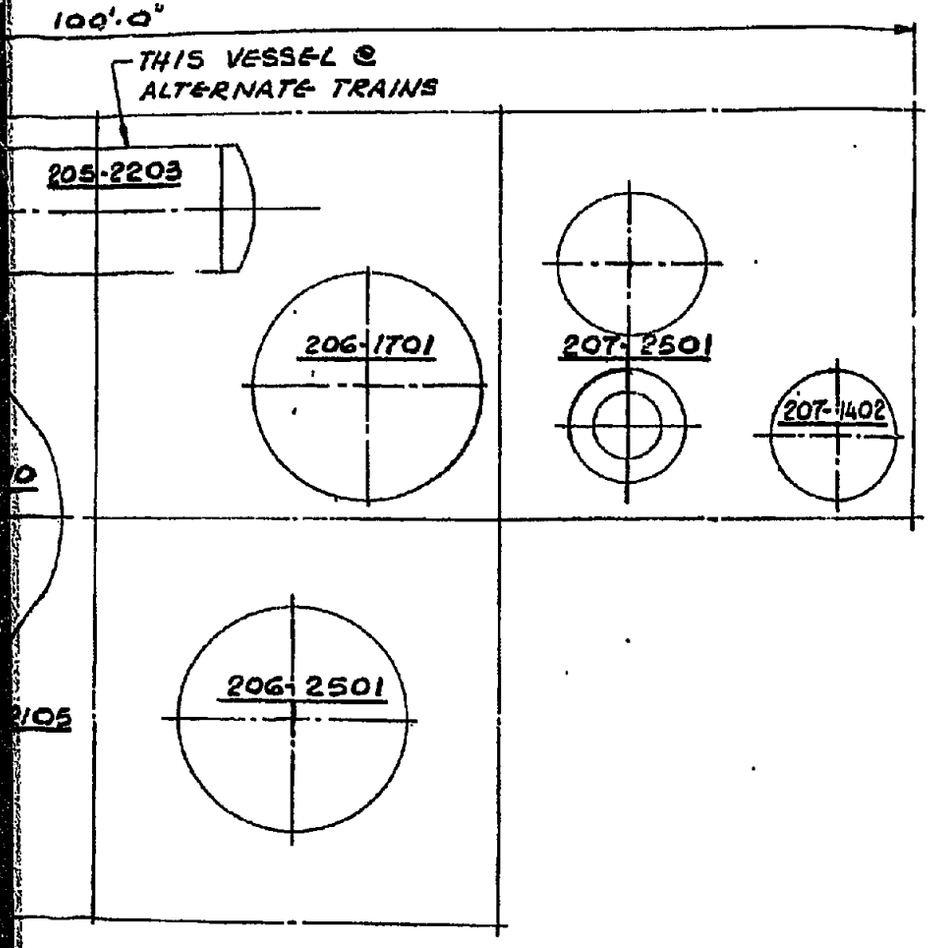
DM-1330-1 REV. 4/80



CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

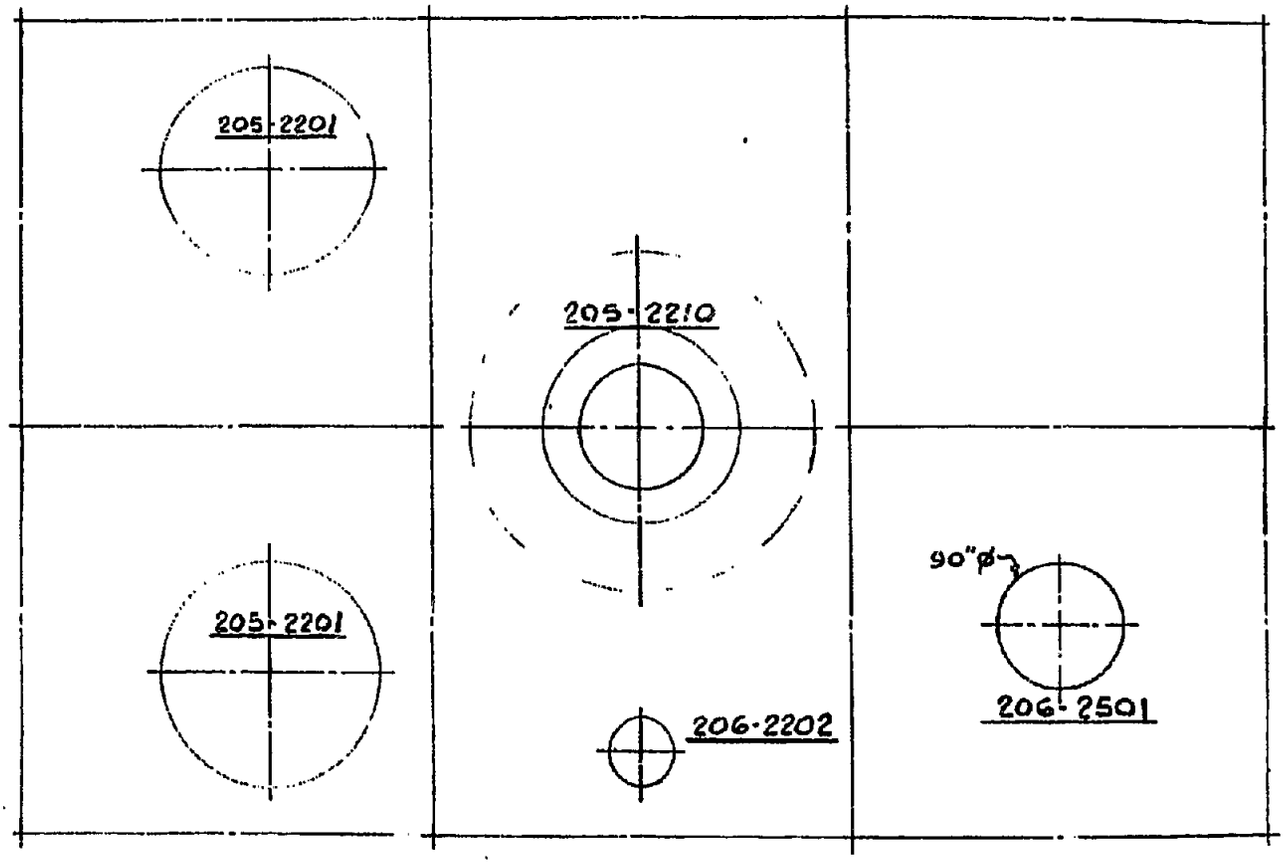
	DES	BY	DATE
	DRWN		
	CK'D		
	APP	[illegible]	7/20/81
	APP		

TITLE
G. SIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
PLAN ABOVE 14'-9"

SCALE 1" = 10'-0"

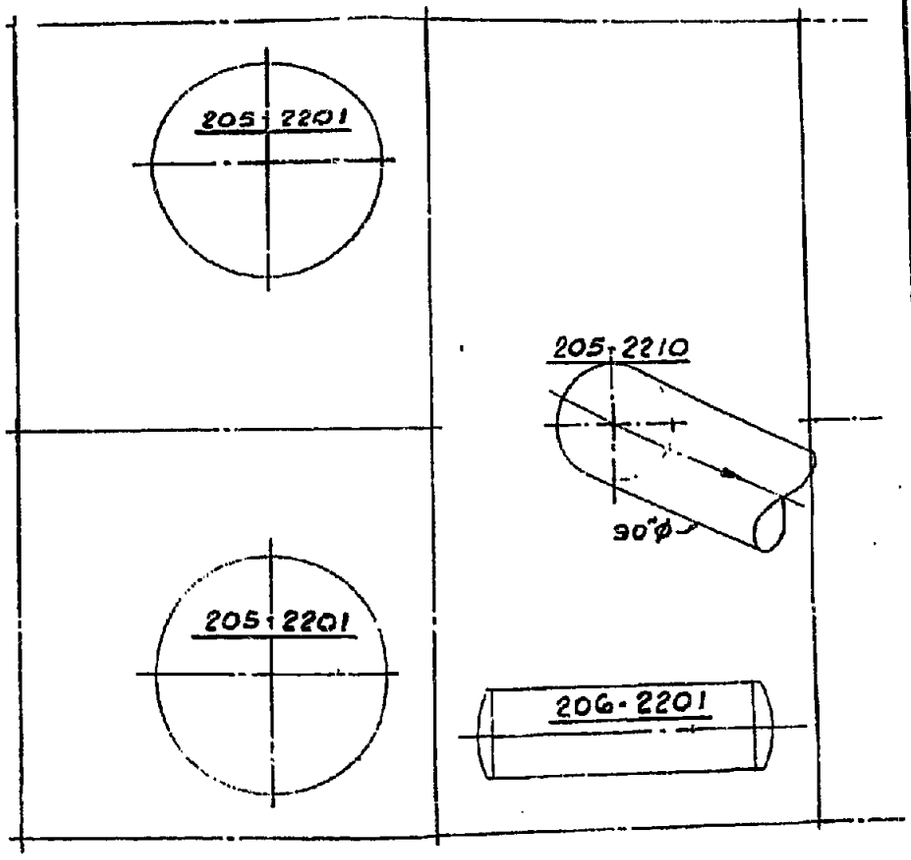
DRAWING NO.
5530-205-P-004

REV.
6



PLAN ABOVE 88'-6"

REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PRELIM. REVIEW	EOK		6/10/81	0	ISSUED FOR FINAL REPORT	GW		7/30/81		



PLAN ABOVE 103'-0"

DES			
DRWN			
CK'D			
APP	[illegible]	7/20/91	
APP			

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

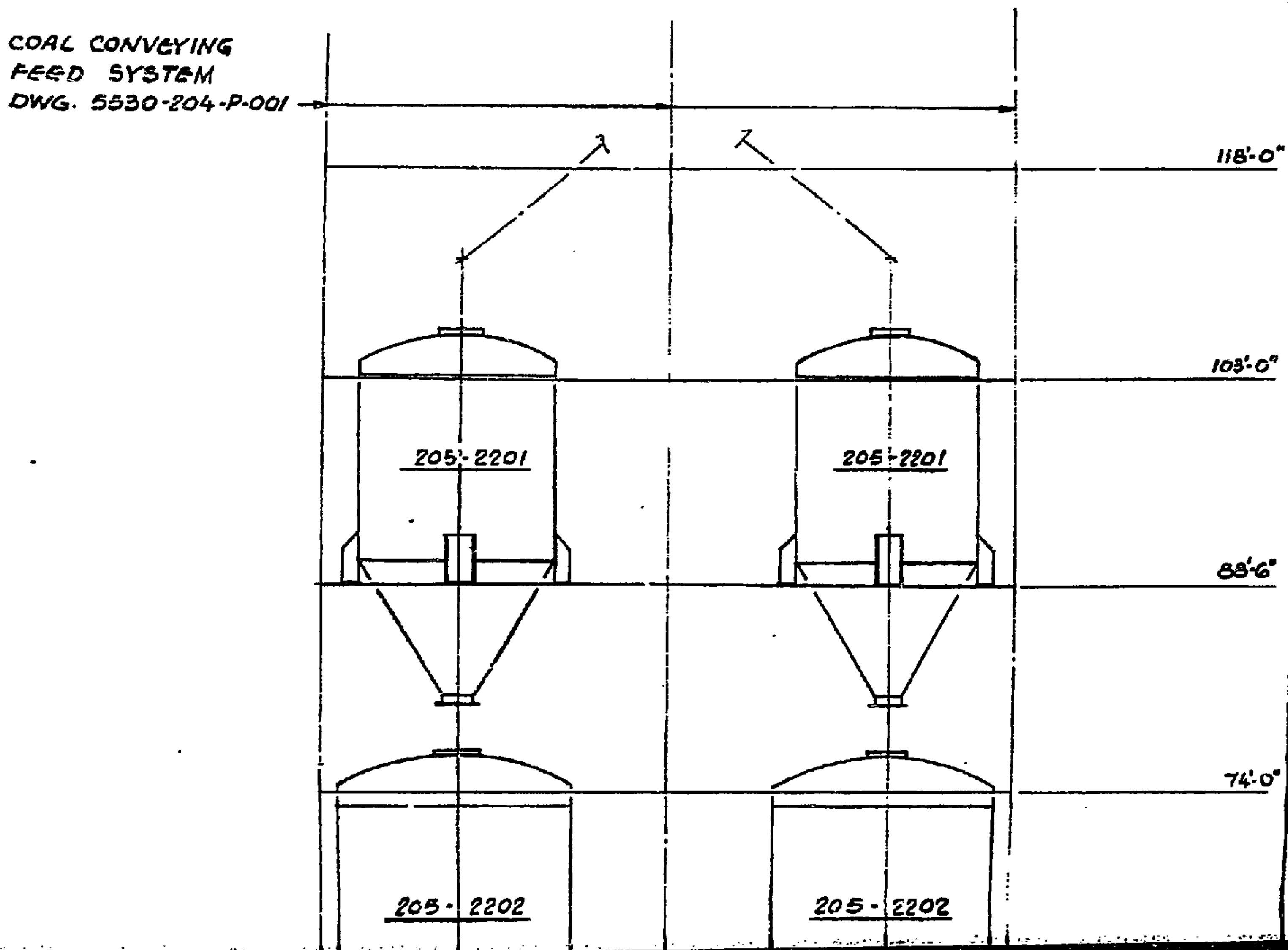
TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
UPPER PLANS

Davy McKee
ENGINEERS AND CONSTRUCTORS

SCALE 1" = 10'-0"

DRAWING NO.
5530-205-P-005

REV.
0



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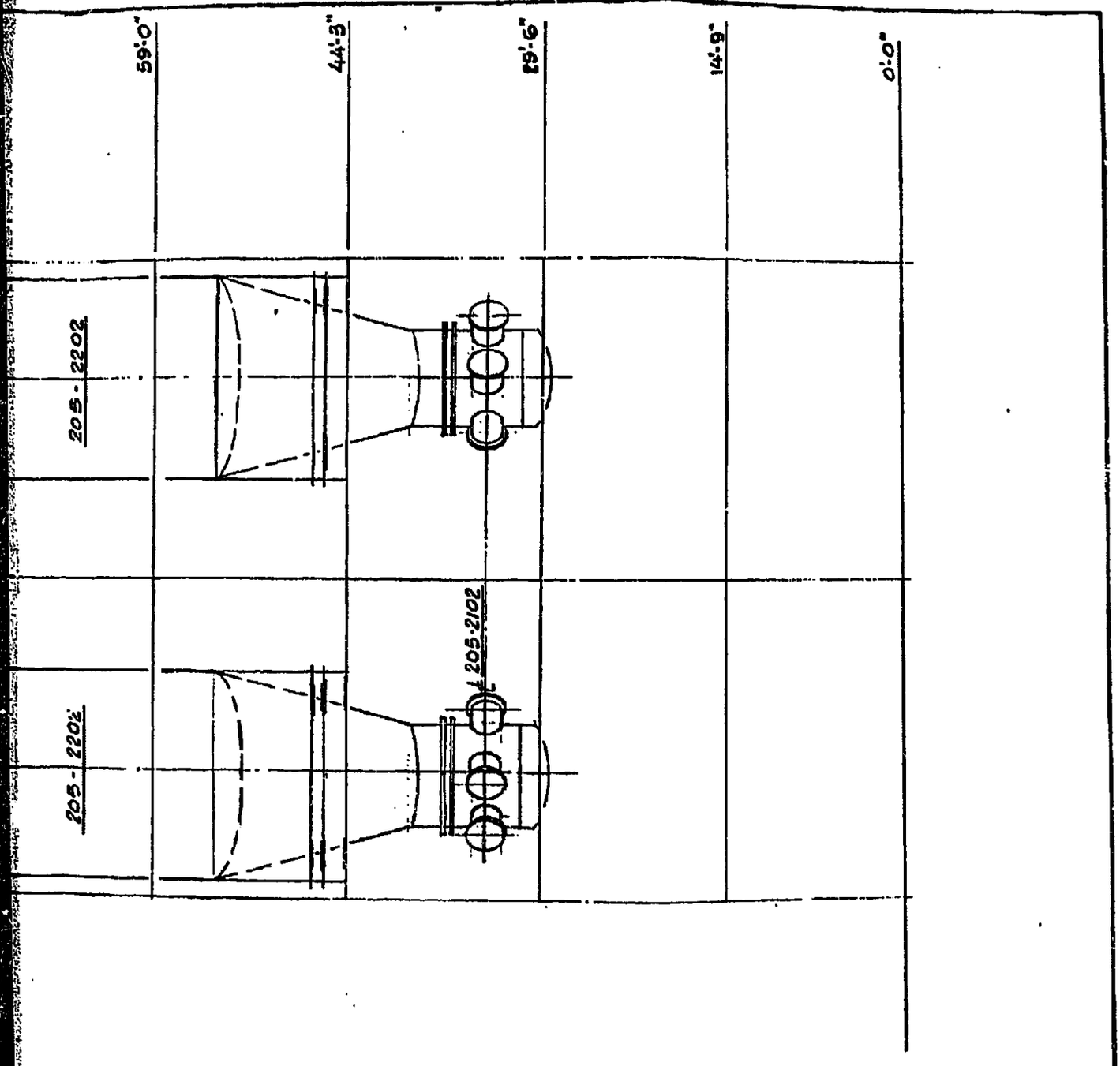
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
A	PRELIM. REVIEW	EDK		6/10/81	O	ISSUED FOR FINAL REPORT	GW		7/30/81		



