2-7-92
12.3846

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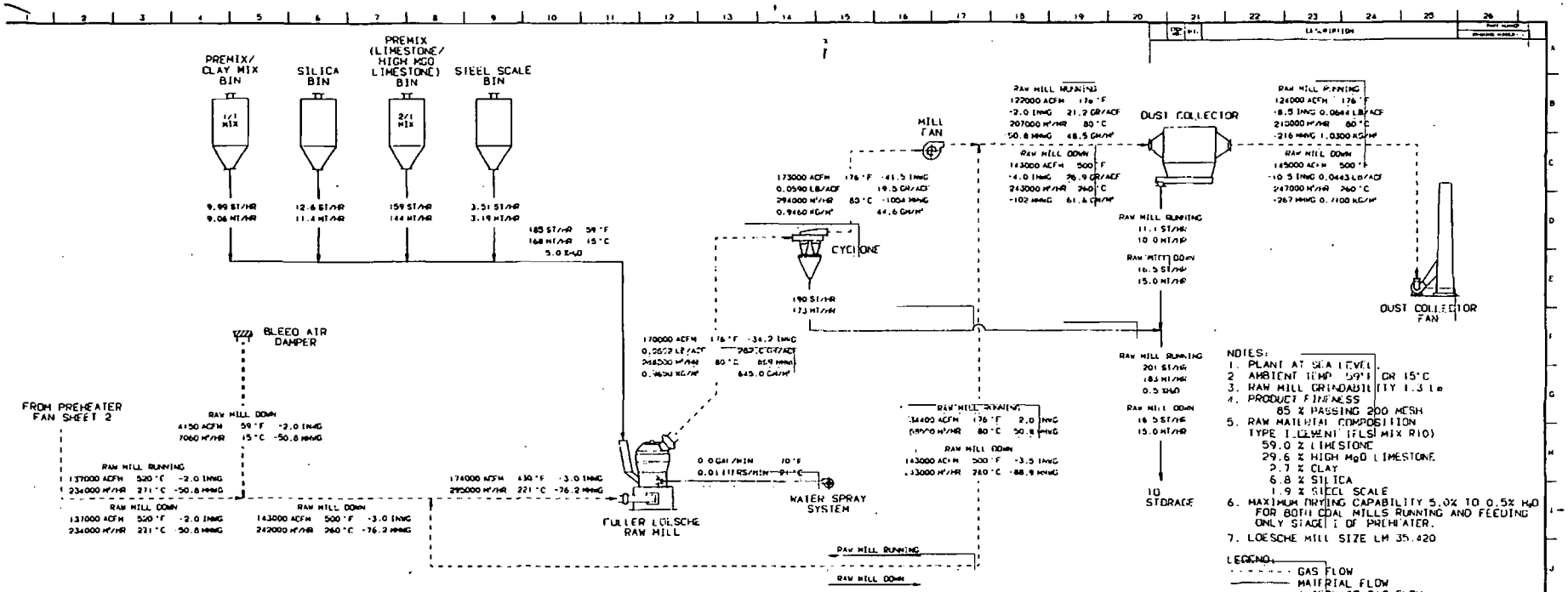

NOTES:
1. PLANT AT SEA LEVEL.
2. AMBIENT TEMP 59°F OR 15°C
3. RAW MILL GRINDABILITY 1.3 Lo
4. PRODUCT FINENESS
   85 % PASSING 200 MESH
5. RAW MATERIAL COMPOSITION
   TYPE I CEMENT (FLS MIX R10)
   59.0 % LIMESTONE
   29.6 % HIGH MgO LIMESTONE
   2.7 % CLAY
   6.8 % SILICA
   1.9 % STEEL SCALE
6. MAXIMUM DRYING CAPABILITY 5.0% TO 0.5% H_2O FOR BOTH COAL MILLS RUNNING AND FEEDING ONLY STAGE I OF PREHEATER.
7. LOESCHE MILL SIZE LM 35.420

LEGEND:
- GAS FLOW
- MATERIAL FLOW
- ALTERNATE GAS FLOW
- ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ - DUST DENSITY

USEPA SF 1261809

EQUIPMENT RATINGS

WEIGHFEEDERS			
CLAY/PREMIX	SILICA	PREMIX	STEEL SCALE
85.2 ST/HR 77.3 MT/HR WET	34.3 ST/HR 31.2 MT/HR WET	233 ST/HR 212 MT/HR WET	11.6 ST/HR 10.5 MT/HR WET

BLEED AIR DAMPER	FULLER LOESCHE RAW MILL	WATER SPRAY SYSTEM	CYCLONE	MILL FAN
		LOESCHE MILL		
18400 ACFM 77 °F 31300 M³/HR 25 °C	185 ST/HR 168 MT/HR	49.7 GAL/MIN 70 °F 188.0 LITERS/MIN 21 °C	170000 ACFM 176 °F -34.2 INWG 0.0602 LB/ACF 287.0 GR/ACF 288000 M³/HR 80 °C -869 MMWG 0.9650 KG/M³ 656.0 GM/M³	197000 ACFM 176 °F -45.0 INWG 0.0564 LB/ACF 19.8 GR/ACF 335000 M³/HR 80 °C -1140 MMWG 0.9030 KG/M³ 45.4 GM/M³

