ANDERSEN 2000 INC

306 DIVIDEND DRIVE
PEACHTREE CITY, GEORGIA 30269 USA
PHONE (770) 486-2000
TELECOPY (770) 487-5066
www.crownandersen.com

July 15, 1998

By Fax Only: (850) 922 6979

Reference: Phosphate Defluorination Facility - Your Telephone Call On July 7, 1998
Andersen 2000 Inc File #APCE-8429-S

Mr. John Reynolds
Florida Department of Environmental Control

Dear Mr. Reynolds:

In response to your inquiry about a scrubbing system with double alkali regeneration for sulfur dioxide and hydrogen fluoride from phosphate or calcining, we searched our files and found a somewhat similar - but larger - unit which was quoted in March of this year for an application not in the state of Florida. We have made a copy of that proposal with the customer name removed and we are faxing that copy to you.

The system in the proposal was sized for an inlet gas flow rate of 63,130 acfm at 400°F and -7" W.G. This gas stream contained 1703 #/hr of sulfur dioxide and 1734 #/hr of HF. Your data would suggest a slightly larger gas flow rate with a dramatically reduced sulfur dioxide and HF content. Your data suggests a system with about 400 #/hr of sulfur dioxide and, assuming about 99.2% HF removal in a conventional scrubbing system, perhaps 400 #/hr of HF. The equal mass concentrations of SO_2 and HF would not be uncommon from a southeastern United States ore.

The proposal we are faxing includes a Model 5000 double alkali waste liquid regeneration system. If there were in fact 400 #/hr of SO_2 and 400 #/hr of HF in the inlet gas stream, then a Model 1000 double alkali waste liquid regeneration system would be required. The Model 1000 unit is priced at about $1,500,000 compared with the $4,680,000 for the Model 5000. Thus, for the application you have described by telephone, the scrubber price would be about the same as in the enclosed proposal, or $725,000. The soda ash supply system could range in price from a low of about $30,000 for a simple storage tank to a high of the $139,800 shown in the enclosed proposal. The regeneration system would then add $1,500,000.

Referring to Drawing P8229-1, chemical consumption and solid waste production would be 23.3% of the figures shown in Drawing P8229-1 in the enclosed proposal. Thus, the total package, including the scrubber, the soda ash system and the regeneration system would typically be priced at about $2.3 million, delivered to the job site in Florida.

We hope this information is adequate for your current purposes. If you need additional information, please don't hesitate to contact us.

Very truly yours,

ANDERSEN 2000 INC

Jack D. Brady, Chairman

JDB:be jr7.15

Encl: 8229

cc: *Andersen Sales Representative*
Mr. Steve King
Monarch Engineered Systems, Inc.
1598 Lago Vista Blvd.
Palm Harbor FL. 34685
Telephone: (813) 781 1818
Fax: (813) 781 1618

PROPOSAL FOR
MODEL HS-150 SULFUR DIOXIDE, HYDROGEN FLUORIDE AND HYDROGEN CHLORIDE SCRUBBING SYSTEM WITH MODEL 5000 DOUBLE ALKALI WASTE LIQUID REGENERATION SYSTEM TO CONTROL PARTICULATE AND ACID GAS EMISSIONS FROM PHOSPHATE DEFLUORINATION KILN

PREPARED FOR

PREPARED BY
ANDERSEN 2000 INC.
306 DIVIDEND DRIVE
PEACHTREE CITY, GEORGIA 30269 USA
PHONE: (770) 486-2000
FAX: (770) 487-5066
(A CROWN ANDERSEN INC. COMPANY)

ANDERSEN 2000 INC

PROPOSAL #APCE-8229-S

MARCH 12, 1998

TABLE OF CONTENTS

DRAWINGS

I. INTRODUCTION

The Andersen 2000 Inc. scrubbing system for HF, HCl and SO_2 removal has been proven in numerous industrial and utility applications throughout the world. All installations of the Andersen scrubbing system exceed 95% in sulfur dioxide removal efficiency, 99% in HF removal efficiency and 99% in HCl removal efficiency. The system is capable of achieving as high as 99.5% sulfur dioxide removal efficiency and 99.9% for HF and HCl. The system performs equally well on low or high inlet acid concentrations. Even with dramatic variations in inlet acid gas concentrations to the scrubbing system, the Andersen system produces an almost constant outlet acid gas concentration. In this respect, it differs substantially from the competitive acid gas removal processes available. This characteristic of the Andersen system is due to operation in the "concentrated" absorption chemical mode. The active chemical in the scrubbing system is sodium sulfite (Na_2SO_3). The concentration of sodium sulfite in the Andersen system is maintained at a much higher level than it is in any of the other systems offered to plant operators. This, in turn, enables the system to operate at a lower recirculated liquid flow rate to the scrubbing system and also enables the system to capture far more sulfur dioxide per unit volume of scrubbing liquid. This reduces the size of recirculation tanks, recirculation pumps, and piping to the scrubbing system.

The Andersen scrubbing system also uses a non-plugging, low differential pressure spray-baffle-type scrubber. The scrubber can be furnished in either a horizontal or vertical configuration. The system is shipped pre-wired and pre-piped to the maximum extent possible and all piping and electrical equipment has been tested in the factory before the system is delivered. The system is shipped on saddle supports and can be lifted as a single unit onto a suitable concrete foundation. Utilities are then connected to complete this system. When the scrubbing system is installed, it requires only a small ground space. The differential pressure across the scrubbing system is 10" W.G. (254 mm) at maximum gas flow rate. The scrubber is operated in an induced draft configuration in this application.

If extremely poor quality water is used as makeup to the scrubbing system, special consideration must be given to possible stress cracking and corrosion, due primarily to chlorides in the absorbing solution. When substantial chloride concentrations are anticipated, the quench section of the Andersen scrubbing system is constructed of Alloy C-276 This alloy is extremely resistant to chloride stress cracking and corrosion at elevated temperatures. It has been used frequently in acidic chloride solutions exposed to alternate wet and dry gas streams. Once the gas has been quenched to saturation temperature, it is then possible to use fiberglass reinforced polyester for the remainder of the scrubbing system. For this particular application, these special materials are required.

Another unique feature of the Andersen scrubbing system is that it always operates in an acidic scrubbing mode. When sodium hydroxide is added to the system as the makeup reagent, it converts sodium bisulfite back to sodium sulfite, rather than existing in the scrubbing solution as free sodium hydroxide. The same is true of the soda ash feed system. The chemical reactions which occur are shown below:

$$SO_2 + Na_2SO_3 + H_2O \longrightarrow 2NaHSO_3$$

$$NaOh + NaHSO_3 \longrightarrow Na_2SO_3 + H_2O$$

OR

$$Na_2CO_3 + 2NaHSO_3 \longrightarrow 2Na_2SO_3 + CO_2 \uparrow + H_2O$$

Calcium scale problems are well known in the scrubbing industry and can cause a scrubbing system to plug up within less than a week of operation. Scale problems have been encountered by other suppliers of sulfur dioxide removal systems because of operation in an alkaline scrubbing mode. Even when the competitive systems are operated in an acidic scrubbing mode, the scrubbing solutions are so poorly buffered from pH change that slight reductions in sulfur dioxide concentration at the inlet to the scrubbing systems result in dramatic changes in scrubbing solution pH. It is frequently possible for the scrubbing system to go back into an alkaline mode of operation. When this occurs, immediate scaling of the calcium compounds occurs. Furthermore, pH control systems are not noted for the highest level of reliability. When the pH controller fails to give a proper reading, it is often possible for the system to become alkaline before an operator can check the pH controller. Again, calcium scaling will occur as soon as the system transitions to an alkaline mode of operation. In the Andersen system, because of the concentrated mode of operation, the system is highly

buffered against pH change. Because the solution is so highly buffered, even if the pH controller failed, or even if substantial changes in inlet sulfur dioxide concentration occurred, the system would not run on the alkaline side. Thus, high calcium concentrations in the makeup water can be tolerated in the Andersen system where they cannot be tolerated in competitive systems.

The acid gas removal systems discussed above use either sodium hydroxide or soda ash as the makeup chemical to absorb sulfur dioxide. After reaction with sulfur dioxide, hydrogen fluoride and hydrogen chloride, both sodium hydroxide and soda ash produce sodium sulfite, sodium bisulfite, sodium fluoride and sodium chloride as direct reaction products. In addition, some of the sodium sulfite oxidizes to sodium sulfate. All of these salts are soluble in the aqueous scrubbing solutions. The initial reactions in the systems, between either sodium hydroxide or sodium carbonate and sulfur dioxide, form sodium sulfite. Sodium sulfite exists primarily in slightly alkaline scrubbing solutions. If the sodium sulfite then contacts sulfur dioxide, it will react to form sodium bisulfite. Sodium bisulfite exists in less alkaline or in acidic scrubbing solutions. In most of the scrubbing systems installed by Andersen, both sodium sulfite and sodium bisulfite exist together in the scrubbing solution with sodium fluoride and sodium chloride and the scrubbing solution is maintained at a pH of approximately 6.8. If the sodium hydroxide or sodium carbonate converts to sodium bisulfite, it can no longer absorb additional sulfur dioxide. In addition, if any of the sodium sulfite oxidizes to sodium sulfate, the sulfate becomes an "inert" chemical in the scrubbing solution and will not react with additional sulfur dioxide. Thus, the consumption of sodium hydroxide or sodium carbonate is determined by the pH at which the scrubbing system operates, the amount of oxidation of sulfite to sulfate, and the amount of sulfur dioxide, HF and HCl removed from the gas stream. These same scrubbing solutions also contain fly ash from combustion of fuel or from process solids. The resultant waste liquid from these scrubbing systems is typically a rather deep yellow in color if the particulate matter is filtered away from it. If the particulate matter is left in the liquid, the solutions are almost black in color and have some amount of free floating condensed organics on top of them.

Sodium sulfite, sodium bisulfite and sodium fluoride are chemically regenerable, using lower cost calcium salts as precipitants. Calcium sulfite, in the dihydrate and hemihydrate crystalline form, is produced as the end product from the precipitation reactions with sodium sulfite and sodium bisulfite. The bisulfite is converted back to sulfite and, if the pH is allowed to increase, some free sodium hydroxide will be created. The regenerated liquid can then be taken back to the scrubbing system and regenerated sodium salts will directly offset the need for new sodium salts. Sodium fluoride is converted into calcium fluoride and sodium hydroxide. Sodium chloride is not regenerated. The various chemical reactions which take place during scrubbing and during regeneration are discussed below.

Andersen 2000 Inc. has designed, patented and commercialized a compact chemical regeneration system for scrubber waste liquid. This system uses either pebble lime or slaked lime to regenerate the scrubbing solutions and to create a solid waste product which can be disposed of in a suitable waste disposal site at significantly lower cost than the waste liquids. This system enables recovery of a minimum 80% of the sodium salts which would have otherwise been consumed in the scrubbing systems, and a minimum of 80% of the water which would have otherwise been disposed of in the waste liquid stream. In most cases, the system will recover 85% of the sodium salts and 85% of the wastewater.

The Andersen regeneration system is unique in that it uses pebble lime directly as the reactant with the scrubbing solution. Most other chemical regeneration systems utilize slaked lime (calcium hydroxide) to insure high chemical conversion rates. The Andersen system can use slaked lime, but pebble lime is less expensive and is the favored reactant. The Andersen system utilizes extremely high agitation rates in the reactor to overcome the slower reaction rate of the calcium oxide (burned lime) when compared with slaked lime.

The various chemical reactions which occur in the sulfur dioxide absorbers are shown below. These reactions are shown for both sodium hydroxide and for soda ash used as makeup chemicals:

SO_2, HF And HCl Absorption - Sodium Hydroxide Absorbant

$2\,NaOH + SO_2 \longrightarrow Na_2SO_3 + H_2O$
Sodium Hydroxide + Sulfur Dioxide ——> Sodium Sulfite + Water

$NaOH + SO_2 \longrightarrow NaHSO_3$
Sodium Hydroxide + Sulfur Dioxide ——> Sodium Bisulfite

$Na_2SO_3 + SO_2 + H_2O \longrightarrow 2NaHSO_3$
Sodium Sulfite + Sulfur Dioxide + Water ——> Sodium Bisulfite

$NaOH + HF \longrightarrow + NaF + H_2O$
Sodium Hydroxide + Hydrogen Fluoride ——> + Sodium Fluoride + Water

$NaOH + HCl \longrightarrow + NaCl + H_2O$
Sodium Hydroxide + Hydrogen Chloride ——> + Sodium Chloride + Water

SO_2 Absorption - Soda Ash (Sodium Carbonate) Absorbant

$Na_2CO_3 + SO_2 \longrightarrow Na_2SO_3 + CO_2$
Sodium Carbonate + Sulfur Dioxide ——> Sodium Sulfite + Carbon Dioxide

$Na_2CO_3 + 2SO_2 + H_2O \longrightarrow 2NaHSO_3 + CO_2$
Sodium Carbonate + Sulfur Dioxide + Water ——> Sodium Bisulfite + Carbon Dioxide

$Na_2SO_3 + SO_2 + H_2O \longrightarrow 2NaHSO_3$
Sodium Sulfite + Sulfur Dioxide + Water ——> Sodium Bisulfite

$Na_2CO_3 + 2HF \longrightarrow 2NaF + H_2O + CO_2$
Sodium Carbonate + Hydrogen Fluoride ——> Sodium Fluoride + Water + Carbon Dioxide

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$
Sodium Carbonate + Hydrogen Chloride ——> Sodium Chloride + Water + Carbon Dioxide

Oxidation

$Na_2SO_3 + 1/2\,O_2 \longrightarrow Na_2SO_4$
Sodium Sulfite + Oxygen ——> Sodium Sulfate

If the waste scrubbing liquid from these systems is then taken to the Andersen chemical regeneration system, the sulfur and fluoride compounds are precipitated from the scrubbing solution and sodium sulfite and sodium hydroxide are produced to allow additional acid gas absorption. The regeneration reactions are shown below:

Regeneration

$2NaHSO_3 + CaO \longrightarrow Na_2SO_3 + H_2O + CaSO_3$
Sodium Bisulfite + Lime ——> Sodium Sulfite + Water + Calcium Sulfite

$CaSO_3 + 2H_2O \longrightarrow CaSO_3 \cdot H_2O$ • 2
(Actually forms as $CaSO_3 \cdot 1/2H_2O$ until it cools in storage and then becomes $CaSO_3 \cdot 2H_2O$)

$2NaF + CaO + H_2O \longrightarrow CaF_2 + 2NaOH$
Sodium fluoride + Lime + Water ——> Calcium Fluoride + Sodium Hydroxide

The chemical regeneration system for the scrubber quoted in this proposal is quoted as a separate plant to serve the scrubber quoted.