CLIENT

CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

	BY	DATE
DES		
DRWN		
CK'D		
APP	mjs	7/20/01
APP		

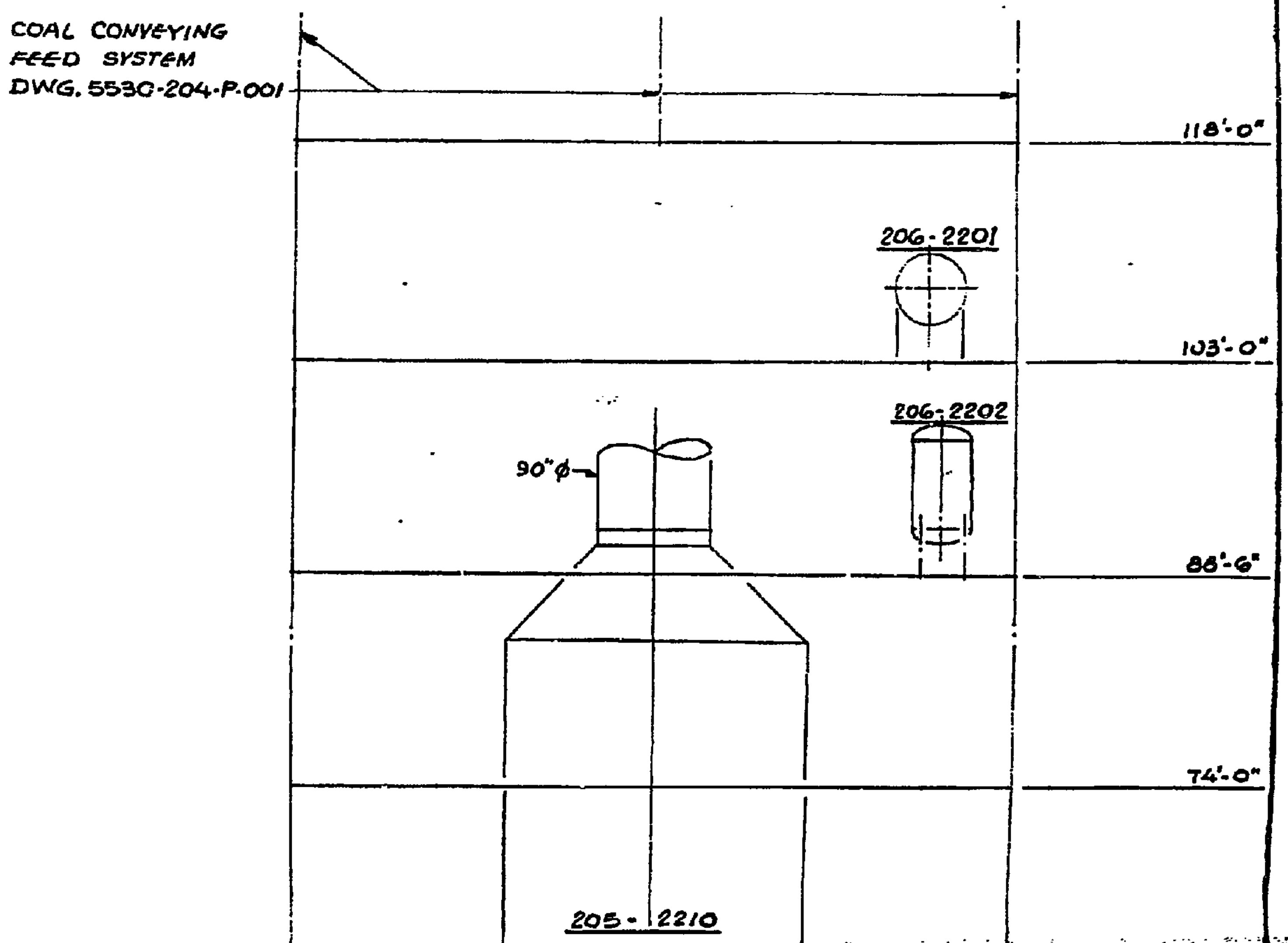
TITLE — GASIFICATION, WASTE HEAT RECOVERY, PARTICULATE REMOVAL ELEVATION.

SCALE 1" = 10'-0"

DRAWING NO.

5530-205-P-006

REV. 0



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NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
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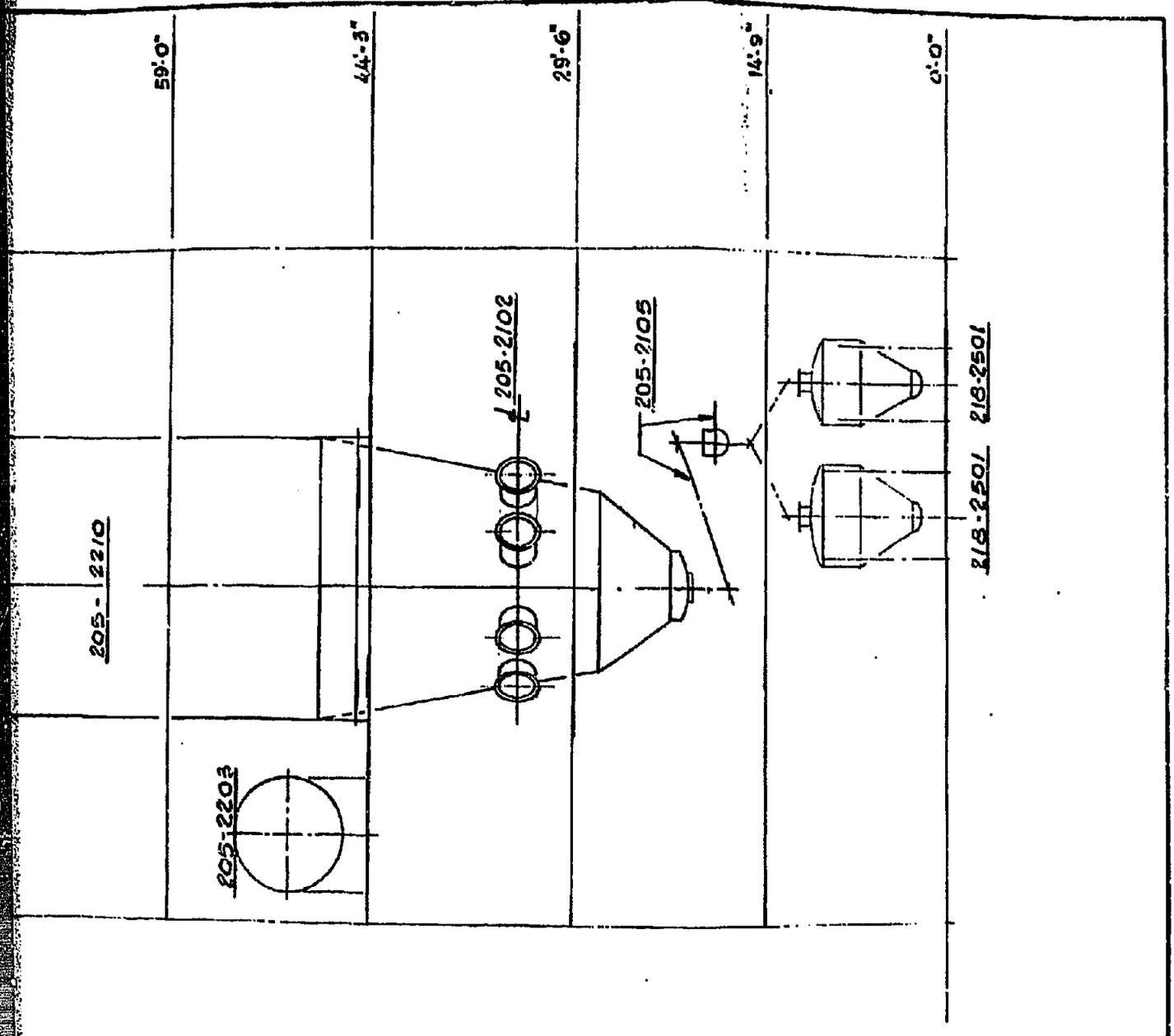
B	REV. TAG NO.'S	EDK		4/24/81							