DUST COLLECTOR		DUST COLLECTOR FAN	
RAW MILL RUNNING	RAW MILL DOWN	RAW MILL RUNNING	RAW MILL DOWN
152000 ACFM 176 °F -2.6 INWG 131 °F DEW PT. 58.9 GR/ACF 258000 M³/HR 80 °C 67.2 MMWG 55 °C DEW PT. 134.1 GM/M³ 16.8 BHP HP VOLUME	185000 ACFM 500 °F -5.8 INWG 120 °F DEW PT. 26.8 GR/ACF 315000 M³/HR 260 °C -146 MMWG 49 °C DEW PT. 61.2 GM/M³ 12.2 BHP AV VOLUME	156000 ACFM 176 °F -10.1 INWG 0.0620 LB/ACF 263000 M³/HR 80 °C -[illegible] MMWG 0.9920 KG/M³	189000 ACFM 500 °F 13.3 INWG 0.0129 LB/ACF 321000 M³/HR 260 °C 337 MMWG 0.8770 KG/M³

PREHEATER GAS FROM COAL FIRED 2200 STPD PYROPROCESSING SYSTEM.

REV.	DATE	DRAWN	CHECKED	APPROVED	DESCRIPTION
1	4-15-92	[illegible]	[illegible]	[illegible]	CHANGED CYCLONE EFFICIENCY TO 93% REVISED FULLER AIR-LIFT AIR. REVISED RAW MILL SYSTEM PRESSURE LOSS.

FULLER COMPANY

CONTRACT PROCESS FLOW DIAGRAM
185 ST/HR FULLER-LOESCHE RAW MILL
ASH GROVE CEMENT WEST, INC.
TACOMA, WASHINGTON, U.S.A.

DRAWING NUMBER 135-904-2407 REV. 1

2-7-92
12.3846

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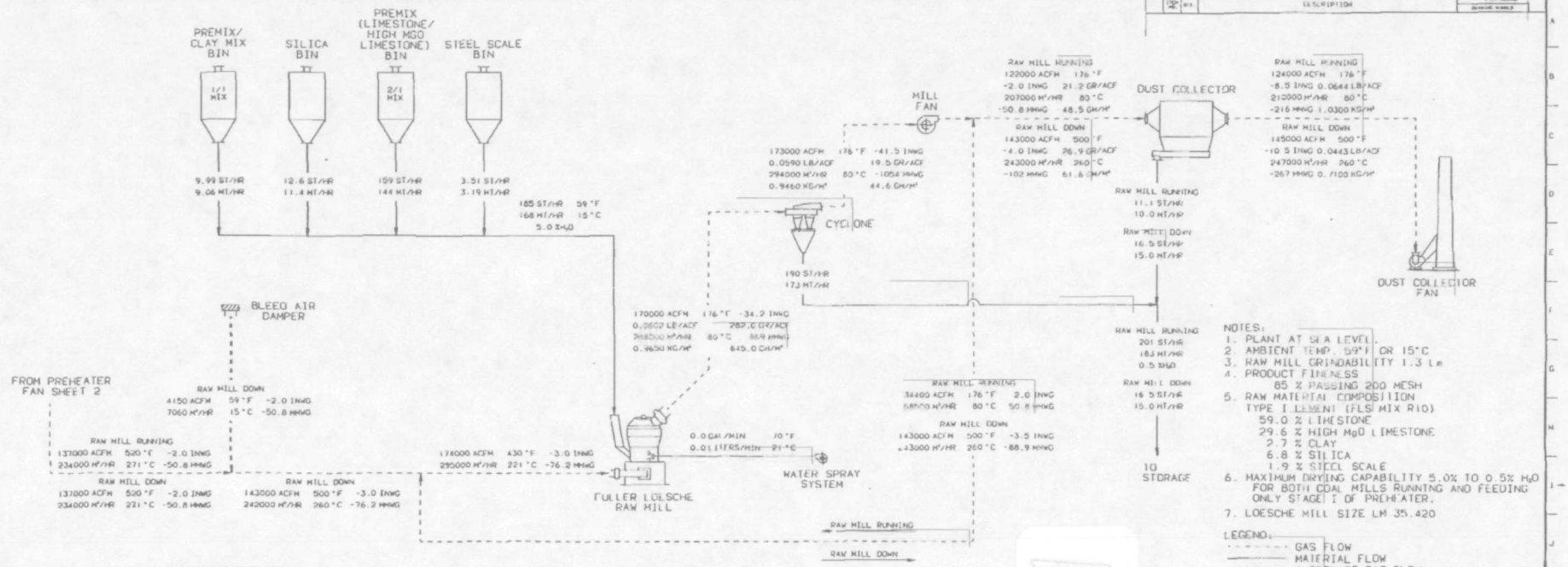