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(A CROWN ANDERSEN INC. COMPANY)

TELEPHONE:(770)486-2000
U.S.A. ONLY:(800)241-5424
TELEFAX: (770)487-5066

II. EQUIPMENT AND/OR SERVICES QUOTATION

- Proposal and Quotation No: APCE-8229-S
- For ("Buyer"):
- Quotation is: [X] Firm [ ] Preliminary [ ] Subject to the Price Escalation Policy on page _____ hereof.
- Date Submitted: MARCH 12, 1998
- Quotation Firm Until: MAY 31, 1998
- Delivery Time(s): EQUIPMENT SHIPMENT - 26 WKS AFTER ORDER RECEIPT

(NOTE: As major equipment items are completed, partial shipments may be made. Partial shipments will result in partial invoicing in the proportion that the shipment bears to the entire order.)

- F.O.B. (Place of Delivery & Special Shipping Instructions, if any):
  JOB SITE,
- Terms: 10% WITH ORDER
  30% NET 30 DAYS AFTER 50% SHOP COMPLETION
  30% NET 30 DAYS AFTER EQUIPMENT SHIPMENT
  20% NET 30 DAYS AFTER STARTUP
  10% NET 30 DAYS AFTER SUCCESSFUL OPERATION AND PERFORMANCE TESTING

All amounts which are outstanding and unpaid for more than 30 days will be subject to a late charge at the rate of one and one-half percent (1.5%) per month (or at the highest amount or rate which under applicable law Buyer may contract to pay in order to induce prompt payment, whichever is less).

- Performance Testing: [X] Required to satisfy the Performance Levels Guaranty when tested for acceptance in accordance with the Acceptance Tests specified on page(s) 22 - 24 hereof.
- Send all correspondence to Andersen 2000 Inc. at its home office address indicated above with copies to the following local Andersen 2000 Inc. sales representative(s).

THIS QUOTATION IS SUBJECT TO OUR

[X] STANDARD CONDITIONS OF SALE [SEE PAGE(S) 15 - 17 HEREOF]

[ ] TURNKEY CONTRACT TERMS AND CONDITIONS [SEE PAGE(S) _____ HEREOF]

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II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
		A. COMPLETE MODEL HS-150 ACID GAS SCRUBBING SYSTEM, INCLUDING THE FOLLOWING EQUIPMENT ITEMS AND SERVICES:
1	1	**ANDERSEN 2000 INC. MODEL WAF-171 WETTED APPROACH, VARIABLE THROAT QUENCH SECTION.** Constructed of 1/4" (6.4 mm) thick Alloy C-276. Quench section is shown in Drawing P8229-2 at the back of this proposal. Differential pressure across the quench section and wetted elbow can be varied from approximately 1.5" W.G. to as high as 8" W.G. using the variable throat. The quench section requires a liquid feed rate of 500 gpm (114 m^3/h) at 40 psig (2.81 kg/cm^2).
2	1	**ANDERSEN 2000 INC. MODEL HS-150 HORIZONTAL SPRAY-BAFFLE ABSORBER.** Includes an integral liquid recirculation tank and a 4-pass chevron mist eliminator. Absorber section is sized for the gas flow conditions indicated in Drawing P8229-1 and is shown in Drawing P8229-2. Scrubber recirculation tank has a total liquid capacity of 36,000 gallons (136 m^3) and an operating capacity of 2000 gallons (7.6 m^3). Entrainment separator/absorber is constructed of 1/2" (12.7 mm) thick fiberglass reinforced vinylester and is operated at a differential pressure which varies from a minimum of 1" W.G. to a maximum of 5.0" W.G. at maximum design gas flow conditions. Absorber section requires a liquid recirculation rate of 1000 gpm (227 m^3/h) at 30 psig (2.11 kg/cm^2). The chevron-type mist eliminator utilizes a constant 5 gpm (1.1 m^3/h) of fresh make-up water to maintain continuous wash on the mist eliminator. The mist eliminator is described in more detail in the brochure at the back of this proposal.
3	1	**ANDERSEN 2000 INC. SCRUBBER I.D. FAN.** Model 7-BIS-IV backward inclined blade centrifugal, Alloy C-276 wheel and rubber lined steel housing construction for an inlet gas flow rate of 51,240 acfm at -17" H_2O static pressure (13,714 psia) at an inlet gas density of 0.0562#/ft^3. Fan produces -7" W.G. at scrubber inlet and 10" W.G. for scrubber differential pressure for a total of 17" W.G. Fan is Arrangement #9, CCW, BAU, and is powered by an 1800 rpm, 200 HP, TEFC, 460V, 3 Ø, 60 Hz drive motor at 1820 rpm. Includes OSHA shaft and belt guards, bolted and gasketed access doors and Teflon® shaft seal. Fan curve is included as Figure 1. Approximate sound data can be found in Table 1. Fan includes flex connector in and out and evasee duct at discharge to stack.
4	1	**EXHAUST STACK.** Stack is 56" (1422 mm) inside diameter by 50' (15.24 m) overall height and is constructed of 3/8" (9.5 mm) thick epoxy lined steel. Stack is self-supporting from customer supplied foundation and includes the necessary supports for sampling platforms and ladders. Also includes 6 sampling ports with flanged covers.
5 (ONE SPARE)	2	**SCRUBBER RECIRCULATION PUMP.** Each pump is rubber lined cast iron construction and powered by a 200 HP, 460V, 3Ø, 60 Hz, TEFC drive motor operating at 1760 rpm. Each pump is sized to deliver 3000 gpm (681 m^3/h) at 55 psig (3.87 kg/cm^2) on 1.10 specific gravity scrubbing liquid. One pump operates and one pump is a piped spare.
6	LOT	**LADDERS, PLATFORMS, STRUCTURAL SUPPORTS, SAMPLING PLATFORM, OSHA HANDRAILS, OSHA CAGES, AND OSHA TOE PLATES FOR ALL**

ANDERSEN 2000 INC
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II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
		ACCESS PLATFORMS AND SAMPLING PLATFORMS. The access platforms, ladders, and sampling platforms are shown in Drawing P8229-2. All items are constructed of mild steel, sandblasted, primered with epoxy primer, and finish painted with epoxy paint.
7	LOT	**PIPING AND PIPING SUPPORTS FOR THE SCRUBBING SYSTEM, NOT INCLUDING THE SODA ASH SYSTEM PIPING WHICH IS QUOTED SEPARATELY BELOW.** Includes all necessary piping for recirculation, control, and regeneration. Piping for scrubber terminates at a single make-up water connection, a single blowdown piping connection, and a single instrument air connection. Includes all necessary valves, including control valves. Piping is FRP with non-metallic control valves for all process solution piping contact. Water piping is galvanized steel.
8	LOT	**ENGINEERING DESIGN, CERTIFIED DRAWINGS, FIELD ERECTION SUPERVISION, OPERATION AND MAINTENANCE MANUALS, OPERATING AND INSTALLATION PROCEDURES, AND COMPLETE ENGINEERING DESIGN PACKAGES.**
9	LOT	**COMPLETE INSTRUMENTATION SYSTEM WITH MOTOR CONTROLS.** Includes a NEMA 4 control panel with PLC system and all necessary control instruments for the system, an annunciator system, control power transformers, motor circuit protectors, fuses and protective devices for all of the instrumentation, and individual field mounted instruments. Includes necessary flowmeters and indicators and flow controllers for all critical process flows, a pH control system to control soda ash make-up to the scrubber, a conductivity control system to control blowdown from the scrubbing system, a differential pressure controller to control the throat position in the quench section, a complete automated pump transfer system in the event of individual pump failure, temperature and pressure indicators for all critical flows, but does not include a continuous stack monitoring system. Motor starters are housed in a NEMA 12 motor control center which must be installed inside of a weather protected building. The building is not included in the purchase price. Individual conduit and wiring connections from the starters to the individual motors are also not included.
10	LOT	**FREIGHT AND INSURANCE FOR ALL EQUIPMENT ITEMS LISTED ABOVE TO JOB SITE IN**
11	LOT	**FIELD SUPERVISION FOR FIELD ASSEMBLY BY OTHERS OF ALL EQUIPMENT ITEMS LISTED ABOVE.**
		SHIPPING WEIGHT FOR ITEMS 1 - 11 = 97,600# (44,270 Kg)
		PRICE FOR ITEMS 1 - 11 = $725,000
12	1	**ANDERSEN 2000 INC. MODEL 21000 SODA ASH SLURRY STORAGE SYSTEM AS SHOWN IN DRAWINGS P8229-6 AND P8229-7.** Soda ash system includes a 12' (3658 mm) diameter by 31' (9449 mm) straight sidewall slurry storage tank constructed of 1/4" (6.4 mm) thick mild steel. Tank has a total capacity of 26,000

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II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION

gallons (98 m^3) and an operating capacity of 20,780 gallons (78.7 m^3). Soda ash system has a total soda ash storage capacity of 136,000# (61.7 metric tons). This provides for 18 days of storage at the conditions shown in Drawing P8229-1. Tank is designed to maintain a saturated solution of soda ash at approximately 30% (wt) dissolved soda ash with up to 30% (wt) undissolved soda ash in a slurry form at the bottom of the tank. Soda ash system includes a 500 gpm, 30 psig, 1.5 sp. gr., ductile iron recirculation pump to be used during filling operations from pneumatic delivery truck or train. This pump delivers solution from the tank to a slurry mixing chamber where the dry soda ash is immediately hydrated during delivery to a slurry form for storage. Also includes a 4"Ø soda ash pneumatic fill line with the necessary controls. Soda ash system includes the required piping, the necessary electric heat tracing and insulation around the slurry draw-off points, and a complete instrumentation system as shown in the drawings. Two soda ash delivery pumps (one spare) are also provided with the system to deliver soda ash solution to the scrubber. The pumps are Ingersoll Dresser Model 2x1x10 HOC pumps powered by 5 HP, 460V, 3Ø, 60 Hz, 1800 rpm drive motors. Pumps include a tungsten face mechanical seal. The larger hydrator pump is an Ingersoll-Dresser 6x4x10 HOC, also constructed of ductile iron, and powered by a 20 HP, TEFC, 460V, 3Ø, 60 Hz drive motor. Soda ash system also includes a dust scrubber at its discharge to remove any residual dust during pneumatic filling. Also includes the necessary ladders, platforms, handrails and kickplates. These are all sandblasted and painted before shipment, and the mild steel storage tank is also sandblasted and painted before shipment. Soda ash system also includes delivery to the job site.

SODA ASH SYSTEM SHIPPING WEIGHT = 61,200# = 27,760 Kg

PRICE = $139,800

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II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
		B. MODEL 5000 DOUBLE ALKALI LIQUID REGENERATION SYSTEM FOR SCRUBBER DISCHARGE LIQUID.
1	3 Each	**SCRUBBER LIQUID STORAGE TANK.** Tank is 120" diameter by 142" straight sidewall with a domed cover, capable of holding 6,200 gallons each of waste liquid and operating at 6,000 gallons each under normal maximum fill conditions. Constructed entirely of high density cross-linked, rotomolded polyethylene. Tank includes a gasketed access manway at the tank top, a 2" tank vent, a 3" flanged cleanout at the base of the tank, all necessary flanged liquid nozzles for entry and exit from the tank, and all necessary instrumentation ports on the tank wall. **SHIPPING WEIGHT = 1,650# EACH = 748 Kg EACH**
2	1	**CHEMICAL REACTOR.** Draft tube type reactor, constructed of ½" thick mild steel, 10' diameter by 13' straight sidewall, and designed to operate at 6,500 gallons capacity from a pumped feed and a gravity overflow discharge. Reactor is fully covered with hinged access doors. Reactor is equipped with a 1200 rpm, turbine type agitator powered by a 30 HP, TEFC, 460V, 3Ø, 60 Hz drive motor. Shaft and turbine blades are constructed of Type 316 S.S. **SHIPPING WEIGHT = 24,000# = 10,886 Kg**
3	1	**PEBBLE LIME FEEDER.** Feeder is a Vibra-Screw volumetric live bin screw feeder capable of feeding between 30 and 300 ft^3/hr of solids. Feeder is equipped with a 7.5 HP AC drive motor, controlled by a 4-20 ma instrument signal from pH controller. Feeder is constructed of stainless steel for lime contacting parts and is connected directly with a flexible boot to an interim storage bin described below. **SHIPPING WEIGHT = 6,000# = 2,721 Kg**
4	1	**INTERIM LIME STORAGE BIN.** 6' diameter by 8' straight sidewall bin with cylindrical discharge to mount directly above the lime feeder. Sized for a minimum capacity of 230 ft^3 and constructed entirely of stainless steel. Including high level and low level switch ports, and closed cover with flanged opening to connect to the screw-lift conveyor from the bulk storage bin. **SHIPPING WEIGHT = 2,400# = 1,089 Kg**
5	1	**SCREW CONVEYOR-SCREW LIFT.** Screw elevator and conveying system with 14" diameter screw and powered by 20 HP, TEFC, 460V, 3Ø, 60 Hz gear motor unit driving screw at approximately 170 rpm. Unit is capable of conveying up to 800 ft^3/hr of pebble lime. Lift is 50' from grade level with 8' of screw conveyor to feed from the bulk storage bin to the screw lift. A bottom drive unit will be furnished. Constructed entirely of mild steel. **SHIPPING WEIGHT = 10,000# = 4,536 Kg**
6	1	**BULK LIME STORAGE BIN.** 30' diameter by 80' tall storage silo constructed of mild steel and fully welded construction. Bin is designed for a capacity of 56,500 ft^3,

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II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
		which is equal to approximately 2,830,000# (1284 metric tons) of pebble lime. Bin is equipped with a conical bottom connected to a Vibra-Screw, 10' diameter vibrating bin activator. The bin activator is powered by a 10 HP, TEFC, 460V, 3Ø, 60 Hz drive motor. The lime storage bin is also equipped with a pneumatic fill line, a bin vent filter with bags totaling 240 ft² and capable of operating at 900 acfm of exhaust gas flow during filling operations. Bag cleaning is accomplished using 20 scfm of 100 psig air. Bag cleaning is an automatic operation. Bag material is glazed polypropylene.
		SHIPPING WEIGHT = 210,000# = 95,254 Kg
7	2 (ONE SPARE)	**REACTOR FEED PUMP.** Centrifugal pump constructed of rubber lined cast iron and powered by 60 HP, TEFC, 460V, 3Ø, 60 Hz drive motor operating at 1800 rpm and direct coupled to the pump. Each pump is designed for 1500 gpm at 30 psig on up to 1.14 specific gravity scrubbing liquid. Pump is equipped with a double mechanical seal and with a seal flush water connection. Pump is base mounted with coupling, guard, and inlet and outlet expansion joints.
		SHIPPING WEIGHT = 3,800# FOR 2 = 1,724 Kg FOR 2
8	2	**SLUDGE THICKENERS.** Lamella gravity settlers with total 5,000 ft² of settling area and designed to accept an inlet liquid flow rate of 1,300 gpm. Each thickener is constructed of mild steel with fiberglass reinforced polyester plates, PVC internals, and flanged inlets and outlets.
		SHIPPING WEIGHT = 40,000# TOTAL = 18,144 Kg
9	2 (ONE SPARE)	**SLURRY PUMPS.** Warren Rupp Sandpiper pump or equal. Each pump is an air operated diaphragm type pump capable of handling solids up to 1" in diameter and designed to pump 100 gpm of 20% (wt) slurry at a specific gravity of 1.30 at 30 psig. Pump is constructed of cast iron with Teflon diaphragm and valves. Pump requires approximately 30 scfm air at 45 psig.
		SHIPPING WEIGHT = 1,800# TOTAL = 816 Kg
10	2	**ROTARY VACUUM FILTERS.** Ametek, Komline-Sanderson, Eimco, or equal, scraper type rotary vacuum filter. Each filter drum is 8' diameter by 8' long and has 200 ft² of filtration surface. Drum and tank are constructed of mild steel with polypropylene filtration decks. Drum drive is 3/4 HP Varidrive and agitator drive is 3/4 HP gear drive. Each filter is sized to process slurry feed at up to 80 gpm and to increase the solids content of the slurry from approximately 16% to approximately 51%.
		SHIPPING WEIGHT = 13,500# EACH = 6,123 Kg EACH