CLIENT
CIR:/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

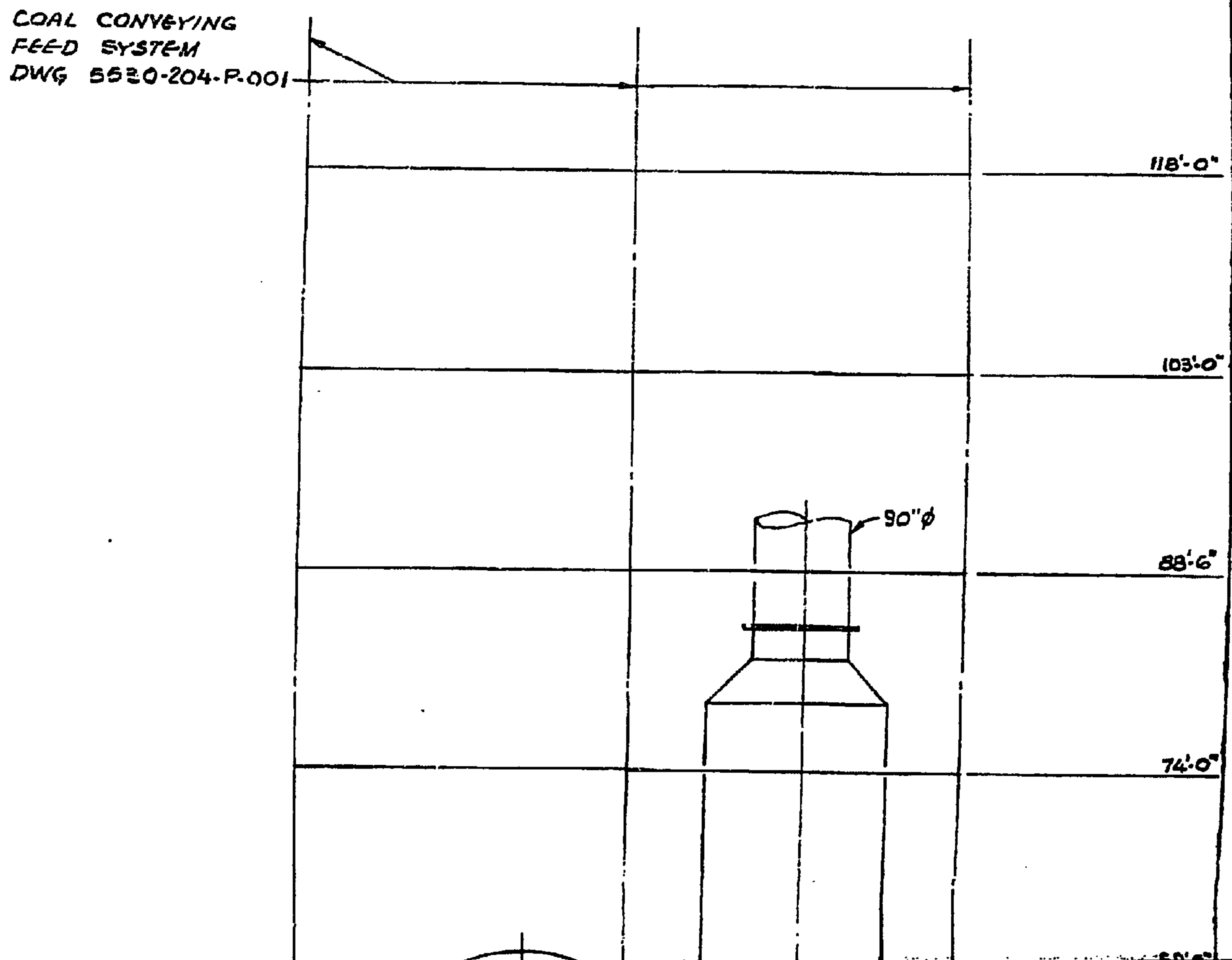
CED TITLE	BY	DATE
DES		
DRWN		
CK'D		
APP	[illegible]	7/10/81
APP		

TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
ELEVATION

SCALE 1"=10'-0"

REV. 0

DRAWING NO.
5530-205-P-007



DN-1329-1 REV.

REVISIONS NO.	DESCRIPTION	BY	CHK.	DATE	REVISIONS NO.	DESCRIPTION	BY	CHK.	DATE	REFERENCES DWG. NO.	TITLE
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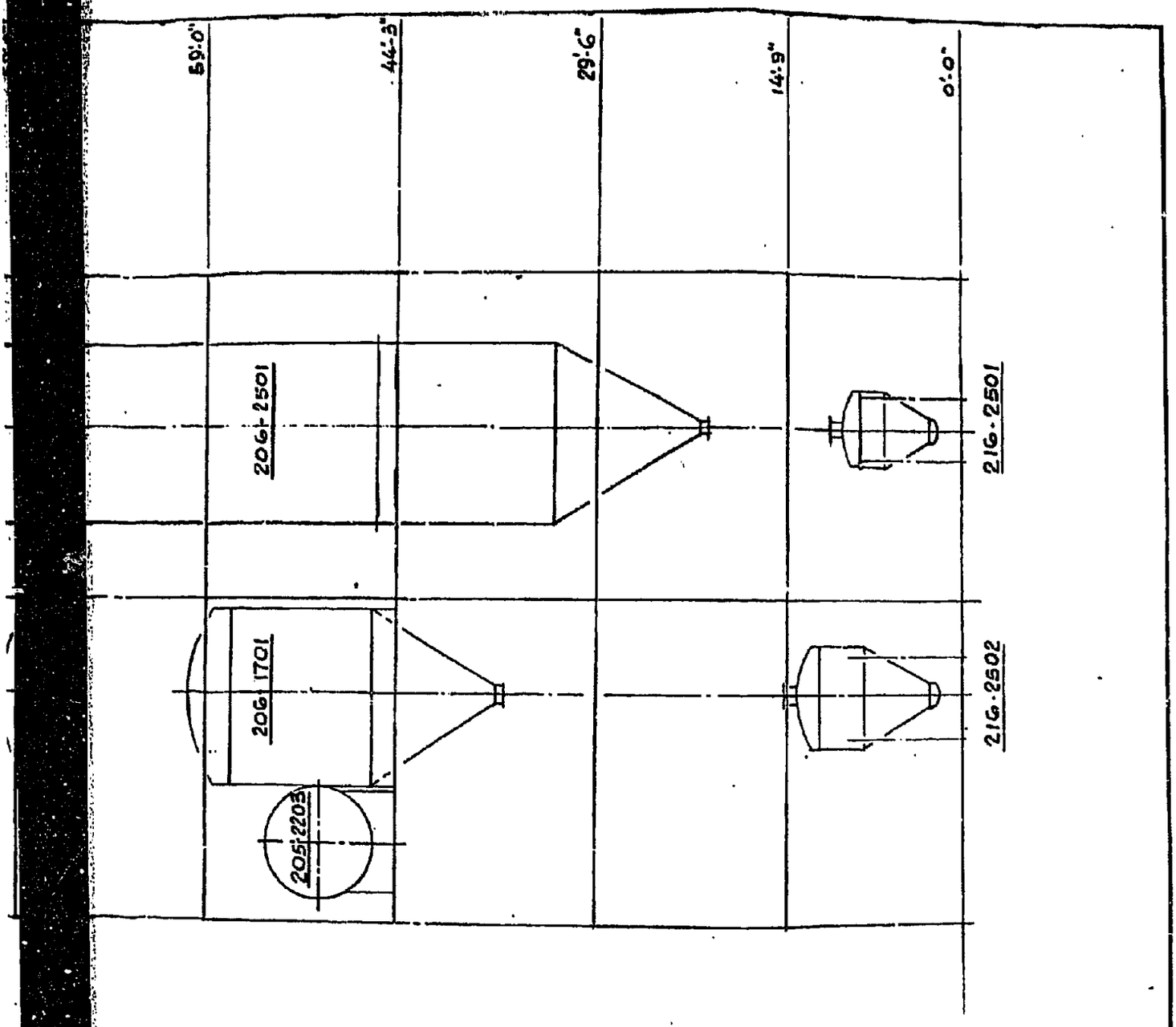
B	REV. TAG No.'S	EOK		9/24/81							



	BY	DATE
DES		
DRWN		
CK'D		
APP	mjs	7/20/81
APP		

CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

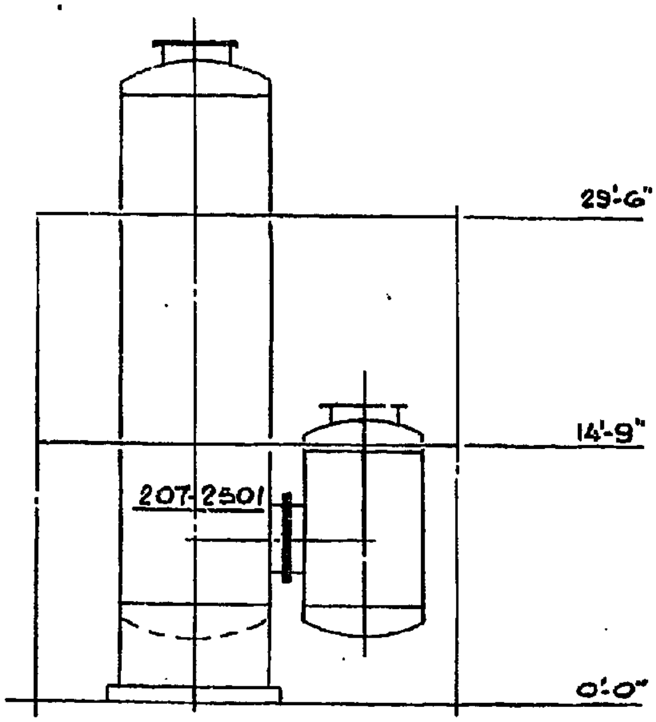
TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
ELEVATION

Davy McKee
ENGINEERS AND CONSTRUCTORS

SCALE 1" = 10'-0"