NOTES:
1. PLANT AT SEA LEVEL.
2. AMBIENT TEMP. 59°F OR 15°C
3. RAW MILL GRINDABILITY 1.3 Lm
4. PRODUCT FINENESS
   85 % PASSING 200 MESH
5. RAW MATERIAL COMPOSITION
   TYPE I CEMENT (FLSI MIX R10)
   59.0 % LIMESTONE
   29.6 % HIGH MgO LIMESTONE
   2.7 % CLAY
   6.8 % SILICA
   1.9 % STEEL SCALE
6. MAXIMUM DRYING CAPABILITY 5.0% TO 0.5% H_2O FOR BOTH COAL MILLS RUNNING AND FEEDING ONLY STAGE I OF PREHEATER.
7. LOESCHE MILL SIZE LM 35.420

LEGEND:
- - - - - GAS FLOW
——— MATERIAL FLOW
= = = = ALTERNATE GAS FLOW
═══ ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ - DUST DENSITY

1261809

EQUIPMENT RATINGS

WEIGHFEEDERS			
CLAY/PREMIX	SILICA	PREMIX	STEEL SCALE
85.2 ST/HR 77.3 MT/HR WET	34.3 ST/HR 31.2 MT/HR WET	233 ST/HR 212 MT/HR WET	11.6 ST/HR 10.5 MT/HR WET

BLEED AIR DAMPER	FULLER LOESCHE RAW MILL	WATER SPRAY SYSTEM LOESCHE MILL	CYCLONE	MILL FAN
18400 ACFM 77 °F 31300 M³/HR 25 °C	185 ST/HR 168 MT/HR	49.7 GAL/MIN 70 °F 188.0 LITERS/MIN 21 °C	170000 ACFM 176 °F -34.2 INWG 0.0602 LB/ACF 287.0 GR/ACF 288000 M³/HR 80 °C -869 MMWG 0.9650 KG/M³ 656.0 GM/M³	197000 ACFM 176 °F -45.0 INWG 0.0564 LB/ACF 19.8 GR/ACF 335000 M³/HR 80 °C -1140 MMWG 0.9030 KG/M³ 45.4 GM/M³

DUST COLLECTOR		DUST COLLECTOR FAN	
RAW MILL RUNNING	RAW MILL DOWN	RAW MILL RUNNING	RAW MILL DOWN
152000 ACFM 176 °F -2.6 INWG 131 °F DEW PT. 58.9 GR/ACF 258000 M³/HR 80 °C 67.2 MMWG 55 °C DEW PT. 134.1 GM/M³ 16.8 IWG BY VOLUME	185000 ACFM 500 °F -5.8 INWG 120 °F DEW PT. 26.8 GR/ACF 315000 M³/HR 260 °C 146 MMWG 49 °C DEW PT. 61.2 GM/M³ 12.2 IWG BY VOLUME	155000 ACFM 176 °F -10.1 INWG 0.0620 LB/ACF 263000 M³/HR 80 °C -[illegible] MMWG 0.9920 KG/M³	189000 ACFM 500 °F 13.3 INWG 0.0422 LB/ACF 321000 M³/HR 260 °C 337 MMWG 0.6770 KG/M³

PREHEATER GAS FROM COAL FIRED 2200 STPD PYROPROCESSING SYSTEM.

REV NO	DR	DG	APPRD	DATE	CHKD	DESCRIPTION
1	ACS			27.1.92		CHANGED CYCLONE EFFICIENCY TO 93% REVISED FULLER AIR-LIFT AIR. REVISED RAW MILL SYSTEM PRESSURE LOSS.

FULLER

FULLER COMPANY 2040 Ave. "C" • Bethlehem, Pa. 18017-2188 USA

TITLE	CONTRACT PROCESS FLOW DIAGRAM
NO.	185 ST/HR FULLER-LOESCHE RAW MILL
APPR	ASH GROVE CEMENT WEST, INC.
DATE 85-10	SEATTLE, WASHINGTON, U.S.A.
SCALE NON	DRAWING NUMBER 1 3 5 - 9 0 4 - 2 4 0 2 REV. 1 SHEET 1 OF 5
METRIC	