ANDERSEN 2000 INC
306 DIVIDEND DRIVE · PEACHTREE CITY, GEORGIA 30269 USA
(A CROWN ANDERSEN INC COMPANY)

II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
11	2	**FILTER VACUUM PUMP.** Nash, Sihi, or equal, vacuum pump capable of handling 800 scfm at 22" mercury vacuum. Powered by 60 HP, TEFC, 460V, 3Ø, 60 Hz drive motor. Pump is constructed of cast iron. Pump requires 10 gpm of recirculated seal water. **SHIPPING WEIGHT = 580# EACH = 263 Kg EACH**
12	2	**VACUUM RECEIVER.** Mild steel tank with ASME heads, 30" diameter by 60" tall, with two 4" vacuum ports to connect to rotary vacuum filter and one 4" vacuum connection to connect to vacuum pump. Including support legs and the necessary pressure regulation valves. **SHIPPING WEIGHT = 850# EACH = 385 Kg EACH**
13	2	**FILTRATE PUMP.** Self-priming centrifugal pump. Powered by 5 HP, TEFC, 460V, 3Ø, 60 Hz, 1800 rpm drive motor. Pump is designed for a liquid flow rate of 80 gpm at 20 psig discharge head. Pump is equipped with a double mechanical seal. Pump is constructed of cast iron. **SHIPPING WEIGHT = 600# EACH = 272 Kg EACH**
14	2	**FILTRATE HOLDING TANKS.** Each tank is constructed of high density cross-linked polyethylene and is 120" diameter by 142" straight side. Each tank has a capacity of 6,200 gallons and a normal operating capacity of 6,000 gallons. Tank is equipped with a closed top, an access door, and the necessary liquid entrance and exit ports and cleanouts. **SHIPPING WEIGHT = 1,650# EACH = 748 Kg EACH**
15	2 (ONE SPARE)	**FILTRATE RETURN PUMPS.** Centrifugal pump, constructed of cast iron and powered by a 75 HP, TEFC, 460V, 3Ø, 60 Hz drive motor operating at 1800 rpm and directly coupled to the pump. Pump is designed for a liquid flow rate of 1500 gpm at 45 psig on 1.10 specific gravity liquid. Pump is equipped with a double mechanical seal with seal flush water connection. **SHIPPING WEIGHT = 1,100# EACH = 499 Kg EACH**
16	3 EACH	**POLISHING FILTERS.** Bag-type filters with top inlet and bottom outlet and containing one polypropylene filter bag sized for 10 micron capture. Each filter is designed for 1000 gpm of liquid flow rate at an inlet pressure of 15 psig under clean conditions and an inlet pressure of 40 psig under dirty conditions. Filter housing is constructed of mild steel and is built to ASME code specifications. **SHIPPING WEIGHT = 1,400# EACH = 635 Kg EACH**
17	2 (ONE SPARE)	**SEAL FLUSH WATER PACKAGE.** This system consists of a small water storage tank tank, a liquid level makeup control system using plant water, a seal water recirculation pump powered by a 5 HP, TEFC, 460V, 3Ø, 60 Hz drive motor, and capable of circulating up to 100 gpm of seal water to the vacuum pump, the

ANDERSEN 2000 INC
306 DIVIDEND DRIVE · PEACHTREE CITY, GEORGIA 30269 USA
(A CROWN ANDERSEN INC COMPANY)

II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
		centrifugal pumps, and any other water seal location in the plant. Mild steel construction.
		SHIPPING WEIGHT = 1,800# EACH = 816 Kg EACH
18	2	**INGERSOLL-DRESSER, OR EQUAL, AIR COMPRESSOR.** Each compressor has a 25 HP, TEFC, 460V, 3Ø, 60 Hz drive motor operating through belt drive. Unit also includes a 250 gallon ASME National Board tank with pressure switches, reliefs, and all safety features. Each pump is capable of delivering up to 100 scfm at 150 psig.
		SHIPPING WEIGHT = 3,000# TOTAL = 1,360 Kg TOTAL
19	3 EACH	**SCRUBBER LIQUOR TANK.** Tank is 120" diameter by 142" tall with a domed cover, capable of holding 6,200 gallons of waste liquid and operating at 6,000 gallons each under normal maximum fill conditions. Constructed entirely of high density, cross-linked polyethylene for corrosion resistance. Tank includes gasketed access manway at the tank top, a 2" tank vent, a 3" flanged cleanout at the base of the tank, all necessary flanged liquid nozzles for entry and exit from the tank, and all necessary instrumentation ports on the tank wall.
		SHIPPING WEIGHT = 1,650# EACH = 748 Kg EACH
20	2 (ONE SPARE)	**RETURN LIQUOR PUMPS.** Centrifugal pump constructed of cast iron and powered by a 60 HP, TEFC, 460V, 3Ø, 60 Hz drive motor operating at 1800 rpm. Pump is designed for a liquid flow rate of 1500 gpm at 30 psig head on 1.06 specific gravity liquid. Pump is equipped with a double mechanical seal with seal flush water connection.
		SHIPPING WEIGHT = 2,000# TOTAL = 907 Kg TOTAL
21	LOT	**COMPLETE INSTRUMENTATION SYSTEM.** Includes all instruments and GE 9030 PLC controller. Including video monitors and PC data processing systems with automatic sequenced startup and shutdown system.
		SHIPPING WEIGHT = 6,000# = 2,722 Kg
22	LOT	**IEC MOTOR STARTERS.** Including NEMA 4 protected motor starters with circuit breaker protection mounted in control panel. Including motor starters for all 3Ø motors in system.
		SHIPPING WEIGHT = 6,100# = 2,767 Kg
23	LOT	**SKID MOUNTING, PRE-WIRING, PRE-PIPING AND PRE-TESTING SYSTEM TO MAXIMUM POSSIBLE DEGREE IN FACTORY.**

ANDERSEN 2000 INC
306 DIVIDEND DRIVE · PEACHTREE CITY, GEORGIA 30269 USA
(A CROWN ANDERSEN INC COMPANY)

II. EQUIPMENT AND/OR SERVICES QUOTATION - Continued

ITEM NO.	QUANTITY	DESCRIPTION
24	LOT	**ELECTRICAL WIRING OF ENTIRE SCRUBBING SYSTEM.** Includes conduit, wire, conduit fittings, labor, and testing of all electrical connections from the control system and instrumentation systems to the various motors and instruments in the plant.
		SHIPPING WEIGHT OF MATERIALS = 4,000# = 1,814 Kg
25	LOT	**SKIDS AND STRUCTURAL SUPPORTS.** Mild steel with primer and epoxy finish coat for all vessels and equipment. Includes OSHA ladders and platforms as required. See Drawings P8229-3 through - 5.
		SHIPPING WEIGHT = 31,000# = 14,061 Kg
26	LOT	**DESIGN ENGINEERING FOR ENTIRE SYSTEM.**
27	LOT	**SURFACE PREPARATION AND PAINTING OF ALL EQUIPMENT IN THE PLANT.**
28	LOT	**FREIGHT AND INSURANCE TO FOR ITEMS 1 - 27 ABOVE.**
		TOTAL REGENERATION SYSTEM PRICE = $4,680,000

TOTAL FOR SCRUBBERS, SODA ASH SYSTEM AND REGENERATION SYSTEM = $5,544,800

TABLE 1 - I.D. FAN SOUND DATA FOR HS-150 SCRUBBER

MODEL	: 7-BIS-IV	INLET ACFM	: 51240.
NUMBER OF BLADES	: 12	RPM	: 1820.
BLADE TYPE	: BACKWARD CURVED	SP (INCHES H20)	: 17.0
WHEEL DIA (IN)	: 44.500	HOUSING THICKNESS	: 0.3750
CAPACITY	: 0.9915	HOUSING MATERIAL	: RUBBER LINED STEEL

	OCTAVE BAND LEVELS								
BAND NUMBER	1	2	3	4	5	6	7	8	DBA
MID FREQUENCY-HZ	63	125	250	500	1000	2000	4000	8000	

Estimated sound power level generated at acoustic center of fan. This is noise yhich can be expected from inlet and discharge openings within 100 feet of fan.

107. 107. 106. 107. 103. 98. 90. 82. 108.

Estimated sound pressure level in near field after attenuation by 0.3750 inch thick housing.
with sound attenuating enclosure

87. 81. 76. 75. 66. 59. 45. 34. 75.

Estimated sound pressure level at 3 feet from near field in air.
(Ducted inlet and outlet.)

81. 75. 70. 69. 60. 53. 39. 28. 69.

Estimated sound pressure level at 5 feet from near field in air.
(Ducted inlet and outlet.)

77. 71. 66. 65. 56. 49. 35. 23. 64.

Near field radius is approximately 3 feet and is centered on fan wheel center.

The near field is a hemispherical area around the fan where sound waves from various sources tend to interfere with each other. The boundary is related to the wavelength of the lowest frequency and to the overall size of the source.

NOTE: ALL SOUND POWER LEVELS ARE DECIBELS REFERRED TO 10-12 WATT.
ALL SOUND PRESSURE LEVELS ARE DECIBELS REFERRED TO 2x10-4 MICROBAR.

IMPORTANT - INTERPRETATION OF SOUND DATA

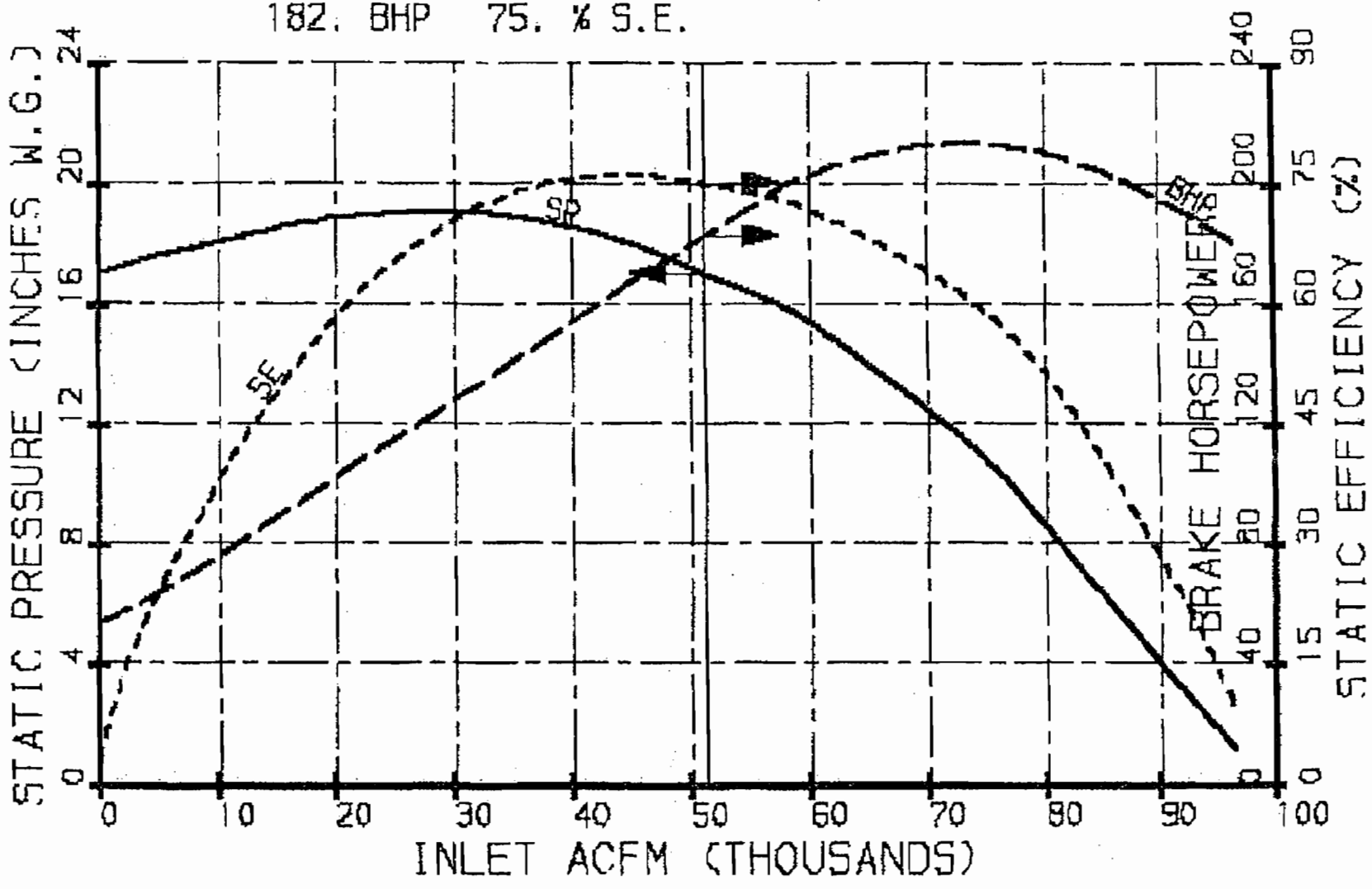
Data are for use by an acoustical engineer to evaluate the fan and the system in which the fan is installed. There are many varibles which can affect sound pressure levels. The acoustical engineer must take all of these variables into consideration when designing a 'quiet' system. Note that outside the near field boundary in air, if there are no obstructions, sound pressure levels decay 6 DB for each doubling of distance. All sound power and sound pressure levels listed above exclude motors or other auxillary equipment.

FIGURE 1, I.D. FAN FOR
ACID GAS SCRUBBING SYS.
FOR

DESIGN 51240. ACFM
17.0 IN. W.G. S.P.
182. BHP 75. % S.E.

ANDERSEN 2000 INC.