DRAWING NO.
5530-205-P-008

REV. 0



REVISIONS					REVISIONS					REFERENCES	
NO.	DESCRIPTION	BY	CHK.	DATE	NO.	DESCRIPTION	BY	CHK.	DATE	DWG. NO.	TITLE
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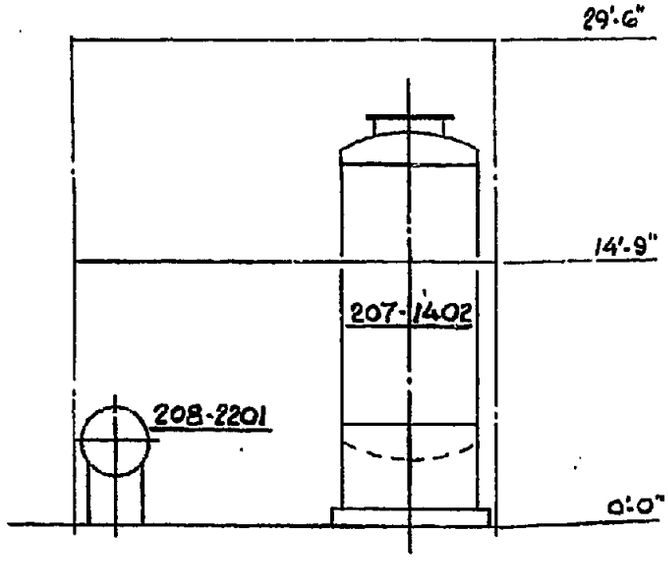


CLIENT
CIRI / PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

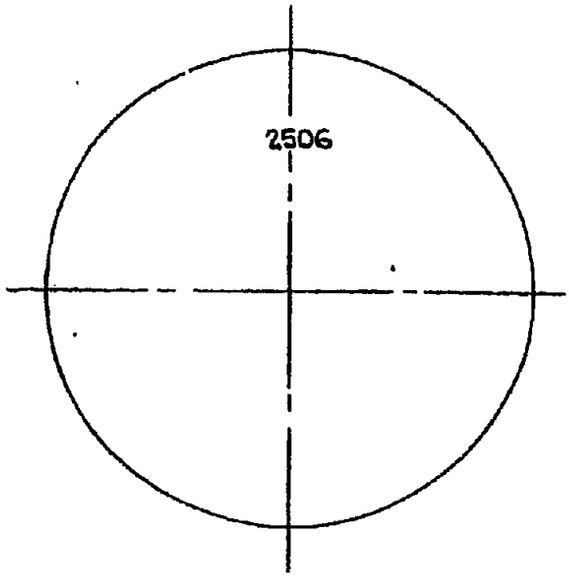
		BY	DATE
DES			
DRWN			
CK'D			
APP	MJS.		7/20/81
APP			

TITLE
GASIFICATION,
WASTE HEAT RECOVERY,
PARTICULATE REMOVAL
ELEVATIONS

SCALE 1" = 10'-0"

DRAWING NO.
5530-205-P-009

REV. 0



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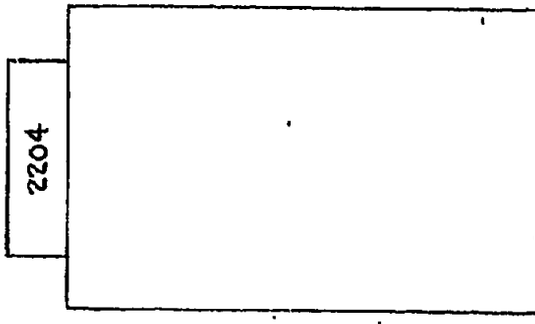
TRACKS



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REVISIONS					REVISIONS					REFERENCES	
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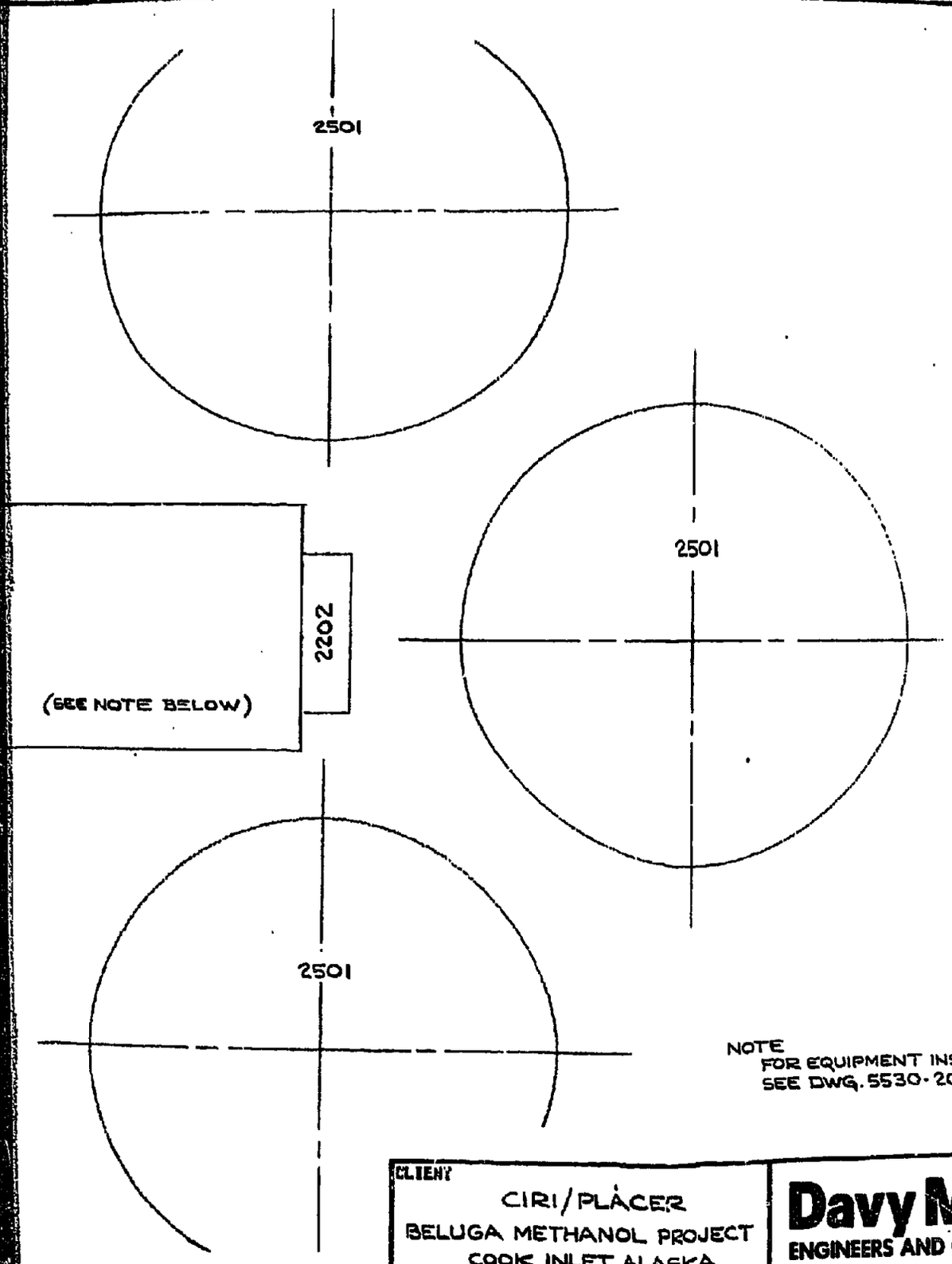
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/10/81		