CAD BY: STARR 1993

AGC2D000002

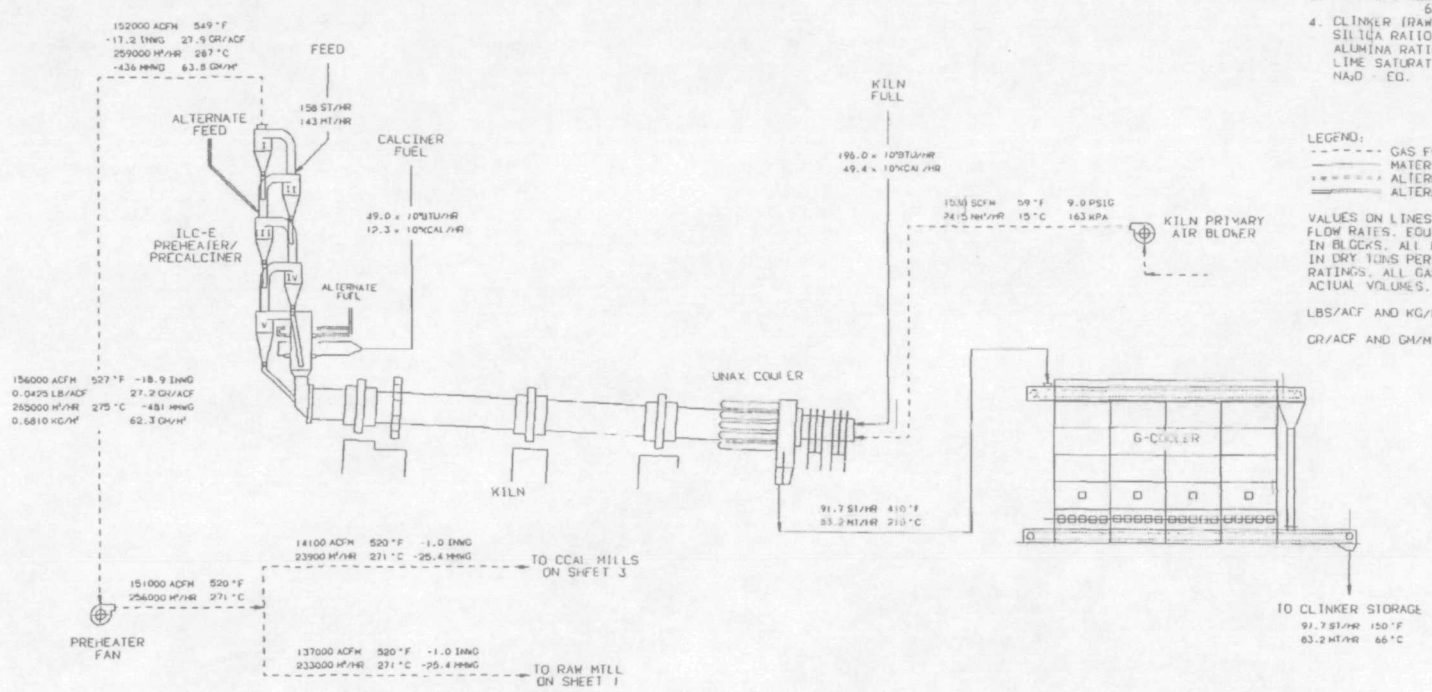
RAW FEED ANALYSIS % BY WEIGHT

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	SO_3	LOSS	TOTAL
13.5	2.5	2.4	43.2	1.97	0.31	0.13	0.40	35.1	99.51

ANALYSIS BASED ON SAMPLES SUPPLIED BY CUSTOMER AND ANALYZED BY FL SMIDTH - COPENHAGEN.

COAL % BY WEIGHT

VOL.	F.C.	S	H_2O	ASH
36.8	49.9	1.48	3.1	10.2



NOTES:
1. PLANT AT SEA LEVEL
2. AMBIENT TEMP. 59°F OR 15°C
3. FUEL LHV 12082 BTU/LB OR 6712 KCAL/KG
4. CLINKER (RAW FEED. LOSS FREE RATIO)
   SILICA RATIO 2.7 C3S 60.0
   ALUMINA RATIO 1.3 C2S 17.6
   LIME SATURATION 0.93 C3A 6.0
   Na_2O - EQ. 0.56

LEGEND:
- GAS FLOW
- MATERIAL FLOW
- ALTERNATE GAS FLOW
- ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ DUST DENSITY

EQUIPMENT RATINGS

PREHEATER FAN

OPERATING CONDITION	DESIGN CONDITION	OPERATING CONDITION
COAL FIRING	GAS FIRING	GAS FIRING
155000 ACFM 522°F -18.7 INWG	181000 ACFM 531°F -23.1 INWG	161000 ACFM 522°F -19.1 INWG
0.0427 LB/ACF 27.4 GR/ACF	0.0401 LB/ACF 26.6 GR/ACF	0.0409 LB/ACF 26.7 GR/ACF
263000 M³/HR 272°C -474 MMWG	308000 M³/HR 277°C -586 MMWG	274000 M³/HR 272°C -484 MMWG
0.6850 KG/M³ 62.8 GM/M³	0.6430 KG/M³ 65.4 GM/M³	0.6560 KG/M³ 61.1 GM/M³

KILN FULL SYSTEM	CALCINER FUEL SYSTEM	KILN PRIMARY AIR BLOWER	FEED CONVEYING SYSTEM
			PREHEATER
265.0 x 10⁶BTU/HR 66.7 x 10⁶KCAL/HR	74.1 x 10⁶BTU/HR 18.7 x 10⁶KCAL/HR	1630 SCFM 68°F 13.0 PSIG 2895 M³/HR 20°C 191 KPA	150.0 ST/HR 122.0 MT/HR

COAL FIRED 2200 STPD PYROPROCESSING SYSTEM. COAL MILL RUNNING.