MODEL 7-BIS-IV (99%)
ARR.#9, CCW, BAU, 1820 RPM
0.0562 #/FT³ INLET DENSITY



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ANDERSEN 2000 INC.
306 DIVIDEND DRIVE • PEACHTREE CITY, GEORGIA 30269 USA
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STANDARD CONDITIONS OF SALE

1. **PURCHASE AND SALE.** Upon acceptance of the equipment and/or services sale proposal and quotation (the "Proposal and Quotation") of which these Standard Conditions of Sale are made a part by the Buyer (as identified on the Equipment and/or Services Quotation page), Andersen 2000 Inc. (the "Seller") shall sell and Buyer shall purchase all of the equipment (hereinafter collectively called the "Equipment") described in the Proposal and Quotation for the sale price specified therein in accordance with all of the terms and conditions hereinafter set forth, as well as with all of the other provisions of the Proposal and Quotation. Except where the context requires otherwise, the terms "herein," "hereof," "hereunder," and other words of similar import refer to the Proposal and Quotation as a whole, and not to any particular article, section, paragraph, clause, attachment or other subdivision thereof.

2. **SALE PRICE AND PAYMENT TERMS.** The sale price of the Equipment specified in the Proposal and Quotation does not include any applicable sales, use, excise or other similar taxes imposed by any federal, state, local or other taxing jurisdiction. If any such taxes are imposed with respect to the sale of the Equipment, Buyer shall pay the same. Seller may require that Buyer pay such taxes directly or, in the alternative, Seller may pay the taxes due on behalf of Buyer and obtain reimbursement from Buyer immediately upon Seller's demand. The terms of payment of the sale price of the Equipment are as set forth on the Equipment and/or Services Quotation page. All payments must be made to Seller promptly when due at its Home Office address indicated in the Proposal and Quotation.

3. **DELIVERY AND RISK OF LOSS.** Any delivery made within 30 days after the end of the respective delivery times specified on the Equipment and/or Services Quotation page is to be deemed to be timely. Subject to the Force Majeure provisions of paragraph 9 below, if Seller fails timely to deliver any of the Equipment, Buyer may cancel that portion of the Equipment which has been delayed, such right of cancellation being Buyer's sole remedy for Seller's failure or delay in making delivery. Risk of loss and damage to the Equipment will automatically be transferred and will pass from Seller to Buyer upon delivery or tender of the Equipment at the F.O.B. place of delivery specified on the Equipment and/or Services Quotation page. Except to the extent provided to the contrary in paragraph 9 below, no loss, destruction or other material damage to the Equipment will relieve the party bearing the risk of loss and damage from fully performing its obligations hereunder.

4. **INVOICES.** The Equipment may be delivered, at the discretion of the Seller, in several lots under separate invoices. In such event, Buyer shall promptly pay the proportionate amount of the total sale price of the Equipment represented by each lot indicated in the invoice furnished by Seller respecting such lot.

5. **SECURITY INTEREST.** As security for the full and prompt payment of the sale price of the Equipment, as well as of all other amounts now or hereafter owing by Buyer to Seller of whatever nature, Buyer grants to Seller a present and continuing first priority, purchase money security interest in the Equipment. If Buyer fails promptly to pay, when due, any amount payable hereunder, then Seller may, without any notice or demand of any kind and notwithstanding any other provisions or agreements to the contrary, declare all amounts when owing by Buyer to Seller to be due and payable, whereupon the same will immediately become due and payable; and Seller may exercise from time to time all rights and remedies available to it hereunder or available under applicable law or in equity. Buyer shall pay all costs and expenses incurred by Seller in collecting any amount owing by Buyer to Seller (including, but not limited to, reasonable attorney's fees, if collected by or through an attorney at law).

6. **WARRANTIES.**

(A) Limited Warranty of Equipment Manufactured by Seller. Subject to the limitations hereinafter set forth, Seller warrants to Buyer that all items of the Equipment manufactured by Seller will be free from defects in material and workmanship under normal use and service for a period of 18 months after the date of delivery or tender of the Equipment to Buyer, or 12 months after the date that the Equipment is ready for commencement of initial operation by Buyer, whichever occurs first; provided, however, that (i) the Equipment must at all times have been operated in accordance with Seller's operating instructions and in accordance with the conditions for which the same are designed and (ii) no alterations or substitutions have been made in the Equipment. Further, and without limiting the foregoing, the limited warranty herein given by Seller will be rendered void by the improper erection of the Equipment by parties other than Seller or by damage to the Equipment after transfer and passage of the risk of loss from Seller to Buyer (including, but not limited to, damage caused by abrasion, corrosion, excess temperature or improper use). Buyer shall make all claims of any nature whatsoever for breach of the foregoing limited warranty, regardless of whether a defect is patent or latent, by written notice to Seller within 10 days after Buyer discovers such defect, setting forth in detail the nature of defect. Buyer's right to make claims for breach of said limited warranty will terminate upon the expiration of such notice period, and all claims for defects will thereafter be barred. Upon Buyer's making a satisfactory written proof of claim with Seller, Seller may fully discharge its obligations under this limited warranty by making any necessary repairs or, at Seller's option, supplying replacement parts within a reasonable period of time thereafter, all at Seller's expense. No payment or allowance will be made for labor costs, parts or other charges of Buyer or of third parties for making repairs or replacements, nor will Seller accept Equipment returned for credit, unless written authorization is obtained in advance from Seller.

(B) Limited Patent Warranty Respecting Equipment Manufactured by Seller. Seller shall defend, at its expense, any suit or proceeding brought against Buyer which asserts any claim that any Equipment manufactured by Seller infringes any United States patent which was issued as of the date of the Proposal and Quotation, and Seller shall pay any damages and costs awarded therein against Buyer up

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ANDERSEN 2000 INC.
306 DIVIDEND DRIVE • PEACHTREE CITY, GEORGIA 30269 USA
(A CROWN ANDERSEN INC. COMPANY)

STANDARD CONDITIONS OF SALE (continued)

to, but not to exceed, the aggregate amount of the sale price of the infringing Equipment theretofore paid by Buyer to Seller; provided, however, Buyer must give Seller written notice of any such claim within 10 days after Buyer is notified thereof; and provided further that Buyer must thereafter fully cooperate with Seller and give Seller all authority, information and assistance as Buyer is able to give in order to allow Seller to conduct such defense effectively and efficiently. If the use of any of the Equipment is enjoined as a result of any such suit, Seller shall, at its option and at its expense, procure for Buyer the right to use such Equipment, or modify the infringing Equipment so that it no longer infringes any United States patent, or replace the infringing Equipment with non-infringing Equipment, or refund the portion of the sale price attributable to the infringing Equipment.

© Equipment Not Manufactured by Seller. All Equipment which is not manufactured by Seller is sold AS-IS and carries only such warranties as are given by the manufacturer thereof (if any), which warranties (if any) are, to the extent permitted by their terms, hereby assigned by Seller to Buyer without recourse against Seller.

7. LIMITATION OF WARRANTIES, REMEDIES AND OBLIGATIONS. EXCEPT AS OTHERWISE EXPRESSLY PROVIDED HEREIN, THE EQUIPMENT IS BEING SOLD AS-IS, AND SELLER MAKES NO WARRANTIES OF ANY NATURE WHATSOEVER WITH RESPECT TO THE EQUIPMENT, ORAL OR WRITTEN, EXPRESS OR IMPLIED (INCLUDING, BUT NOT LIMITED TO, THOSE OF MERCHANTABILITY AND FITNESS OF USE FOR A PARTICULAR PURPOSE); AND SELLER HEREBY DISCLAIMS ANY WARRANTY NOT EXPRESSLY SET FORTH HEREIN. SELLER'S ONLY OBLIGATIONS FOR BREACH OF WARRANTY ARE AS SET FORTH HEREIN. SELLER WILL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE ARISING IN CONNECTION WITH THE EQUIPMENT, OR IN CONNECTION WITH SELLER'S PERFORMANCE OR BREACH OF ITS OBLIGATIONS HEREUNDER, REGARDLESS OF WHETHER BASED IN CONTRACT OR IN TORT, (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, PLANT DOWN TIME, LOSS OF USE OF THE EQUIPMENT, AND CLAIMS, SUITS AND DAMAGES OF THIRD PERSONS, EXCEPT FOR U.S. PATENT INFRINGEMENT CLAIMS TO THE EXTENT PROVIDED IN CLAUSE (B) OF PARAGRAPH 6 ABOVE). IN NO EVENT WILL SELLER'S LIABILITY FOR PERFORMANCE OR BREACH OF ANY OF ITS OBLIGATIONS HEREUNDER EXCEED THE AMOUNT OF THE SALE PRICE THERETOFORE PAID BY BUYER TO SELLER. SELLER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION OR LIABILITY OF ANY NATURE WHATSOEVER OR TO MAKE ANY ADDITIONAL REPRESENTATION OR WARRANTY NOT HEREIN CONTAINED RESPECTING THE EQUIPMENT OR SELLER'S OBLIGATIONS. By way of illustration, and not in limitation of the foregoing, no communication, representation or statement made by any sales agent or representative of Seller respecting the performance or operation of the Equipment, or otherwise, is binding upon Seller (the sole and exclusive warranties, representations and obligations of Seller being set forth herein). Further, Seller makes no representation or warranty that the Equipment complies with, or that it will perform or operate in accordance with, the requirements of any law, code, statute, regulation, rule or ordinance of any federal, state, local or other governmental authority (including, but not limited to, any pollution control agency). Seller neither undertakes nor has any obligation to obtain permits, licenses or approvals from any such governmental authority or agency concerning the Equipment or concerning the installation, operation or use thereof. Only such safety devices as are specified in the Proposal and Quotation will be furnished by Seller to Buyer. Buyer shall, at its expense, obtain and install all other safety devices required or desirable due to the nature of the Equipment or due to Buyer's operation of the Equipment. Seller hereby disclaims, and Buyer hereby releases Seller from, all liability arising out of the improper use of the Equipment or from the absence of proper safety devices respecting the Equipment. In no event will Seller be liable for any claim, loss, damage or expense arising out of the sole or contributory negligence of Buyer, its employees, agents, engineers, architects, or other contractors, and Buyer shall indemnify, defend and save Seller harmless therefrom (including, but not limited to, payment of Seller's reasonable attorneys' fees).

8. PERFORMANCE LEVELS GUARANTY AND ACCEPTANCE TESTS. In the event that the Equipment and/or Services Quotation page specifies that the provisions of the Performance Levels Guaranty and Acceptance Tests are applicable and the same are included as a part of the Proposal and Quotation, but only in such event, then Seller shall perform all of the additional obligations set forth therein. If the provisions of the Performance Levels Guaranty and Acceptance Tests are applicable, then wherever possible the provisions of these Standard Conditions of Sale are to be construed so as to be consistent with the provisions thereof; but in the event of any irreconcilable inconsistencies, the provisions of the Performance Levels Guaranty and Acceptance Tests will always prevail, govern and control.

9. FORCE MAJEURE RESPECTING DELIVERIES BY SELLER. All deliveries by Seller are contingent upon Seller's receiving necessary materials, parts, and components for its manufacture, assembly or supply of the Equipment to Buyer; and Seller's deliveries to Buyer may be delayed, reduced or cancelled to the extent affected by delay, reduction or cancellation of shipments thereof from Seller's suppliers. Seller will not be liable for any default, delay, reduction or failure in delivery attributable thereto or attributable to strikes, lock-outs, disputes or disagreements resulting in labor stoppages, plant shutdowns or slowdowns at the facilities of Seller or elsewhere, government regulations, embargo, lack or failure of shipping facilities, military service, war, delays by carriers, casualties, fires, earthquakes, floods, storms, explosions, epidemics, civil commotion or disturbances, acts of God or any other causes or conditions, whether similar or dissimilar to those enumerated, beyond the reasonable control and without the negligence of the Seller. In such circumstances, the time for delivery by Seller will automatically be extended for the period of time Seller is delayed as a result thereof.

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ANDERSEN 2000 INC.
306 DIVIDEND DRIVE - PEACHTREE CITY, GEORGIA 30269 USA
(A CROWN ANDERSEN INC COMPANY)

STANDARD CONDITIONS OF SALE (continued)

10. MISCELLANEOUS. All rights and remedies of Seller, whether provided for herein, or conferred by law, or in equity, or by statute, or otherwise are cumulative and not alternative, and can be enforced successively or concurrently. This Agreement cannot be amended except by a subsequent writing signed by Seller. Seller will not be deemed to have waived any of its rights or remedies hereunder unless such waiver is in writing and signed by Seller. No delay or omission by Seller in exercising any of its rights or remedies is to be deemed to be a waiver thereof, and a waiver in writing on one occasion will be effective only in that specific instance and only for the precise purpose for which given. All communications hereunder must be in writing and are to be deemed to have been duly given and to be effective upon delivery to the party to whom directed. Communications that are sent by U.S. mail, first class, certified, return receipt requested, postage prepaid, are to be deemed to have been delivered 3 days after being so posted. None of Buyer's obligations hereunder may be assigned or delegated without the prior written consent of Seller. All of the provisions hereof will be binding upon and will inure to the benefit of both parties, and their respective successors and permitted assigns. Each of the provisions hereof is severable from each of the others; and if any provision hereof is prohibited or unenforceable under applicable law, such provision will be ineffective only to the extent of such prohibition or unenforceability without invalidating the remainder thereof or the remaining provisions hereof. The captions herein are for convenience of reference only and are not to be used in construing the provisions hereof. The Proposal and Quotation is made, and the contract contemplated hereby is to be substantially performed, in the State of Georgia, and all of the provisions hereof are in all respects (including, but not limited to, all matters of construction, interpretation, validity, enforcement, performance and the consequences of breach) to be construed in accordance with and governed by the internal laws (excluding all conflict of law rules) of that State (including, but not limited to, the Uniform Commercial Code of Georgia), as from time to time amended and in effect, and the applicable internal federal laws of the United States of America, as from time to time amended and in effect.

III. DESIGN SPECIFICATIONS AND ASSUMPTIONS

Andersen 2000 Inc. has built acid gas scrubbing systems throughout the world on various industrial and utility applications. The company is the largest supplier of packaged sulfur dioxide and HF scrubbing systems in the world, primarily for industrial plants. Based on this experience, and on the basis of data given to Andersen for this application, we have developed the following specifications for this scrubbing system.

1. Scrubber Inlet Gas Temperature = 400°C

2. Exhaust Gas From The Kiln At Maximum Gas Flow =

   63,129 acfm @ 400°F and -7" H_2O at 700' above sea level

3. Gas Composition Assumed For These Calculations:

Particulate	= 126 #/hr
O_2	= 7,138.78 #/hr
N_2	= 100,986.59 #/hr
CO_2	= 30,523.41 #/hr
H_2O	= 20,615.79 #/hr
SO_2	= 1,703.2 #/hr
HF	= 1,734.4 #/hr
HCl	= 12.64#/hr

4. SO_2 Removal Efficiency = 95%
   HF Removal Efficiency = 99%
   HCl Removal Efficiency = 99%

5. Particulate removal efficiency will be about 25% based on typical size distribution for the kiln dust.

6. Total scrubber differential pressure is 10" (254 mm) W.G.

7. Makeup Water Assumed to Scrubber:

   MAKEUP WATER ANALYSIS (UNFILTERED & UNSOFTENED)

pH	=	7.0
Chlorides (Cl)	=	50 ppm (wt)
Temperature	=	70°F

8. Motive force for exhaust gas through scrubber will be supplied by system I.D. fan quoted.

9. We have assumed use of soda ash (sodium carbonate) solution as the sodium makeup source and pebble lime as the reactant in the double alkali system.