DM-1291 REV. 4/70



NOTE
FOR EQUIPMENT INSIDE BUILDING
SEE DWG. 5530-208-P-002

CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

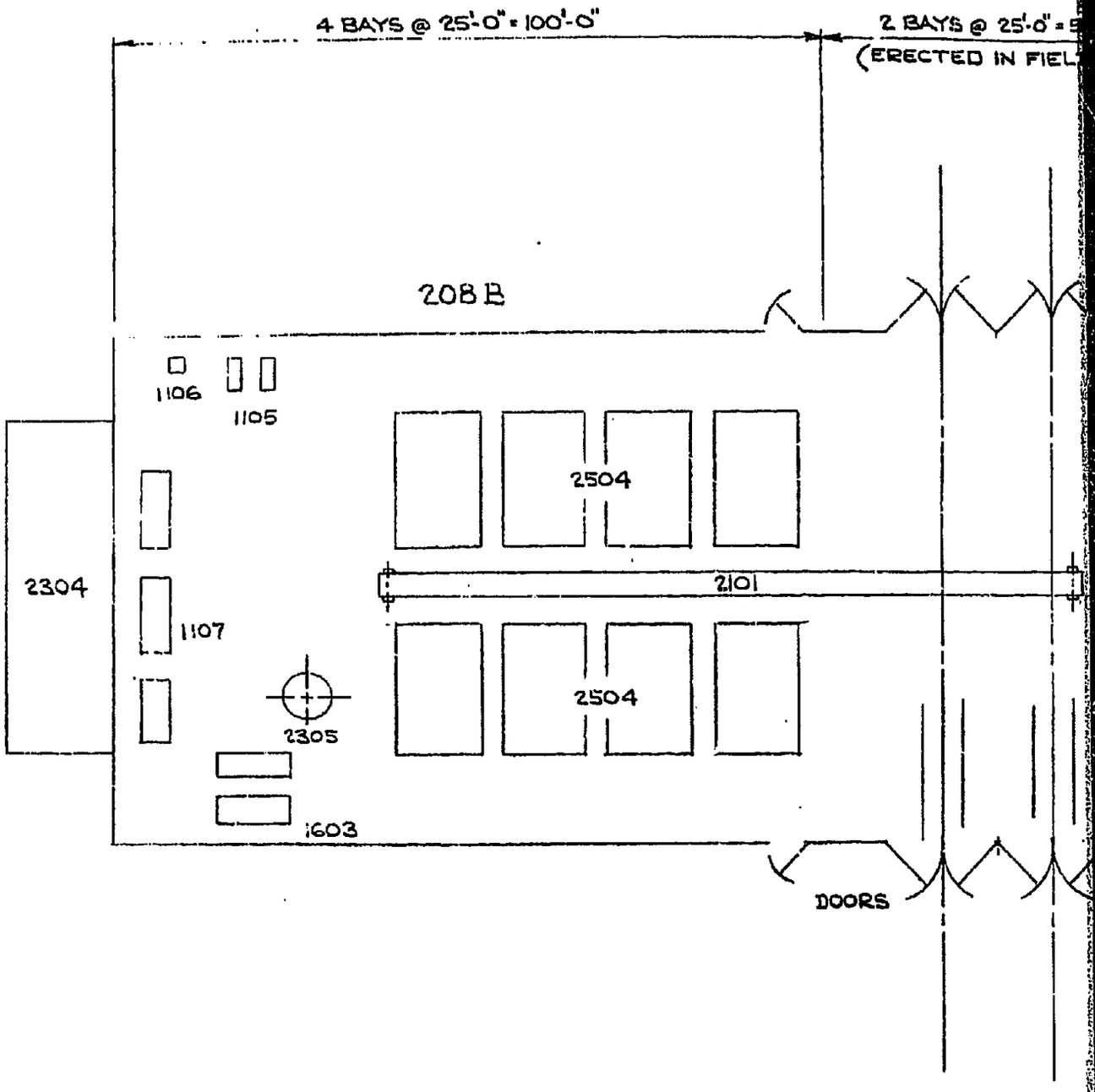
	DES	BY	DATE
	DRWN		
	CK'D		
	APP	MJS.	7/20/81
	APP		

TITLE
GASIFICATION CHAR
AND COAL DRYER
PARTICULATE SETTLING & FILT.
GENERAL ARRANGEMENT

SCALE 1" = 40'

DRAWING NO.
5530-208-P-001

REV.
0



REVISIONS					REVISIONS					REFERENCES	
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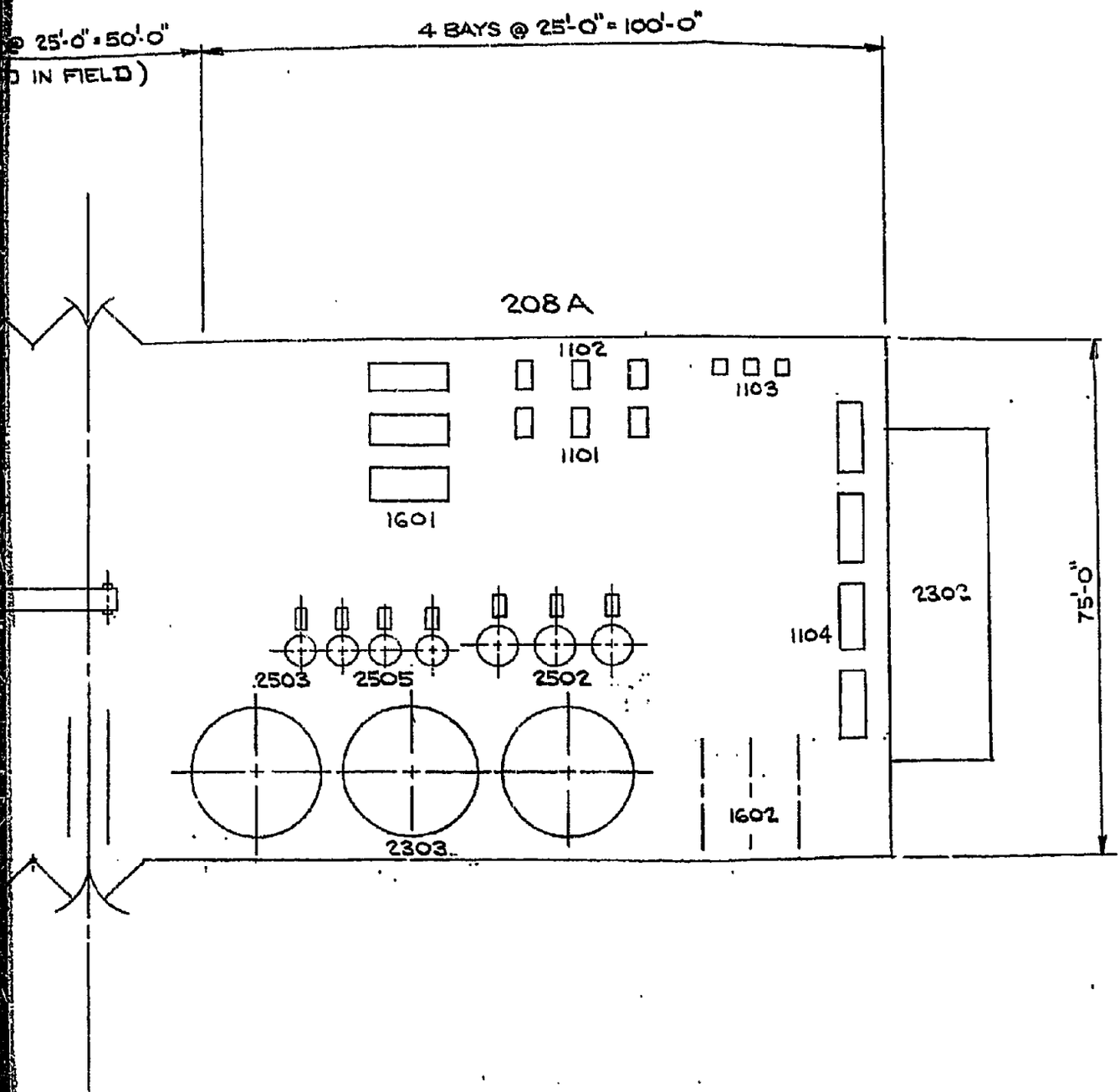
A	PREL. REVIEW	GW		6-24-81	0	ISSUED FOR FINAL REPORT	GW		7/20/81		



MODULE - 208A & B

	DES	BY	DATE
	DRKN		
	CK'D		
	APP	gjk.	7/20/81
	APP		

CLIENT
CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

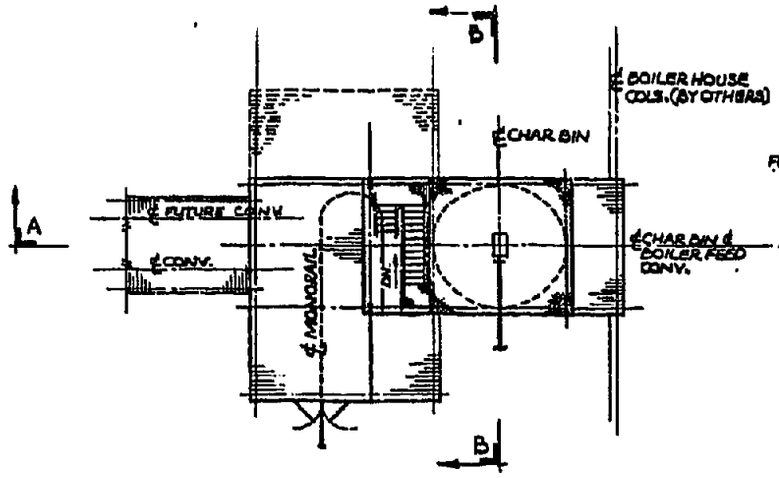
TITLE
GASIFICATION CHAR AND COAL DRYER PARTICULATE SETTLING & FILT. PLAN @ GRADE

SCALE 1" = 20'