REV. NO.	DR.	CHK.	APPR.	DATE	ZONE	STATUS	ACS	ACS
1	ACS			10/18/92			ACS	

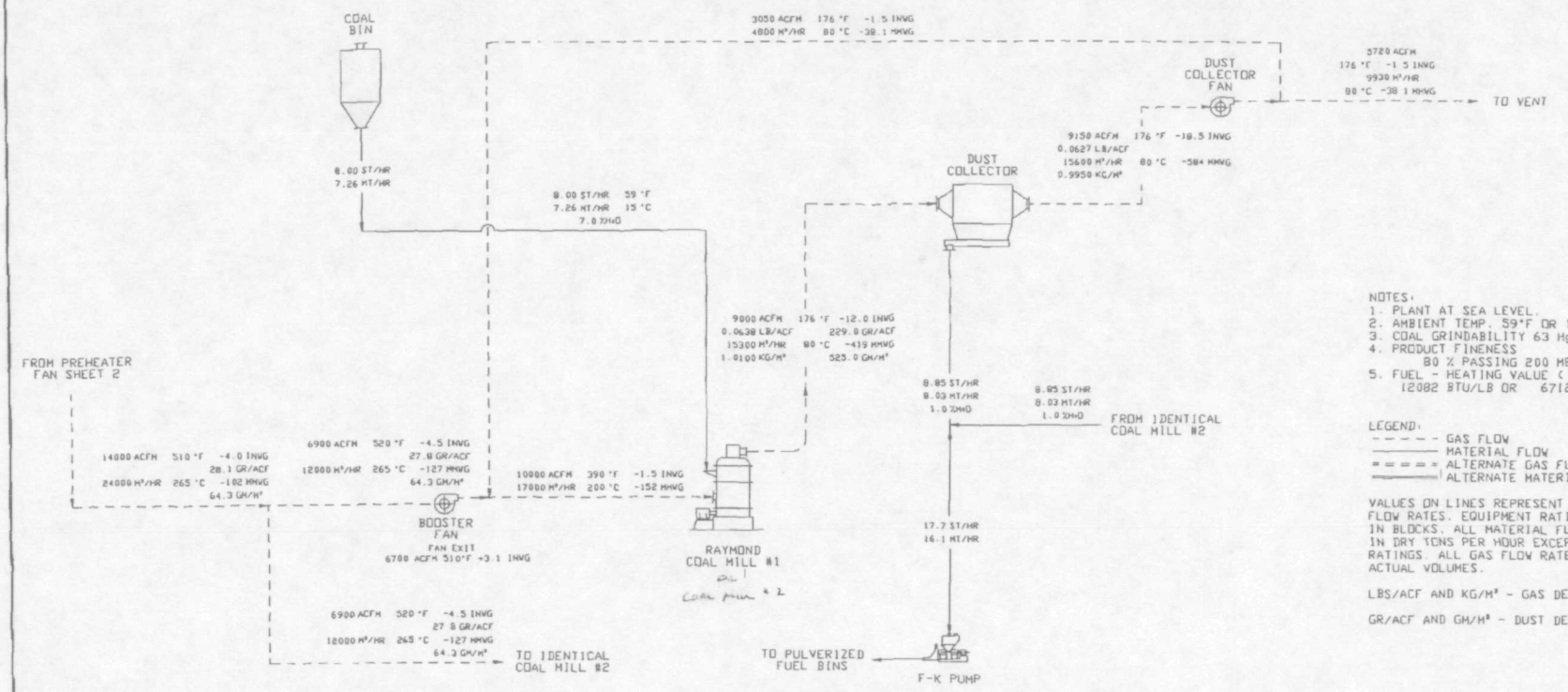
REVISED FULLER AIR-LIFT AIR CHANGED PRIMARY AIR FAN TO BLOWER

FULLER

FULLER COMPANY

CONTRACT PROCESS FLOW DIAGRAM
2200 STPD PYROPROCESSING SYSTEM
ASH GROVE CEMENT WEST, INC.
SEATTLE, WASHINGTON, U.S.A.