IV. PROCESS DESCRIPTION

A. Scrubbing System

The process flow sheet and material balance drawing is included as Drawing P8229-1. Using this drawing, the Andersen acid gas removal process can be described as follows:

Inlet gas is introduced to a quench inlet section preceding the absorption section. Scrubbing liquid is introduced to this quench section to insure that the gas has been saturated. A damper is incorporated into the quench section to allow control of exhaust pressure from the kiln. The gas is quenched with an aqueous scrubbing solution containing sodium fluoride, sodium chloride, sodium hydroxide, sodium sulfite, sodium bisulfite and sodium sulfate. The exhaust gas from the inlet section enters a spray-baffle-type vertical gas scrubber where entrained liquor is removed, and where the gas contacts fresh scrubbing liquor for additional acid gas absorption. The gas encounters six baffles in passing through the absorber unit and then exits through a chevron type mist separator to the stack. Scrubbing liquor to the inlet section and to the spray-baffle-type absorption chamber is supplied from a stud mounted recirculation tank and pump. This same pump also provides for a bleed liquor stream, which must be taken to regeneration. Combined inlet section scrubbing liquor and spray-baffle-type gas absorber scrubber liquor are discharged by gravity back into the recirculation tank. Soda ash (30% wt) is supplied to the recirculation tank as necessary to maintain a reasonable concentration of sodium sulfite and sodium bisulfite in the scrubbing loop after regeneration.

The scrubbing liquor is maintained at a pH of between 6.3 and 7.0 at optimum conditions. At this pH, and at the concentration of sodium sulfite, sodium sulfate and sodium bisulfite indicated in Drawing P8229-1, the scrubbing solution is highly buffered against substantial pH change. As a result, larger variations in inlet sulfur dioxide concentration can be tolerated with very little effect on outlet sulfur dioxide concentration. The sodium sulfite-bisulfite buffer system is highly resistant to pH change. In addition, because the system operates in an acidic condition at all times, calcium scale formation, from calcium contained in the makeup water, is eliminated. In addition, at this pH, CO_2 absorption is minimal and the carbonate-bicarbonate absorption reactions do not take place.

Chemical utilization is essentially 100%. The soda ash reacts with dissolved sulfur dioxide, HF and HCl to form sodium sulfite, sodium chloride and sodium fluoride. If additional sulfur dioxide is then absorbed, it reacts with the sodium sulfite to form the more acidic sodium bisulfite. In addition, oxygen dissolved in the scrubbing solution reacts with the sodium sulfite to oxidize it to sodium sulfate. A small amount of the sulfur dioxide is ultimately converted to sodium sulfate by this oxidation reaction. A bleed stream is taken from the scrubbing system to regeneration to maintain a relatively constant sodium sulfite, sulfate, and bisulfite concentration.

The concentrations of sulfite, sulfate and bisulfite in the scrubbing solution were selected to give a dissolved solids content which would prevent any substantial pH fluctuation during normal operation, but which would not create problems with chemical salt formation during cold operating conditions. If the concentrations of these chemical components are increased, cold weather will sometimes precipitate salts, and these will plug up some of the piping in the system. If the system is operated with more dilute scrubbing liquor, a higher bleed rate is required to get rid of the absorbed sulfur dioxide, and the system is less well buffered against pH changes. In addition, at the concentrations selected for this application, the inventory of scrubbing liquor in the recirculation tank is sufficient to continue to absorb sulfur dioxide for at least one hour, even if no soda ash or regenerated liquid is fed to the system.

The scrubber piping and instrumentation system is discussed below:

Gas from the kiln first enters the quench section. At the inlet to this section, temperature indicators are used to indicate temperature of the incoming gas stream. A pressure switch is also mounted on each inlet gas duct to operate in the event of scrubber pluggage, initiating a bypass of the scrubbing system, and also activating an alarm on the control panel. A differential pressure indicator is included in the PLC in the control panel to monitor the differential pressure across the entire scrubbing system. In addition, a differential pressure indictor is provided to monitor inlet pressure to the scrubber. The quench section requires a very low differential pressure. Total differential pressure across the scrubber is 10" W.G. Approximately 1.5" W.G. of this differential pressure occurs across the mist eliminator.

Scrubbing liquor is supplied to the inlet section and the baffle scrubber by a centrifugal pump. The quench liquor is fed through a single pipe and multiple nozzles into the quench section. Multiple liquid nozzles are used to introduce the liquid into the absorber section. Manual control valves are installed on each of the main lines feeding the individual nozzles. In addition, a pressure switch is installed on the feed pump discharge and is actuated if the liquid pressure drops to a predetermined low set point. This switch activates a low pressure alarm to warn of impending pump failure, and is connected to the backup pump system. A pressure indicator is also mounted on each pump discharge line to give local pressure readings.

A rotameter is provided on the blowdown from the scrubbing system to monitor blowdown rate to regeneration. This flow is automatically controlled by a density control system. The necessary check valves and isolation valves are included.

Scrubbing liquor for the spray-baffle-type scrubber and the quench section is supplied through a vortex-shedding flowmeter to the various nozzles at the use points. The recirculation tank maintains adequate scrubber inventory for the feed pump. The scrubbing liquor returned from the scrubber is discharged by gravity into this tank. A water makeup line is connected to this tank to make up for evaporative losses and for the liquor which is lost to the bleed stream. The water makeup line is connected to a float actuated diaphragm valve, which is pilot operated, and which is used to maintain level in the tank. In the event the water makeup to the system fails, the recirculation pump would ultimately run out of liquor to supply to the scrubbing system, and both the pressure switch and the temperature switch in the scrubber discharge would actuate an alarm and could actuate the steam boiler shutdown system. As additional protection, a low tank level switch is provided with a level alarm which is connected to the bypass sequencer. Temperature and pressure indicators are provided on the scrubber gas discharge.

A bypass liquid stream is taken from the spray-baffle-type scrubber recirculation line through a pH monitoring cell. The flow to the pH monitoring cell is directed through a rotameter with a manual valve so that flow can be adjusted by the operator of the equipment on an occasional basis. The pH cell produces a signal which is transmitted by a pH transmitter to the pH controller on the control panel. This controller is a proportional controller which controls a variable speed controller on the soda ash feed pump. This controller meters soda ash into the recirculation tank to maintain proper pH. Should the soda ash supply fail, a low pH alarm will sound, and this alarm is connected to the shutdown system. In addition, a high pH alarm is provided to alarm in the event of pH controller failure. This is also connected into the shutdown sequencer. A pressure gauge is provided in the soda ash feed line for local pressure readings. A temperature indicator is also provided to give local temperature readings.

B. Liquid Regeneration System

The regeneration system has been designed to operate unattended 24 hours/day 365 days/year. The system is equipped with automatic startup and shutdown sequencers to handle variations in liquid flow rates from the scrubbing system. The regeneration system is designed to operate on a constant liquid flow rate so that it is simply shut off when inadequate liquid is available to be processed, and it is turned back on when sufficient inventory of liquid is available. The system is skid mounted, pre-piped, pre-wired, and fully instrumented to the maximum extent possible prior to shipment to the job site from Andersen's plant. It is then reassembled on the foundation provided by the customer, piping spools are connected and the system is started up. The chemical reactions which take place in the system are discussed in Section 1 of this proposal.

Drawing P8229-1 shows the flowsheet and material balance for this plant. Drawings P8229-3 through -5 show the Model 5000 liquid waste regeneration system.

Liquid is pumped from the scrubbing system to the holding tanks preceding the regeneration system. These tanks are constructed of corrosion resistant materials and hold sufficient waste liquid to operate the regeneration system on a relatively continuous basis. Liquid is pumped from these tanks at a constant rate to the lime reactor. In the lime reactor, pebble lime is introduced to a draft-tube type reactor where a turbine-type agitator is used to force the pebble lime to mix with the scrubbing solution and react with it. The chemical reaction is exothermic, elevating the temperature of the liquid in the tank and maintaining an elevated temperature for operating conditions. The reacted liquid overflows from this reactor by gravity into a Lamella type gravity settler. Here the solid material separates from the liquid and concentrates in the bottom of the settler. Clear liquid overflows from the top of the settler and is routed to a storage tank. A slurry containing approximately 16% (wt) solids is taken off the bottom of the settler and pumped, using an air operated diaphragm pump, into a rotary drum vacuum filter. The rotary vacuum filter separates the solids away from the bulk of the carrier liquid. The solids are then discharged, using

a scraper blade, down a chute into a storage hopper, which is provided by the customer. Vacuum across the rotary vacuum filter is provided by a water sealed vacuum pump mounted adjacent to the filter. A vacuum receiver is used to separate the liquid in the vacuum line from the air. The vacuum pump discharges through a silencer to minimize noise and to also remove any residual water and any seal flush water which is fed to the pump. An automatic seal-flush water package is provided with this system to provide for the necessary seal-flush water to the vacuum pump and to other centrifugal pumps in the system. A filtrate pump draws the filtered liquid from the vacuum receiver and pumps it into a storage tank. This is the same storage tank that the thickener overflows into. A high pressure pump then draws this liquid from the holding tank, forces it through polishing filters to remove any residual lime compounds which might still be present, and then delivers the liquid to additional storage tanks.

Solids feed is accomplished by storage in a large silo adjacent to the chemical reactor. The storage silo is equipped with a live bin bottom and a vibrator to feed into a screw conveyor and a screw lift which feed the pebble lime into an interim storage bin above a vibrating screw conveyor. The vibrating screw conveyor speed is controlled by a pH controller in the lime reactor. The equipment is described in the drawings referenced above.

The instrumentation system can be described as follows:

A liquid level switch is installed in the storage tank about two-thirds of the way up the wall. When the liquid level exceeds this level switch height, an automatic start sequence is initiated for all of the equipment in the system. The filtration system is first started, followed by the system feed pump. In this fashion, all of the processing equipment is brought up to speed before a surge of fresh scrubbing liquid for regeneration enters the system. Flow into the lime reactor is monitored by a vortex-shedding flowmeter. Temperature in the reactor is monitored by a thermocouple and temperature readout. The lime reactor agitator is left on at all times to prevent solids deposition in the bottom of the tank, even when scrubbing liquid is not being fed to the system. Because the lime reactor operates on an overflow basis, it always contains liquid, even if scrubbing liquid is not being fed to the system. A pH monitor is installed in a well in the overflow pipe from the lime reactor. This pH monitor transmits its signal to a pH controller mounted in the control panel. The pH is set at approximately 9 to insure complete neutralization of all bisulfite in the scrubbing system. The pH controller sends a 4-20 ma signal to a speed controller on an AC drive motor on a vibrating rotary screw conveyor. This conveyor feeds pebble lime into the lime reactor at a rate determined by the pH controller. Above this vibrating screw feeder, an interim storage tank is provided with both low and high level switches. When the low level switch is reached, indicating the lime supply is being depleted, a screw conveyor and screw lift in a live bottom bin on the storage silo are automatically turned on to feed pebble lime into the interim storage bin until the high level switch is actuated. When the high level switch is actuated, the conveyors are turned off.

The regenerated scrubbing liquid, before filtration, is fed to a thickener where the solids are separated from the bulk of the liquid. A thick slurry underflow is taken from the thickener through an air operated diaphragm pump into the rotary vacuum filter. The feed rate of this thickener underflow liquid is determined by the liquid level in the rotary vacuum filter tank. Pump stroke frequency is controlled by air pressure to the pump, based on the level controller in the rotary vacuum filter tank.

After the liquid has been filtered, the clear liquid is taken to a vacuum receiver where the liquid is separated from the air. The air is exhausted by a vacuum pump to a silencer. Seal water is provided to the vacuum pump from a small seal water package. The liquid is drawn from the vacuum receiver by a self-priming centrifugal pump and is transmitted to an additional storage tank where the clear liquid is stored for transmission back to the scrubbing system. A level controller in the storage tank transmits its signal to a control valve on the discharge of a high pressure pump which draws liquid from this tank, pumps it through the polishing filters and delivers it to the scrubbing system. This level control system maintains essentially constant liquid level in the storage tank. The liquid is then sent to a larger capacity holding tank before being fed back to the scrubbing system. All automatic systems in the instrumentation circuit are equipped with selector switches, allowing manual operation. In addition, all critical alarm points also actuate the automatic shutdown sequencing.

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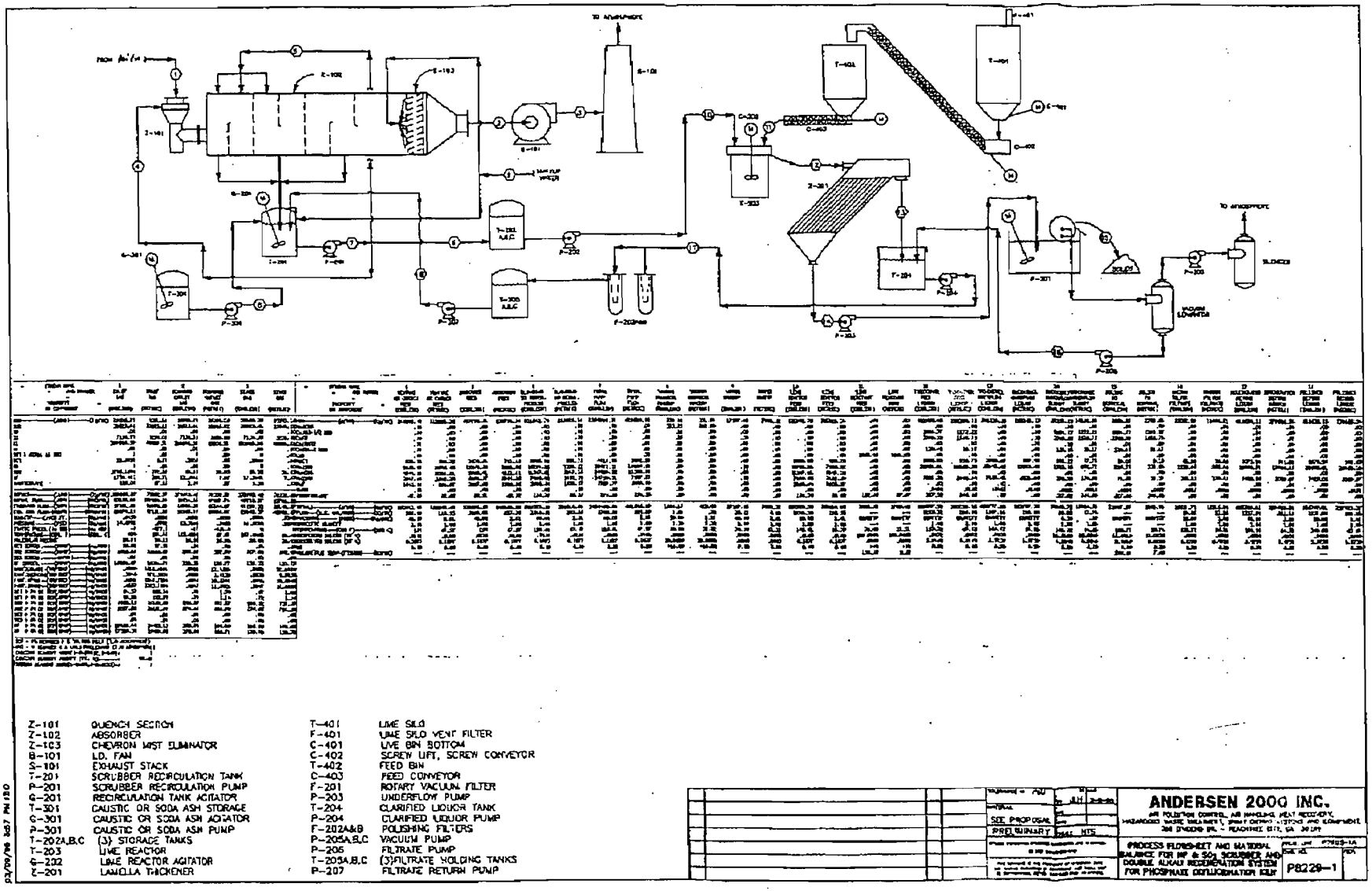
Jul-15-98 02:00P CROWN ANDERSEN INC-USA 770-631-0730 P.12