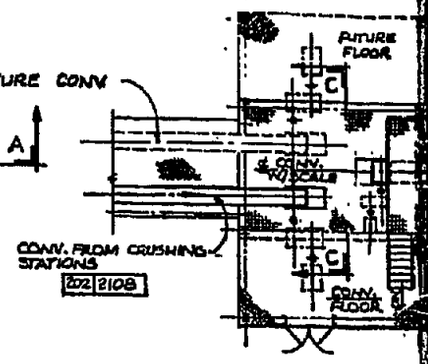
DRAWING NO.
5530-208-P-002

REV. 0

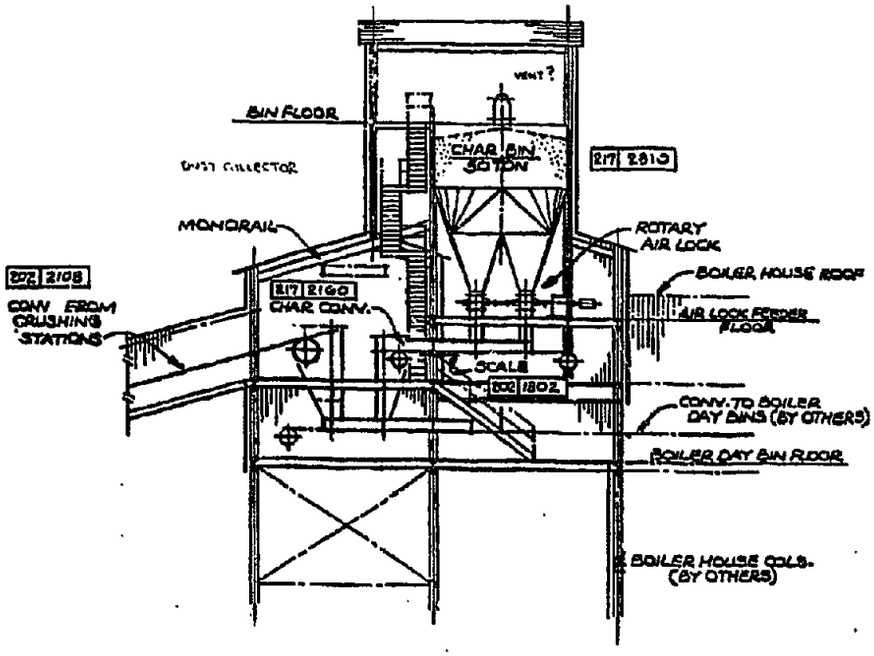
SCALING RULES 1/8" 1/4"



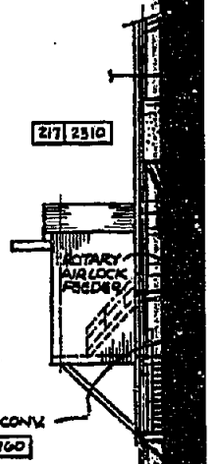
PLAN AT BIN FLOOR



PLAN AT F



SECTION A-A



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NO.	DESCRIPTION	BY	CH.	APPROVED	DATE
1	PRELIMINARY ISSUE				2/6/11
2	ADDED EQUIP Nos & FUTURE ADDN NOTED				2/7/11
3	ISSUED FOR REPORT				2/7/11

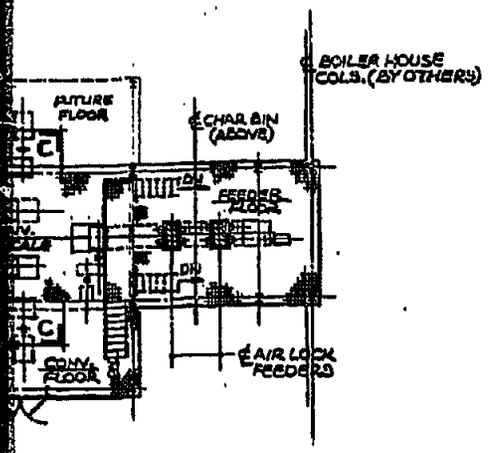
REVISIONS

NO.	DESCRIPTION	BY	CH.	APPROVED	DATE

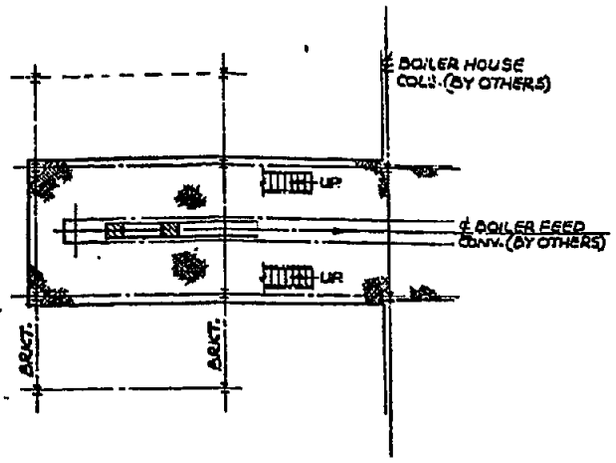
REVISIONS

REFERENCES

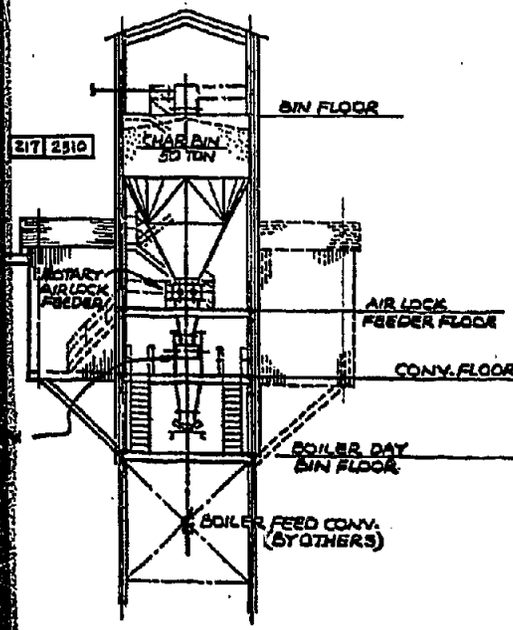
1 2 3 4 5



PLAN AT FEEDER FLOOR



PLAN AT FEED CONVEYOR



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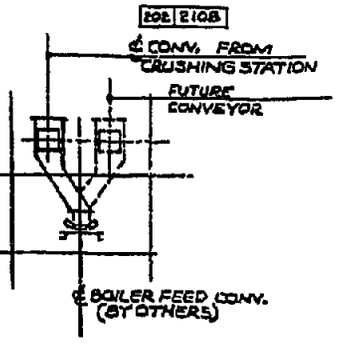

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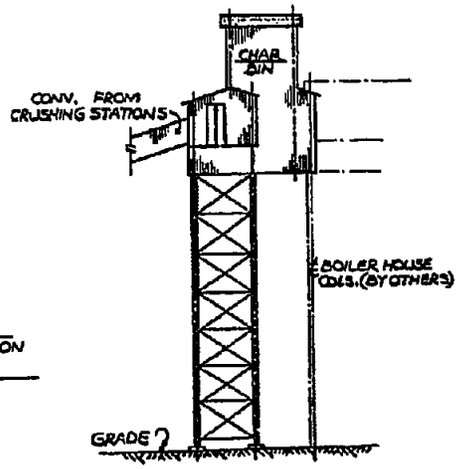


SOUTH ELEVATION

CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

DESIGNED	BY	DATE	DATE TO	A	B	C	D	1	2	3	4	5	6	7
DRAWN	KVK	8/5	CLIENT											
CHECKED			FIELD											
APPROVED 1														
APPROVED 2														
APPROVED 3														