DRAWING NUMBER 1 3 2 1 0 4 2 4 0 2 1 SHEET NO. 2 OF 5



NOTES:
1. PLANT AT SEA LEVEL.
2. AMBIENT TEMP. 59°F OR 15°C
3. COAL GRINDABILITY 63 Hg
4. PRODUCT FINENESS
   80 % PASSING 200 MESH
5. FUEL - HEATING VALUE (LHV BASIS)
   12082 BTU/LB OR 6712 KCAL/KG

LEGEND:
- - - - - GAS FLOW
——— MATERIAL FLOW
= = = = ALTERNATE GAS FLOW
———— ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ - DUST DENSITY

EQUIPMENT RATINGS

WEIGHFEEDER	RAYMOND COAL MILL	DUST COLLECTOR	DUST COLLECTOR FAN	F-K PUMP	BOOSTER FAN
COAL 11.2 ST/HR 10.1 MT/HR WET	8.00 ST/HR 7.26 MT/HR	10400 ACFM 176 °F -19.7 INWG 122 °F DEW PT. 229.0 GR/ACF 17600 M³/HR 80 °C -500 MMWG 50 °C DEW PT. 525.0 GM/M³ 12.8 %H2O BY VOLUME	10600 ACFM 176 °F -27.2 INWG 0.0614 LB/ACF 17900 M³/HR 80 °C -690 MMWG 0.9840 KG/M³	17.7 ST/HR 16.1 MT/HR	8000 ACFM 520 °F +10.0 INWG 0.0459 LB/ACF 27.8 GR/ACF

REV.		
DATE		
APVD BY		

ASH GROVE CEMENT CO.

DRWN JL	CONTRACT PROCESS FLOW DIAGRAM 8.0 STPH COAL MILL SYSTEM		
CKD			
DATE 07/18/93	DRAWING NUMBER	REV.	SHEET
SCALE NONE	135-90-4-2402		PN 3 #5
CADFILE 0002-462			

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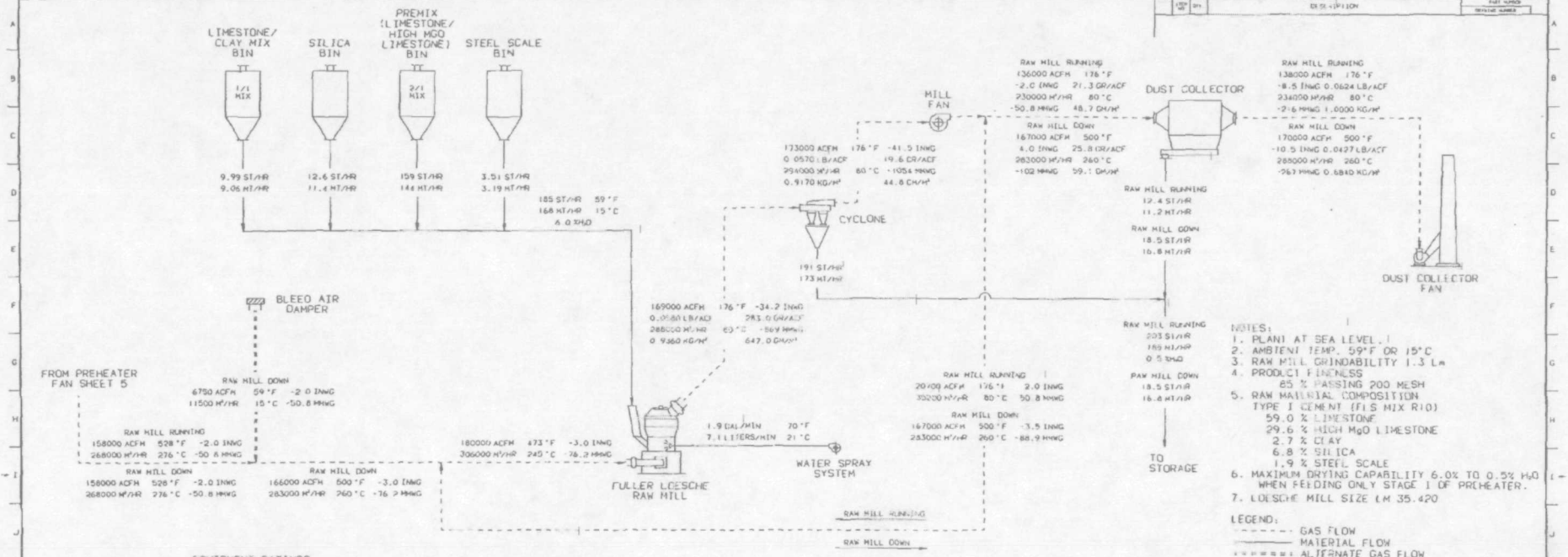


NOTES:
1. PLANT AT SEA LEVEL.
2. AMBIENT TEMP. 59°F OR 15°C
3. RAW MILL GRINDABILITY 1.3 Lm
4. PRODUCT FINENESS
   85 % PASSING 200 MESH
5. RAW MATERIAL COMPOSITION
   TYPE I CEMENT (FLS MIX R10)
   59.0 % LIMESTONE
   29.6 % HIGH MgO LIMESTONE
   2.7 % CLAY
   6.8 % SILICA
   1.9 % STEEL SCALE
6. MAXIMUM DRYING CAPABILITY 6.0% TO 0.5% H_2O WHEN FEEDING ONLY STAGE 1 OF PREHEATER.
7. LOESCHE MILL SIZE LM 35.420

LEGEND:
- GAS FLOW
- MATERIAL FLOW
- ALTERNATE GAS FLOW
- ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ - DUST DENSITY

PREHEATER GAS FROM GAS FIRED 2200 STPD PYROPROCESSING SYSTEM.