Z-101	QUENCH SECTION	T-401	LIME SILO
Z-102	ABSORBER	F-401	LIME SILO VENT FILTER
Z-103	CHEVRON MIST ELIMINATOR	C-401	LIME BIN BOTTOM
B-101	I.D. FAN	C-402	SCREW LIFT, SCREW CONVEYOR
S-101	EXHAUST STACK	T-402	FEED BIN
T-201	SCRUBBER RECIRCULATION TANK	C-403	FEED CONVEYOR
P-201	SCRUBBER RECIRCULATION PUMP	F-201	ROTARY VACUUM FILTER
G-201	RECIRCULATION TANK AGITATOR	P-203	UNDERFLOW PUMP
T-301	CAUSTIC OR SODA ASH STORAGE	T-204	CLARIFIED LIQUOR TANK
G-301	CAUSTIC OR SODA ASH AGITATOR	P-204	CLARIFIED LIQUOR PUMP
P-301	CAUSTIC OR SODA ASH PUMP	F-202A&B	POLISHING FILTERS
T-202A,B,C	(3) STORAGE TANKS	P-205A,B,C	VACUUM PUMP
T-203	LIME REACTOR	P-205	FILTRATE PUMP
G-202	LIME REACTOR AGITATOR	T-205A,B,C	(3)FILTRATE HOLDING TANKS
Z-201	LAMELLA THICKENER	P-207	FILTRATE RETURN PUMP

SEE PROPOSAL	
PRELIMINARY	

ANDERSEN 2000 INC.

AIR POLLUTION CONTROL, AIR HANDLING, HEAT RECOVERY, HAZARDOUS WASTE TREATMENT, SPRAY DRYING, INCINERATORS AND EQUIPMENT
300 SYNDER DR. - READYRIC CITY, GA 30129

PROCESS FLOWSHEET AND MATERIAL BALANCE FOR HF & SO_2 SCRUBBER AND DOUBLE ALKALI REGENERATION SYSTEM FOR PHOSPHATE DEFLUORINATION KILN

P8229-1

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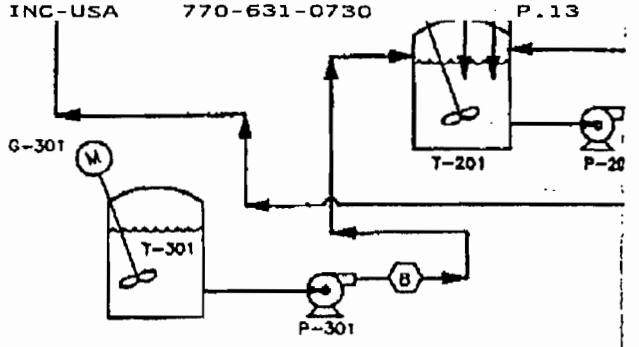

STREAM NAME AND NUMBER / PROPERTY OR COMPONENT	1 INLET GAS (ENGLISH)	INLET GAS (METRIC)	2 SCRUBBER OUTLET GAS (ENGLISH)	SCRUBBER OUTLET GAS (METRIC)	3 STACK GAS (ENGLISH)	STACK GAS (METRIC)
H2O (#/HR) (Kg/HR)	20615.79	9351.12	33940.74	15395.18	33940.74	15395.18
CO2	30523.41	13845.12	30523.41	13845.12	30523.41	13845.12
CO	.00	.00	.00	.00	.00	.00
O2	7138.78	3238.08	7138.78	3238.08	7138.78	3238.08
N2	100986.59	45806.51	100986.59	45806.51	100986.59	45806.51
AR	.00	.00	.00	.00	.00	.00
SO3 & MESO4 AS SO3	0	.00	0	.00	0	.00
HCl	12.6439	5.74	.1264	.06	.1264	.06
NO	0	.00	.00	.00	0	.00
SO2	1703.1998	772.55	85.16	38.63	85.16	38.63
HF	1734.611	786.71	17.3441	7.87	17.3441	7.87
PARTICULATE	126.00	57.15	1.26	.57	1.26	.57
TOTALS (#/HR) (Kg/HR)	162840.83	73862.57	172693.42	78332.01	172693.42	78332.01
ACTUAL FLOW (ACFM) (M3/HR)	63129.06	107268.89	51234.55	87057.74	49310.67	83788.52
STANDARD FLOW (SCFM) (NM3/HR)	37261.66	64776.64	41296.35	65140.67	41296.35	65140.67
STD. DRY FLOW (SDCFM (NM3D/HR)	29879.14	47131.36	29142.17	45968.67	29142.17	45968.67
DENSITY (#/CU.FT.) (Kg/M3)	.0430	.6886	.0562	.8998	.0584	.9349
PRESSURE (PSIA) (Kg/Cm2)	14.0752	.9702	13.7140	.9453	14.3280	.9876
STATIC PRESS.(In H2O) (mm H2O)	-7	-177.8	-17	-431.8	0	0
TEMPERATURE (DEG. F) (DEG. C)	400	204.46	153.6095	67.57	157.0095	69.46
MOLECULAR WEIGHT	28.15	28.15	26.95	26.95	26.95	26.95
HCl CONCEN. (PPMV) (mg/NM3)	59.92	97.58	.54	.88	.54	.88
SO2 CONCEN. (PPMV) (mg/NM3)	4603.41	13143.93	207.68	592.99	207.68	592.99
SO3 CONCEN. (PPMV) (mg/NM3)	.00	.00	.00	.00	.00	.00
HF CONCEN. (PPMV) (mg/NM3)	18000.87	13384.79	135.35	120.77	135.35	120.77
PARTICULATE (GR/SDCF (mg/NM3D)	.4920	1212.6181	.0050	12.4328	.0050	12.4328
PART.@12%CO2 (GR/SDCF (mg/NM3D)	.3945	972.3808	.0039	9.7238	.0039	9.7238
PART.@7%O2 (GR/SDCF (mg/NM3D)	.4251	1047.7264	.0044	10.8241	.0044	10.8241
PART.@6%O2 (GR/SDCF (mg/NM3D)	.4557	1123.1024	.0047	11.6028	.0047	11.6028
HCl @ 7% O2 DRY (PPMV (mg/NM3D)	84.57	165.14	.67	1.09	.67	1.09
HCl @ 6% O2 DRY (PPMV (mg/NM3D)	89.21	112.79	.72	1.16	.72	1.16
SO2 @ 7% O2 DRY (PPMV (mg/NM3D)	4960.19	14162.60	256.22	731.57	256.22	731.57
SO2 @ 6% O2 DRY (PPMV (mg/NM3D)	5317.03	15181.49	274.65	784.20	274.65	784.20
SO3 @ 7% O2 DRY (PPMV (mg/NM3D)	.00	.00	.00	.00	.00	.00
SO3 @ 6% O2 DRY (PPMV (mg/NM3D)	.00	.00	.00	.00	.00	.00
HF @ 7% O2 DRY (PPMV (mg/NM3D)	18163.46	14422.13	166.99	149.00	166.99	149.00
HF @ 6% O2 DRY (PPMV (mg/NM3D)	17326.30	15459.69	179.00	159.71	179.00	159.71

SCF = 70 DEGREES F & 14.696 PSIA (1.0 ATMOSPHERE)
NM3 = 0 DEGREES C & 1013 MILLIBARS (1.0 ATMOSPHERE)
CALCIUM REAGENT USED(1=Ca(OH)2,2=CaO): 2
CALCIUM REAGENT PURITY (WT. %): 95.00
SODIUM REAGENT USED(1=NaOH,2=Na2CO3): 2

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Z-101	QUENCH SECTION	T-401
Z-102	ABSORBER	F-401
Z-103	CHEVRON MIST ELIMINATOR	C-401
B-101	I.D. FAN	C-402
S-101	EXHAUST STACK	T-402
T-201	SCRUBBER RECIRCULATION TANK	C-403
P-201	SCRUBBER RECIRCULATION PUMP	F-201
G-201	RECIRCULATION TANK AGITATOR	P-203
T-301	CAUSTIC OR SODA ASH STORAGE	T-204
G-301	CAUSTIC OR SODA ASH AGITATOR	P-204
P-301	CAUSTIC OR SODA ASH PUMP	F-202
T-202A,B,C	(3) STORAGE TANKS	P-205
T-203	LIME REACTOR	P-206
G-202	LIME REACTOR AGITATOR	T-205
Z-201	LAMELLA THICKENER	P-207

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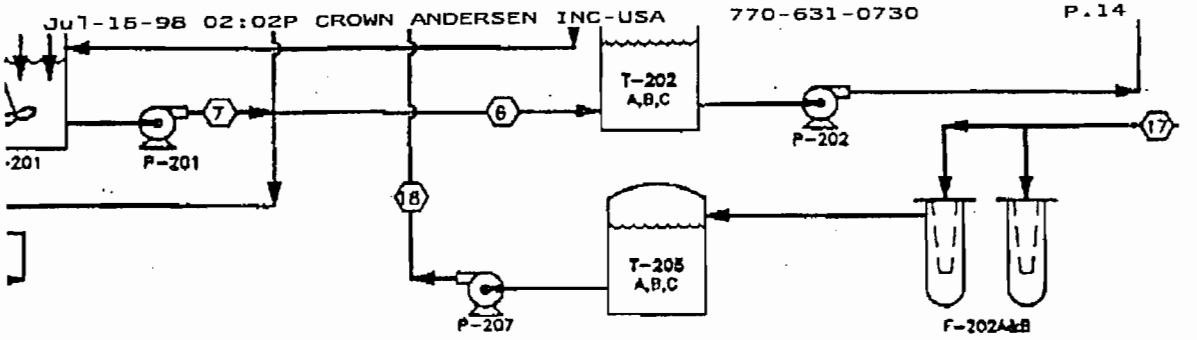

STREAM NAME AND NUMBER / PROPERTY OR COMPONENT	4 VENTURI OR QUENCH FEED (ENGLISH)	VENTURI OR QUENCH FEED (METRIC)	5 ABSORBER FEED (ENGLISH)	ABSORBER FEED (METRIC)	6 BLOWDOWN TO REGEN. PROCESS (ENGLISH)	BLOWDOWN TO REGEN. PROCESS (METRIC)	7 TOTAL PUMP FLOW (ENGLISH)	TOTAL PUMP FLOW (METRIC)	8 SODIUM CHEMICAL MAKEUP (ENGLISH)	SODIU CHEMIC MAKEU (METRI
H2O ——— (#/HR) ——— (Kg/HR)	244899.40	112898.24	497798.81	225796.56	621541.79	281925.16	1368240.81	620618.86	730.92	33
[illegible]	.00	.00	.00	.00	.00	.00	.00	.00	313.25	14
.00CaSO3-1/2 H2O	.00	.00	.00	.00	.00	.00	.00	.00	.00	
[illegible] CaF2	.00	.00	.00	.00	.00	.00	.00	.00	.00	
[illegible] Ca(OH)2	.00	.00	.00	.00	.00	.00	.00	.00	.00	
.00CaSO4-2 H2O	.00	.00	.00	.00	.00	.00	.00	.00	.00	
.00CaO	.00	.00	.00	.00	.00	.00	.00	.00	.00	
.05[illegible]	839.35	380.72	1678.71	761.45	2096.00	950.73	4614.06	2092.89	.00	
.00Na2SO3	6499.19	2943.43	12978.38	5866.86	18204.65	7250.22	35672.11	16185.51	.00	
38.63Na2SO3	4344.20	2061.21	9088.41	4122.41	11347.61	5147.16	24980.22	11330.78	.00	
7.87Na2SO4	3047.08	1382.13	6094.17	2764.25	7609.06	3451.39	16750.31	7597.77	.00	
.57NaF	1443.90	654.97	2887.95	1309.95	3605.84	1635.57	7937.77	3600.49	.00	
NaOH	.00	.00	.00	.00	.00	.00	.00	.00	.00	
332.91 PARTICULATE	40.95	22.66	99.91	45.32	124.74	56.58	274.60	124.55	.00	
[illegible]										
140. TOTALS ——— (#/HR) ——— (Kg/HR)	265313.16	120343.40	530626.33	240686.80	682529.59	309616.80	1456469.08	661546.99	1044.17	47
968. FLOW ——— (U.S. GAL/MIN) ——— (M3/HR)	500.00	113.55	1000.00	227.10	1248.58	283.55	2748.58	624.20	1.81	
.9349 PRESSURE ——— (PSIG) ——— (Kg/cm2)	40.00	2.81	40.00	2.81	40.00	2.81	40.00	2.81	30.00	
.9878 SPECIFIC GRAVITY	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.30	
0 TEMPERATURE ——— (DEG F) ——— (DEG C)	154	67.57	154	67.57	153.61	67.57	153.61	67.57	90.00	3
99.48 SUSPENDED SOLIDS (WT %)	.0188	.0188	.0188	.0188	.0188	.0188	.0188	.0188	.0000	
26.95 DISSOLVED SOLIDS (WT %)	6.1677	6.1677	6.1677	6.1677	6.1677	6.1677	6.1677	6.1677	30.0000	30.
.88 pH	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	>14.00	>1
892.89 VOLUMETRIC FLOW (FT3/HR) ——— (M3/HR)	—	—	—	—	—	—	—	—	—	
.00										
120.77										
1.4328										
1.7238										
1.8241										
.8028										
1.09										
1.16										
31.57										
84.20										
.00										
.00										
49.00										
59.71										