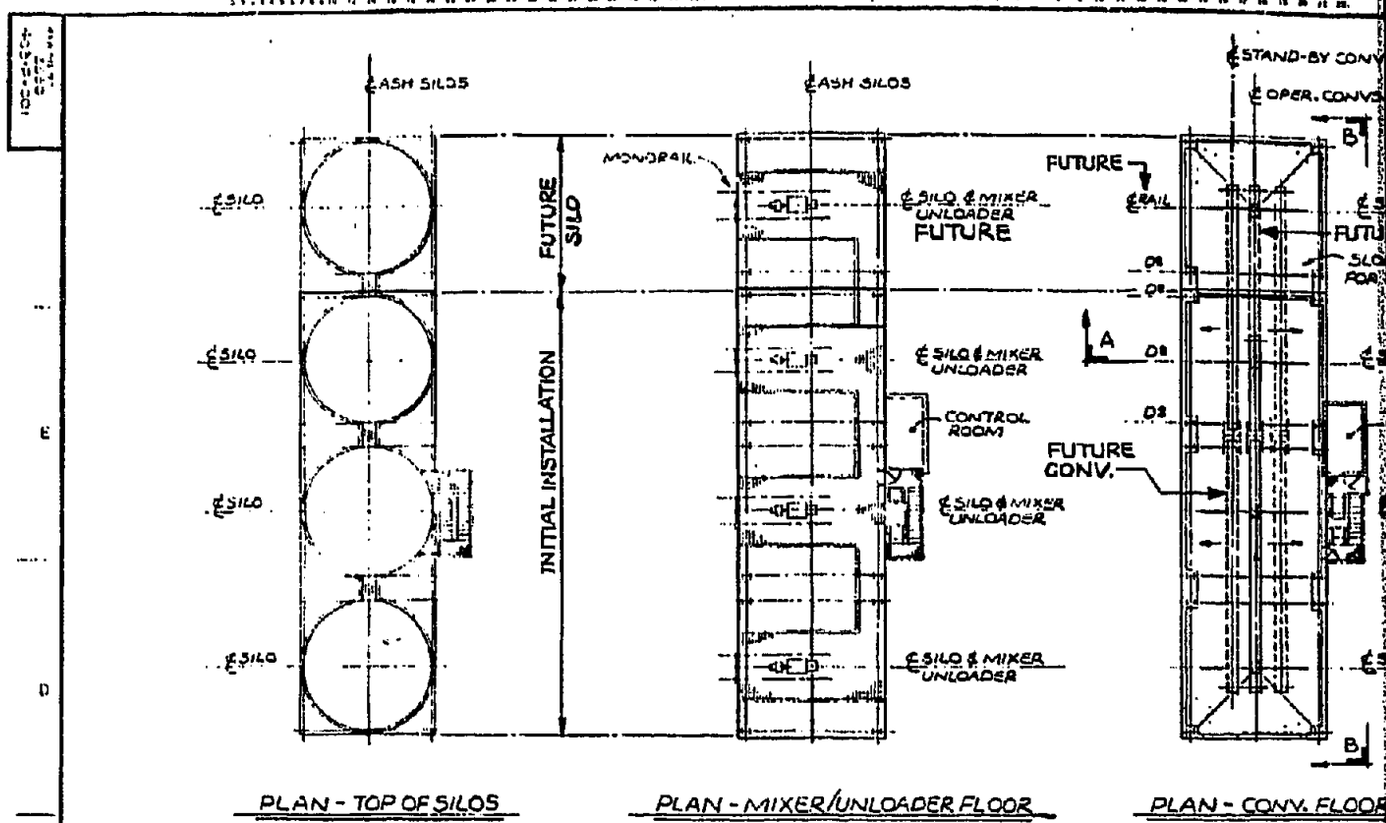
TITLE: RAW COAL & DRY CHAR BLENDING - CHAR BIN

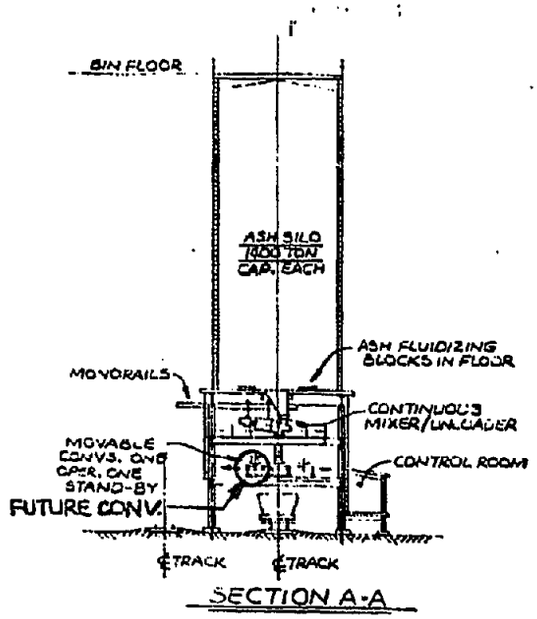
SCALE 1/8"-1'-0" 1/32"-1'-0" — BC-5530

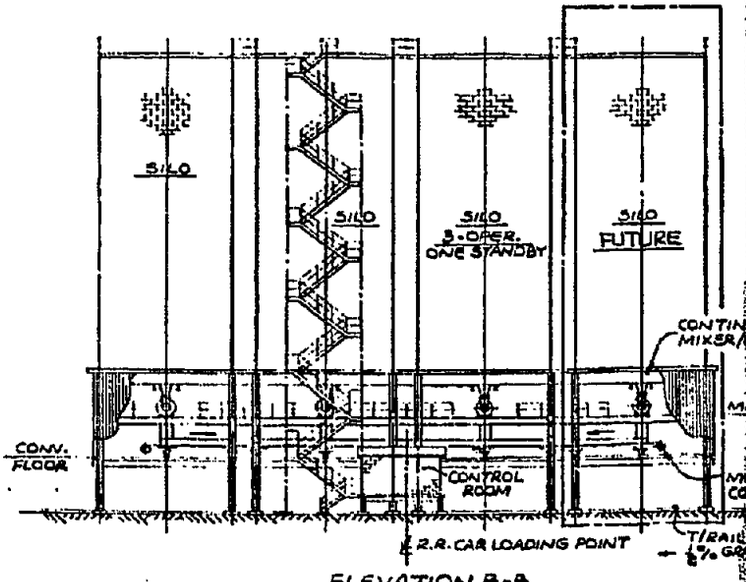
5530
216-P-001

REVISIONS

6 7 8 9 10





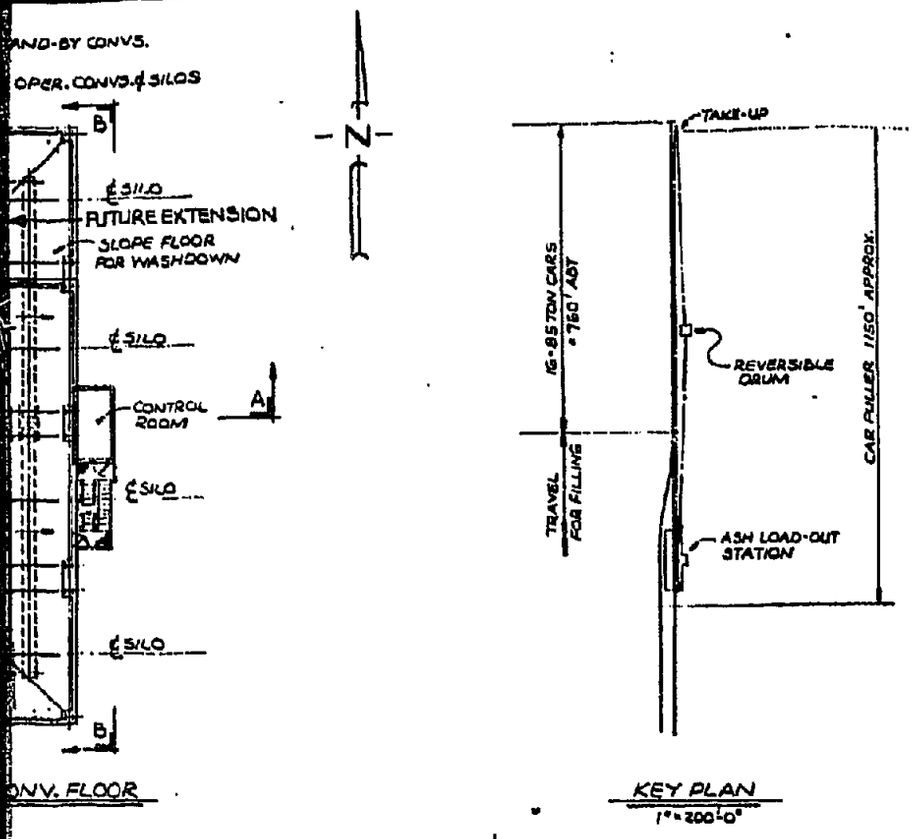


NO	DESCRIPTION	BY	CH	APPROVED	DATE
A	PRELIMINARY ISSUE				
B	FUTURE EQUIPMENT NOTED	RVK			
C	REVISED FUTURE EQUIP. NOTES	KD			
D	ISSUED FOR REPORT	KB			

REVISIONS

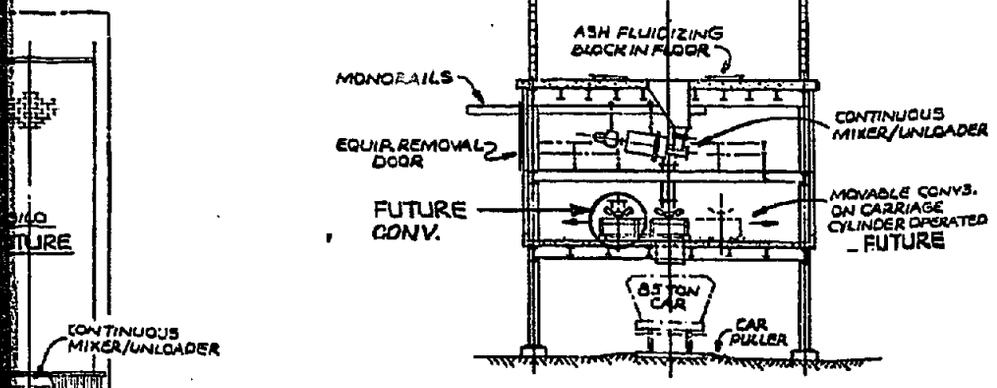
NO	DESCRIPTION	BY	CH	APPROVED	DATE

REFERENCES



CONV. FLOOR

KEY PLAN
1"=200'-0"



ENLARGED VIEW OF LOAD-OUT STATION
1"=10'-0"

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CLIENT: CIRI/PLACER
BELUGA METHANOL PROJECT
COOK INLET, ALASKA

Davy McKee
ENGINEERS AND CONSTRUCTORS

TITLE: ASH BLENDING & DISPOSAL
ASH LOAD-OUT STATION
PLAN & SECTIONS

SCALE 1"=20'-0" UNL. DWG. PC-1330

5530
218-P-001

REVISION 0

	BY	DATE
DESIGNED		
DRAWN	KLE/KAB	3-31
CHECKED		
APPROVED 1		
APPROVED 2		
APPROVED 3		

DATE TO: CLIENT / FIELD

A	B	C	D	1	2	3	4	E	F

6 7 8 9 10