EQUIPMENT RATINGS

WEIGHFEEDERS			
CLAY/PREMIX	SILICA	PREMIX	STEEL SCALE
85.2 ST/HR 77.3 MT/HR WET	34.3 ST/HR 31.2 MT/HR WET	233 ST/HR 212 MT/HR WET	11.6 ST/HR 10.5 MT/HR WET

BLEED AIR DAMPER	FULLER LOESCHE RAW MILL	WATER SPRAY SYSTEM	CYCLONE	MILL FAN
		LOESCHE MILL		
16400 ACFM 77 °F 31300 M³/HR 25 °C	185 ST/HR 168 MT/HR	49.7 GAL/MIN 70 °F 188.0 LITERS/MIN 21 °C	170000 ACFM 176 °F -34.2 INWG 0.0607 LB/ACF 287.0 GR/ACF 288000 M³/HR 80 °C -869 MMWG 0.9650 KG/M³ 656.0 GM/M³	197000 ACFM 176 °F -45.0 INWG 0.0564 LB/ACF 19.8 GR/ACF 335000 M³/HR 80 °C -1140 MMWG 0.9030 KG/M³ 45.4 GM/M³

DUST COLLECTOR		DUST COLLECTOR FAN	
RAW MILL RUNNING	RAW MILL DOWN	RAW MILL RUNNING	RAW MILL DOWN
152000 ACFM 176 °F -2.6 INWG 131 °F DEW PT. 58.9 GR/ACF 258000 M³/HR 80 °C -67.2 MMWG 55 °C DEW PT. 135.1 GM/M³ 16.8 %H2O BY VOLUME	180000 ACFM 500 °F -5.8 INWG 120 °F DEW PT. 26.8 GR/ACF 315000 M³/HR 260 °C -146 MMWG 49 °C DEW PT. 61.2 GM/M³ 12.2 %H2O BY VOLUME	159000 ACFM 176 °F 10.1 INWG 0.0620 LB/ACF 269000 M³/HR 80 °C -258 MMWG 0.9920 KG/M³	181000 ACFM 500 °F -13.3 INWG 0.0422 LB/ACF 321000 M³/HR 260 °C -337 MMWG 0.6710 KG/M³

REV.	DR.	CHK.	APPR.	DATE	ECN NO.	REVISIONS
1	ACS			7/31/2002	AC-02	CHANGED CYCLONE EFFICIENCY TO 93% REVISED FULLER AIR-LIFT AIR REVISED RAW MILL SYSTEM PRESSURE LOSS.

FULLER

FULLER COMPANY

PROJECT PROCESS FLOW DIAGRAM
FLS SMIDTH FULLER LOESCHE RAW MILL
ASH GROVE CEMENT WEST, INC.
SEATTLE, WASHINGTON, U.S.A.

DRAWING NUMBER 1 3 5 V 0 - 4 - 2 4 0 2 REV 1 SHEET NO. 4 OF 5

AGC2D000004

RAW FEED ANALYSIS % BY WEIGHT

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	SO_3	LOSS	TOTAL
13.5	2.5	2.4	43.2	1.97	0.31	0.13	0.40	35.1	99.51

ANALYSIS BASED ON SAMPLES SUPPLIED BY CUSTOMER AND ANALYZED BY FL SMIDTH - COPENHAGEN.