T-401	LIME SILO
F-401	LIME SILO VENT FILTER
C-401	LIVE BIN BOTTOM
C-402	SCREW LIFT, SCREW CONVEYOR
T-402	FEED BIN
C-403	FEED CONVEYOR
F-201	ROTARY VACUUM FILTER
P-203	UNDERFLOW PUMP
T-204	CLARIFIED LIQUOR TANK
P-204	CLARIFIED LIQUOR PUMP
F-202A&B	POLISHING FILTERS
P-205A,B,C	VACUUM PUMP
P-206	FILTRATE PUMP
T-205A,B,C	(3)FILTRATE HOLDING TANKS
P-207	FILTRATE RETURN PUMP

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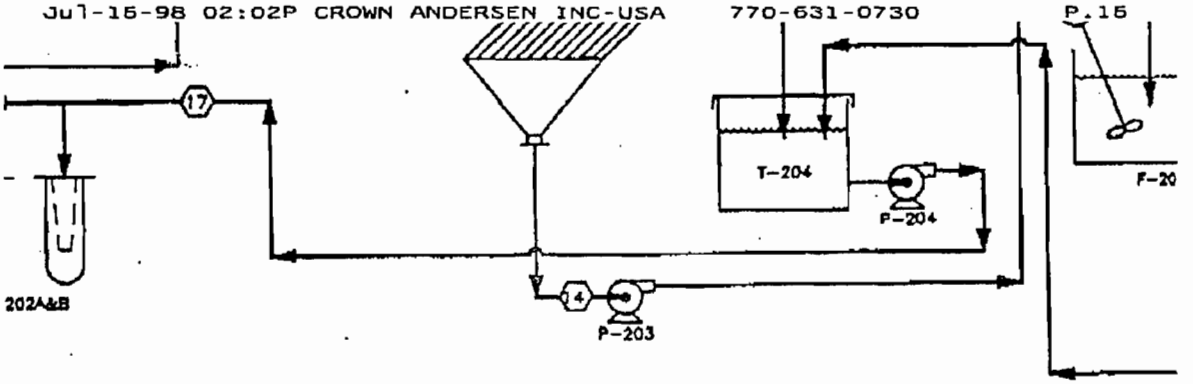

TOTAL PUMP FLOW (METRIC)	8 SODIUM CHEMICAL MAKEUP (ENGLISH)	SODIUM CHEMICAL MAKEUP (METRIC)	9 WATER MAKEUP (ENGLISH)	WATER MAKEUP (METRIC)	10 LIME REACTOR FEED (ENGLISH)	LIME REACTOR FEED (METRIC)	11 LIME REACTANT FEED (ENGLISH)	LIME REACTANT FEED (METRIC)	12 THICKENER FEED LIQUOR (ENGLISH)	THICKENER FEED LIQUOR (METRIC)	13 THICKENER OVERFLOW LIQUOR (ENGLISH)	THICKENER OVERFLOW LIQUOR (METRIC)	T
620619.86	730.92	331.54	17597.65	7982.12	621541.79	281925.14	.00	.00	622496.44	282358.18	591215.25	268160.33	
.00	313.25	142.09	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	
.00	.00	.00	.00	.00	.00	.00	.00	.00	2804.77	1272.22	.00	.00	
.00	.00	.00	.00	.00	.00	.00	.00	.00	3348.76	1518.75	.00	.00	
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	
.00	.00	.00	.00	.00	.00	.00	.00	.00	136.45	59.17	.00	.00	
.00	.00	.00	.00	.00	.00	.00	3663.94	1661.93	.00	.00	.00	.00	
2092.89	.00	.00	.00	.00	2096.00	950.73	.00	.00	2096.00	950.73	1990.87	902.95	
16180.51	.00	.00	.00	.00	16294.56	7350.22	.00	.00	29952.61	13586.20	28447.45	12903.48	
11330.78	.00	.00	.00	.00	11347.61	5147.16	.00	.00	.00	.00	.00	.00	
7587.77	.00	.00	.00	.00	7609.08	3451.39	.00	.00	7501.38	3402.54	7124.41	3231.56	
3606.49	.00	.00	.00	.00	3605.84	1635.57	.00	.00	.00	.00	.00	.00	
.00	.00	.00	.00	.00	.00	.00	.00	.00	.0424	.0192	.0403	.0183	
124.56	.00	.00	.00	.00	124.74	56.58	192.84	87.47	317.58	144.06	.00	.00	
661546.99	1044.17	473.63	17597.65	7982.12	669529.59	300516.80	3856.78	1749.40	668647.58	303291.86	621777.83	282207.33	
824.20	1.61	.36	35.21	8.00	1748.56	783.55	----	----	1263.12	286.86	1187.14	269.60	
2.81	30.00	2.11	40.00	2.81	20.00	1.41	GRAVITY	GRAVITY	GRAVITY	GRAVITY	GRAVITY	GRAVITY	
1.06	1.30	1.30	1.00	1.00	1.06	1.06	----	----	1.06	1.06	1.06	1.06	
67.57	90.00	32.22	70.00	21.11	148.61	64.79	70.00	21.11	150.72	67.63	148.72	64.85	
.0188	.0000	.0000	.0000	.0000	.0188	.0188	100.0000	100.0000	.9872	.9872	.0000	.0000	
8.1677	30.0000	30.0000	.0000	.0000	8.1677	8.1677	.0000	.0000	8.9149	8.9149	8.9739	8.9739	
8.80	>14.00	>14.00	7.00	7.00	8.80	8.80	>14	>14	8.20	8.20	8.20	8.20	
----	----	----	----	----	----	----	110.19	3.12	----	----	----	----	

				TOLERA
				MATERIAL
				SEE PROPOSA
				PRELIMINAR
				UNLESS OTHERWISE

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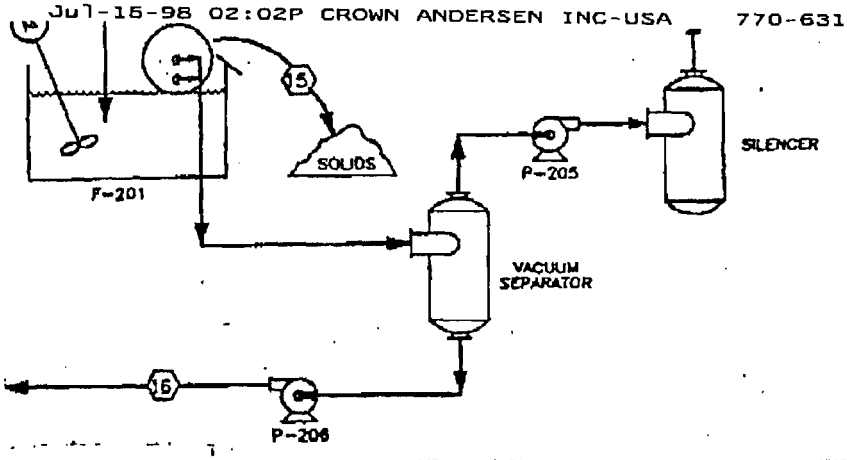

ER # 1)	THICKENER OVERFLOW LIQUOR (METRIC)	14 THICKENER UNDERFLOW SLURRY (ENGLISH)	14 THICKENER UNDERFLOW SLURRY (METRIC)	15 SOLIDS TO DISPOSAL (ENGLISH)	SOLIDS TO DISPOSAL (METRIC)	16 VACUUM FILTER FILTRATE (ENGLISH)	VACUUM FILTER FILTRATE (METRIC)	17 REGENERATED RETURN LIQUOR (ENGLISH)	REGENERATED RETURN LIQUOR (METRIC)	18 POLISHED RETURN LIQUOR (ENGLISH)	POLISHED RETURN LIQUOR (METRIC)
.25	268169.33	31251.23	14168.85	9858.33	2702.64	25322.90	11486.21	616538.15	279655.54	616538.15	279655.54
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	2804.77	1272.22	2804.77	1272.22	.00	.00	.00	.00	.00	.00
.00	.00	3348.28	1518.75	3348.28	1518.75	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	130.45	59.17	130.45	59.17	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.87	902.95	104.33	47.31	20.06	9.10	85.78	38.68	2075.94	941.63	2075.94	941.63
.48	12903.48	1648.18	692.72	286.70	130.04	1218.46	552.68	29665.91	13456.16	29665.91	13456.16
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.41	3231.56	376.95	170.98	71.80	32.57	305.15	138.41	7429.56	3369.97	7429.56	3369.97
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
483	.0183	.0021	.0010	.0004	.0002	.0017	.0008	.0420	.0191	.0420	.0191
.00	.00	217.58	144.05	317.58	144.05	.00	.00	.00	.00	.00	.00
.83	285207.33	39669.75	18004.52	12937.97	5868.54	26931.76	12215.99	655709.61	297423.32	655709.61	297423.32
.14	269.60	75.98	17.26	---	---	80.85	11.55	1237.99	281.15	1237.99	281.15
ITY	GRAVITY	4.30	.30	GRAVITY	GRAVITY	15.00	1.06	40.00	2.41	20.00	1.41
.06	1.06	1.06	1.06	---	---	1.06	1.06	1.06	1.06	1.06	1.06
.72	64.85	148.72	64.85	128.72	53.74	133.72	56.51	148.10	64.51	146.60	63.67
000	.0000	16.5566	16.5566	51.0210	51.0210	.0000	.0000	.0000	.0000	.0000	.0000
739	5.9739	4.9648	4.9648	2.9260	2.9260	5.9739	5.9739	5.9739	5.9739	5.9739	5.9739
.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20
---	---	---	---	248.81	7.05	---	---	---	---	---	---

ERANCE = (N/)	BY JH	DATE 3-9-98
TERIAL	CHK	
EE PROPOSAL	APP'D	
PRELIMINARY	SCALE NTS	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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ANDERSEN 2000 INC.

AIR POLLUTION CONTROL, AIR HANDLING, HEAT RECOVERY, HAZARDOUS WASTE TREATMENT, SPRAY DRYING SYSTEMS AND EQUIPMENT.
300 DIVIDEND DR. - PEACHTREE CITY, GA 30269

PROCESS FLOWSHEET AND MATERIAL BALANCE FOR HF & SO_2 SCRUBBER AND DOUBLE ALKALI REGENERATION SYSTEM FOR PHOSPHATE DEFLUORINATION KILN

PROD. LINE P7695-1A

DWG. NO. P8229-1

REV.

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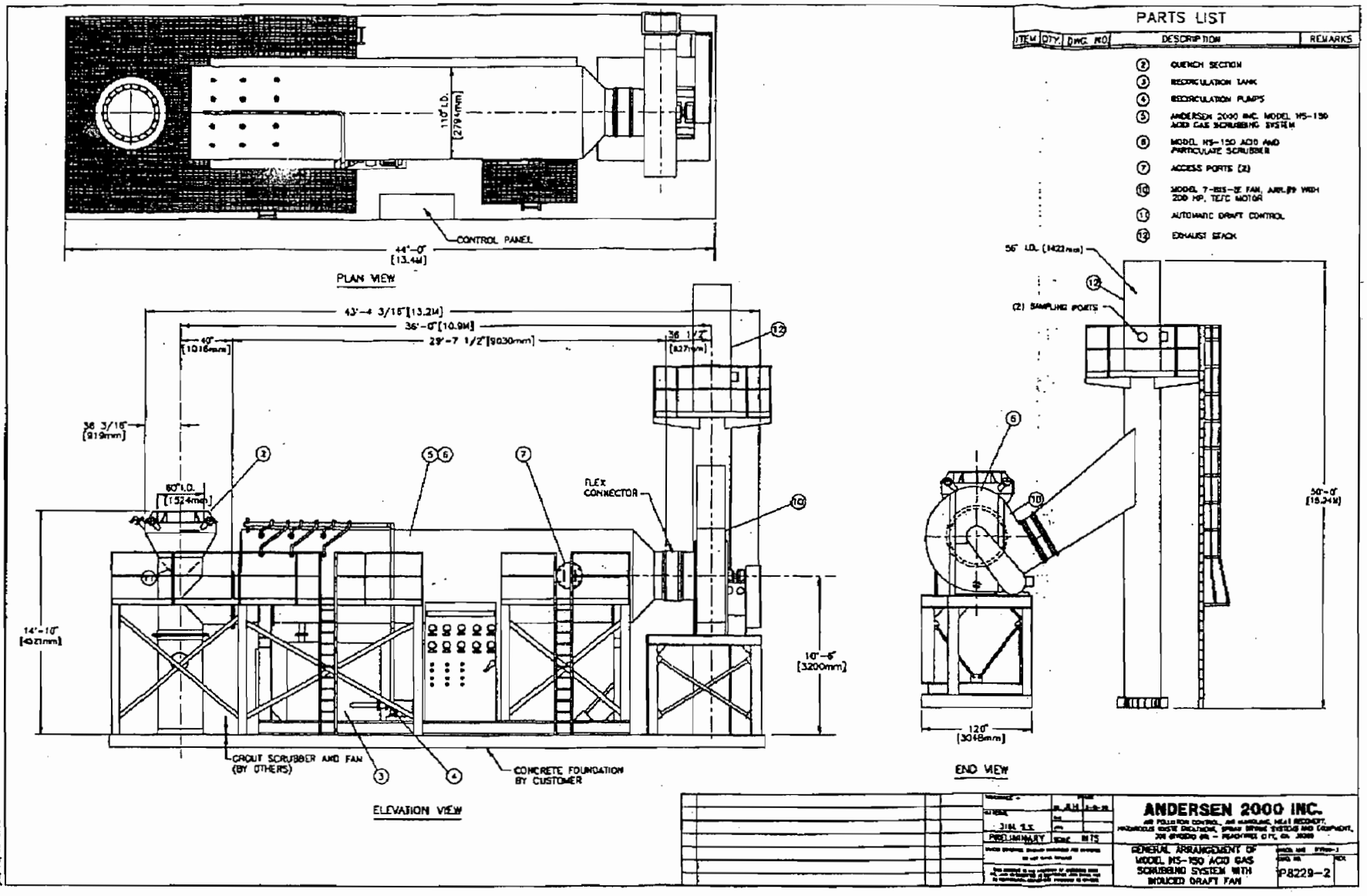
Jul-15-98 02:03P CROWN ANDERSEN INC-USA 770-631-0730 P.17