GAS % BY VOLUME

CH_4	C_2H_6	N_2	O_2
76.6	16.4	4.0	3.0

REV.	DESCRIPTION	PART NUMBER / DRAWING NUMBER

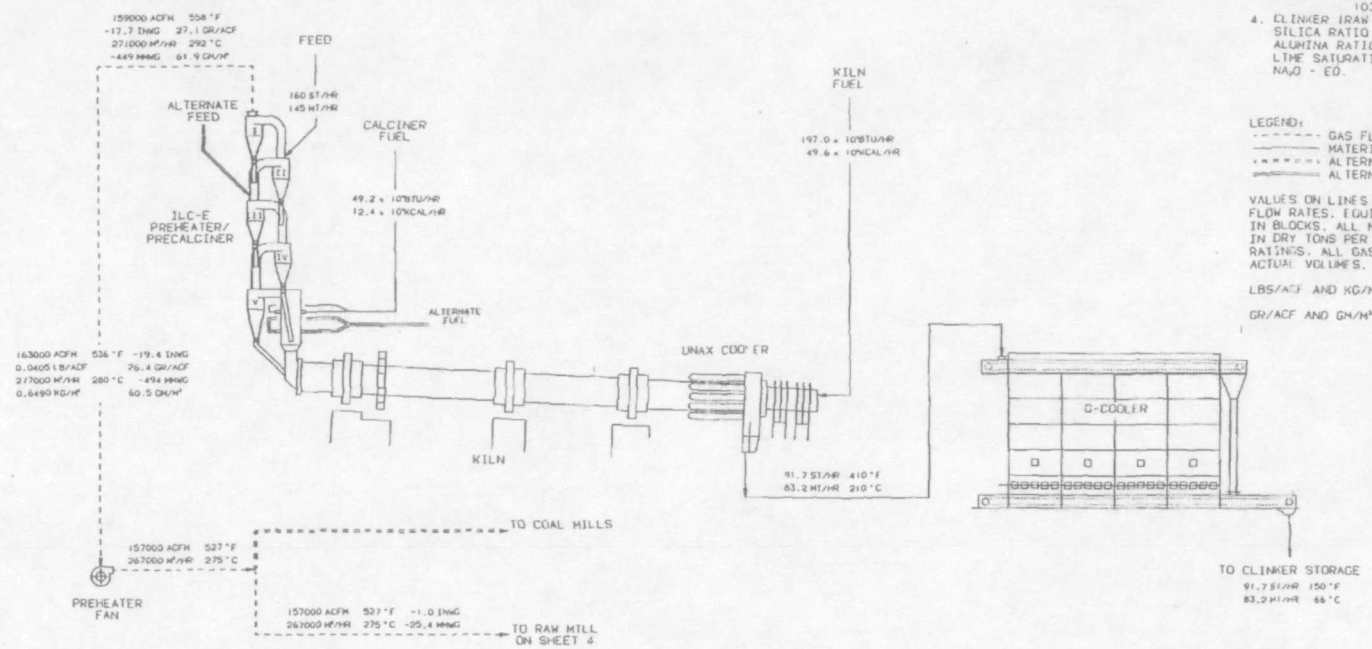
NOTES:
1. PLANT AT SEA LEVEL
2. AMBIENT TEMP. 59°F OR 15°C
3. FUEL LHV 18540 BTU/LB OR 10300 KCAL/KG
4. CLINKER (RAW FEED, LOSS FREE RATIO)
   SILICA RATIO 2.7 C3S 60.0
   ALUMINA RATIO 1.3 C2S 17.6
   LIME SATURATION 0.93 C3A 6.0
   Na_2O - EQ. 0.56

LEGEND:
- GAS FLOW
- MATERIAL FLOW
- ALTERNATE GAS FLOW
- ALTERNATE MATERIAL FLOW

VALUES ON LINES REPRESENT THEORETICAL FLOW RATES. EQUIPMENT RATINGS ARE SHOWN IN BLOCKS. ALL MATERIAL FLOW RATES ARE IN DRY TONS PER HOUR EXCEPT FOR WEIGHFEEDER RATINGS. ALL GAS FLOW RATES ARE SHOWN AS ACTUAL VOLUMES.

LBS/ACF AND KG/M³ - GAS DENSITY

GR/ACF AND GM/M³ - DUST DENSITY



EQUIPMENT RATINGS

PREHEATER FAN		
OPERATING CONDITION	DESIGN CONDITION	OPERATING CONDITION
COAL FIRING	GAS FIRING	GAS FIRING
156000 ACFM 522 °F -18.7 INWG	181000 ACFM 531 °F -23.1 INWG	161000 ACFM 522 °F 19.1 INWG
0.0427 LB/ACF 27.4 GR/ACF	0.0401 LB/ACF 28.6 GR/ACF	0.0409 LB/ACF 26.7 GR/ACF
263000 M³/HR 272 °C -474 MMWG	308000 M³/HR 277 °C -586 MMWG	274000 M³/HR 272 °C -484 MMWG
0.6850 KG/M³ 62.8 GM/M³	0.6430 KG/M³ 65.4 GM/M³	0.6560 KG/M³ 61.1 GM/M³

KILN FUEL SYSTEM	CALCINER FUEL SYSTEM	KILN PRIMARY AIR FAN	FEED CONVEYING SYSTEM
			PREHEATER
265.0 x 10⁶BTU/HR 66.7 x 10⁶KCAL/HR	74.1 x 10⁶BTU/HR 18.7 x 10⁶KCAL/HR	1835 SCFM 68 °F 13.0 PSIG 2895 M³/HR 20 °C 191 KPA	190.0 ST/HR 172.0 MT/HR

GAS-FIRED 2200 STPD PYROPROCESSING SYSTEM. COAL MILL DOWN.

REV	BY	CHK	APPROV	DATE	APPROVED	DESCRIPTION
A					KZ 9/8	REVISED FULLER AIR-LIFT AIR. CHANGED PRIMARY AIR DESIGN RATING.

FULLER

FULLER COMPANY

DR. BPW	CONTRACT PROCESS FLOW DIAGRAM
CHK.	2200 STPD PYROPROCESSING SYSTEM
APPR.	ASH GROVE CEMENT WEST, INC.
DATE 8/1/98	SEATTLE, WASHINGTON, U.S.A.
SCALE NONE	DRAWING NUMBER 135-90-4-2402-1 REV. A
WEIGHT	SHEET 1 OF 5

CAD REF. START 1/HP3 22 0 9/09/97 21 136

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