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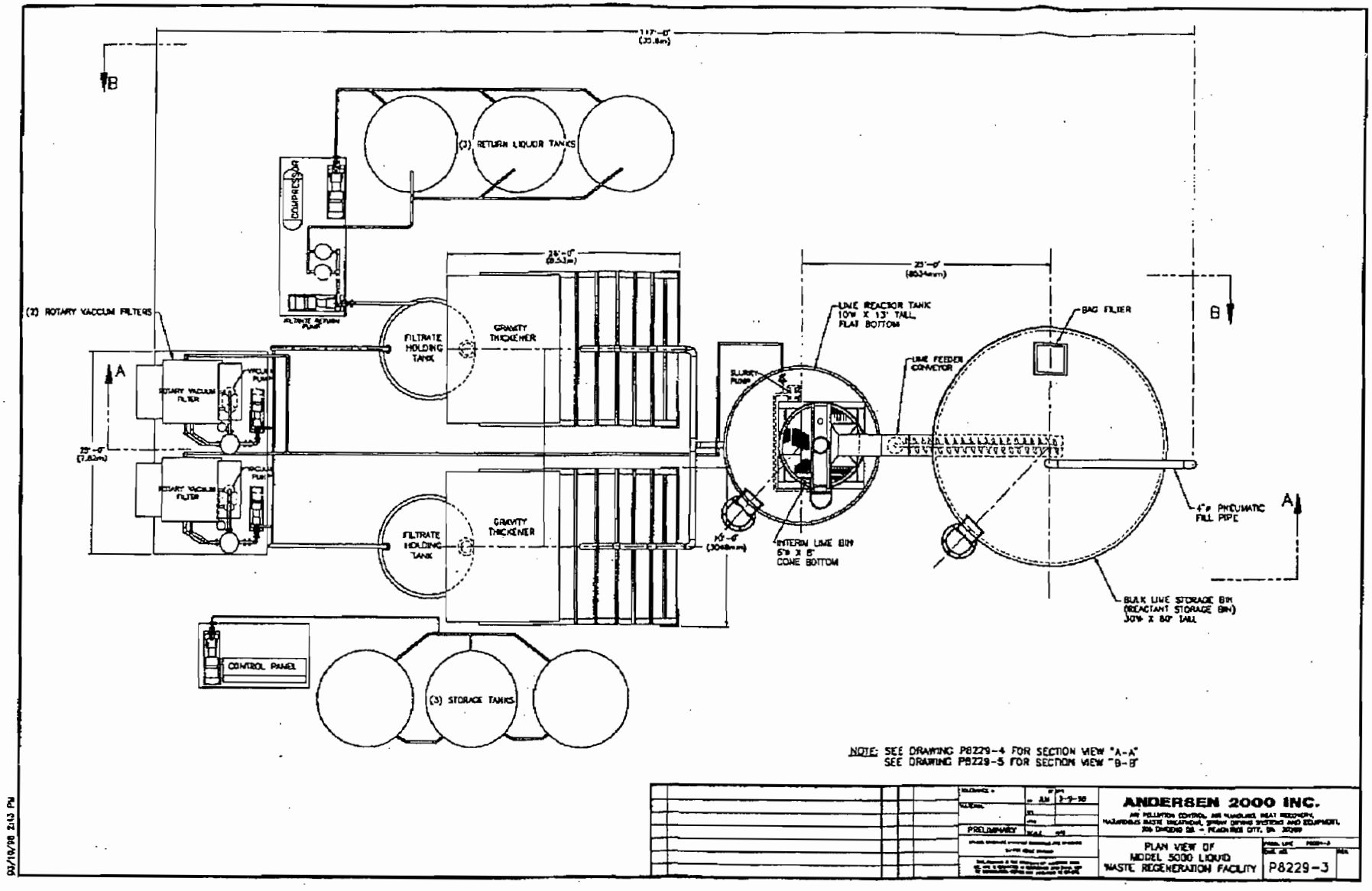

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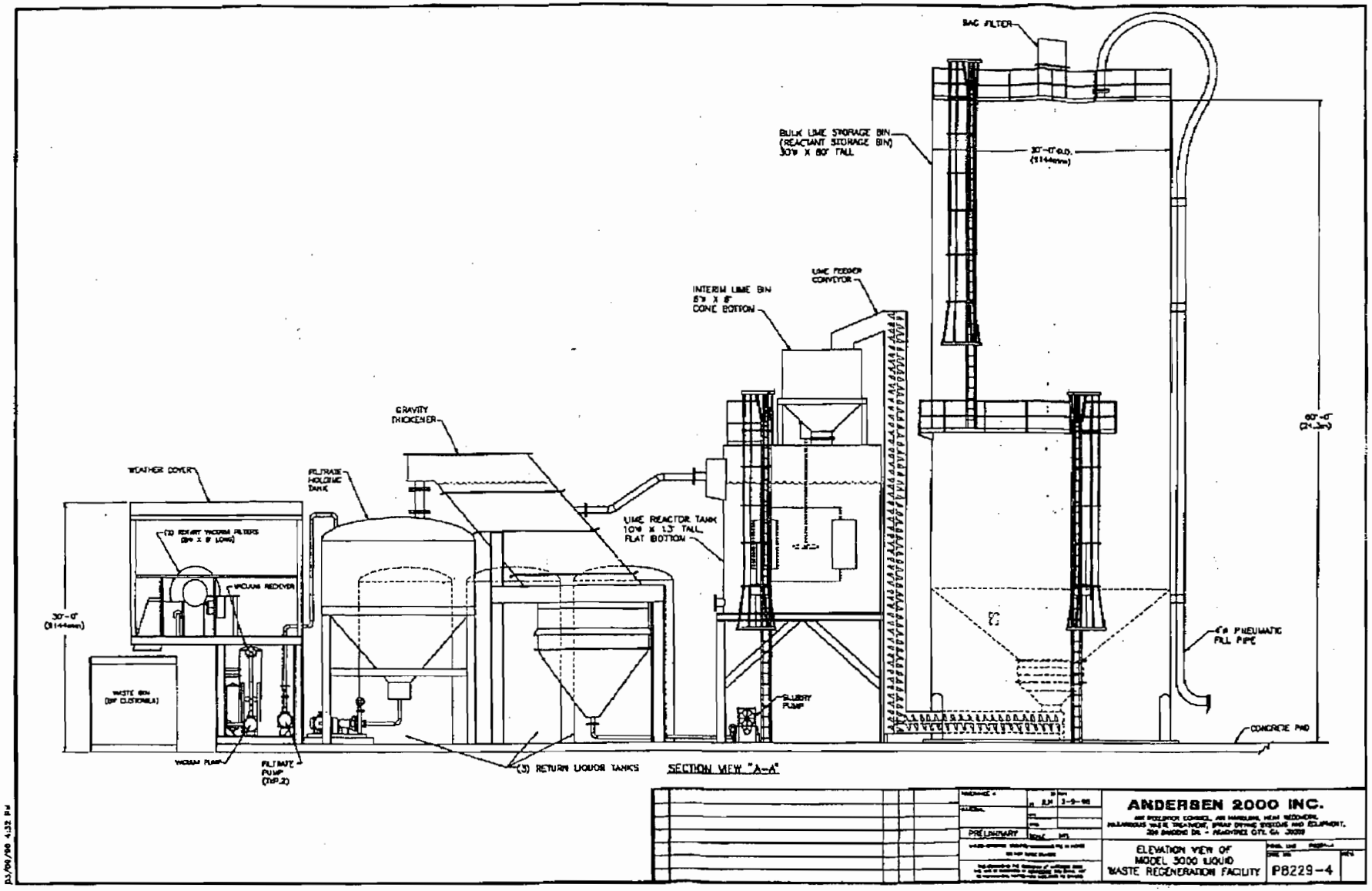

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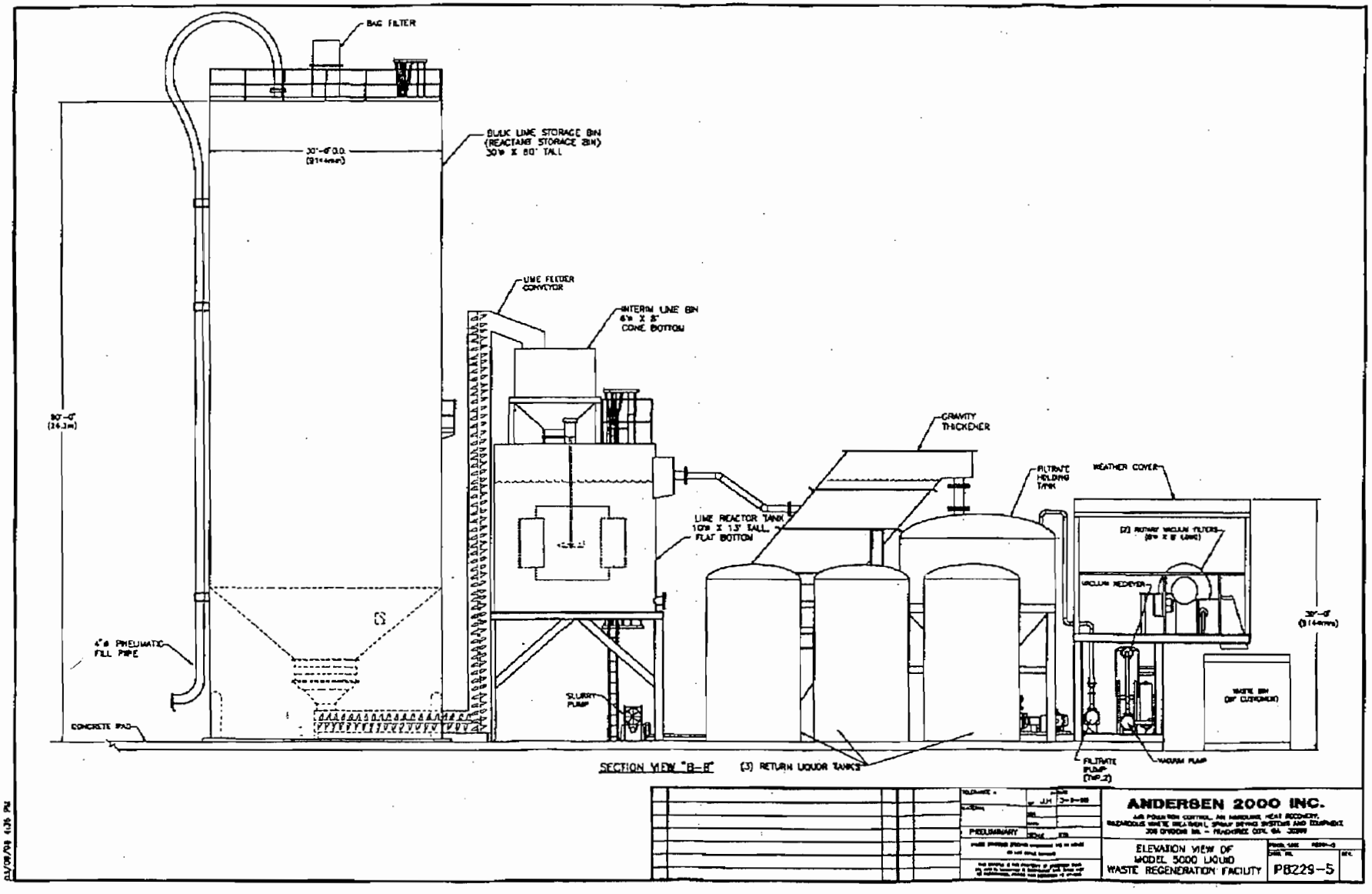

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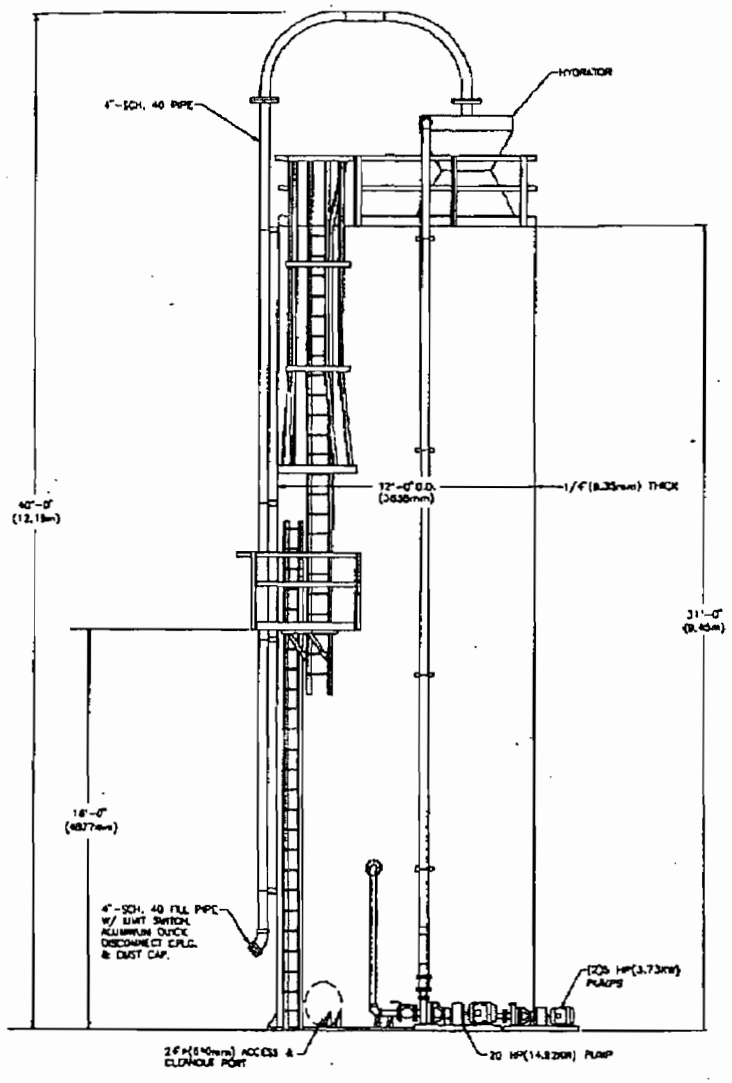
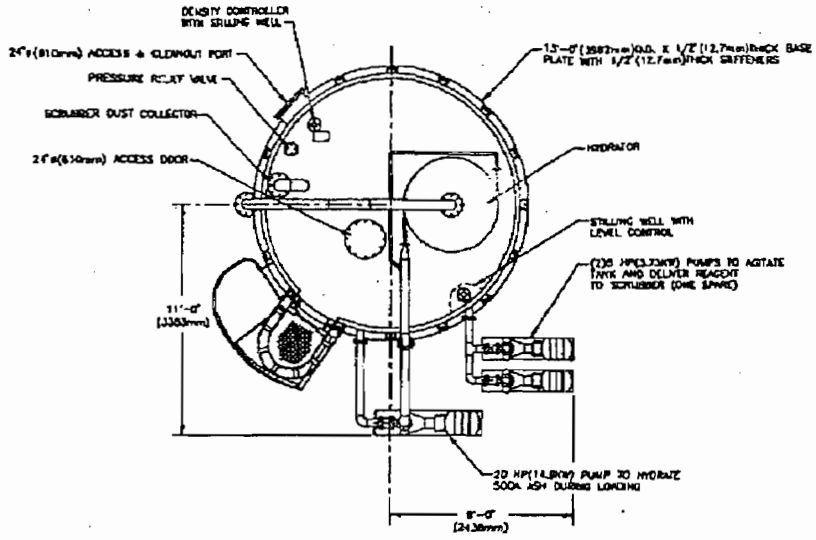
PARTS LIST				
ITEM	QTY.	DWG. NO.	DESCRIPTION	REMARKS



ELEVATION VIEW



PLAN VIEW

		SEE PROPOSAL	ANDERSEN 2000 INC.
		PRELIMINARY	MODEL 21000 SODA ASH SLURRY STORAGE
			P8229-6

03/09/98 4:37 PM

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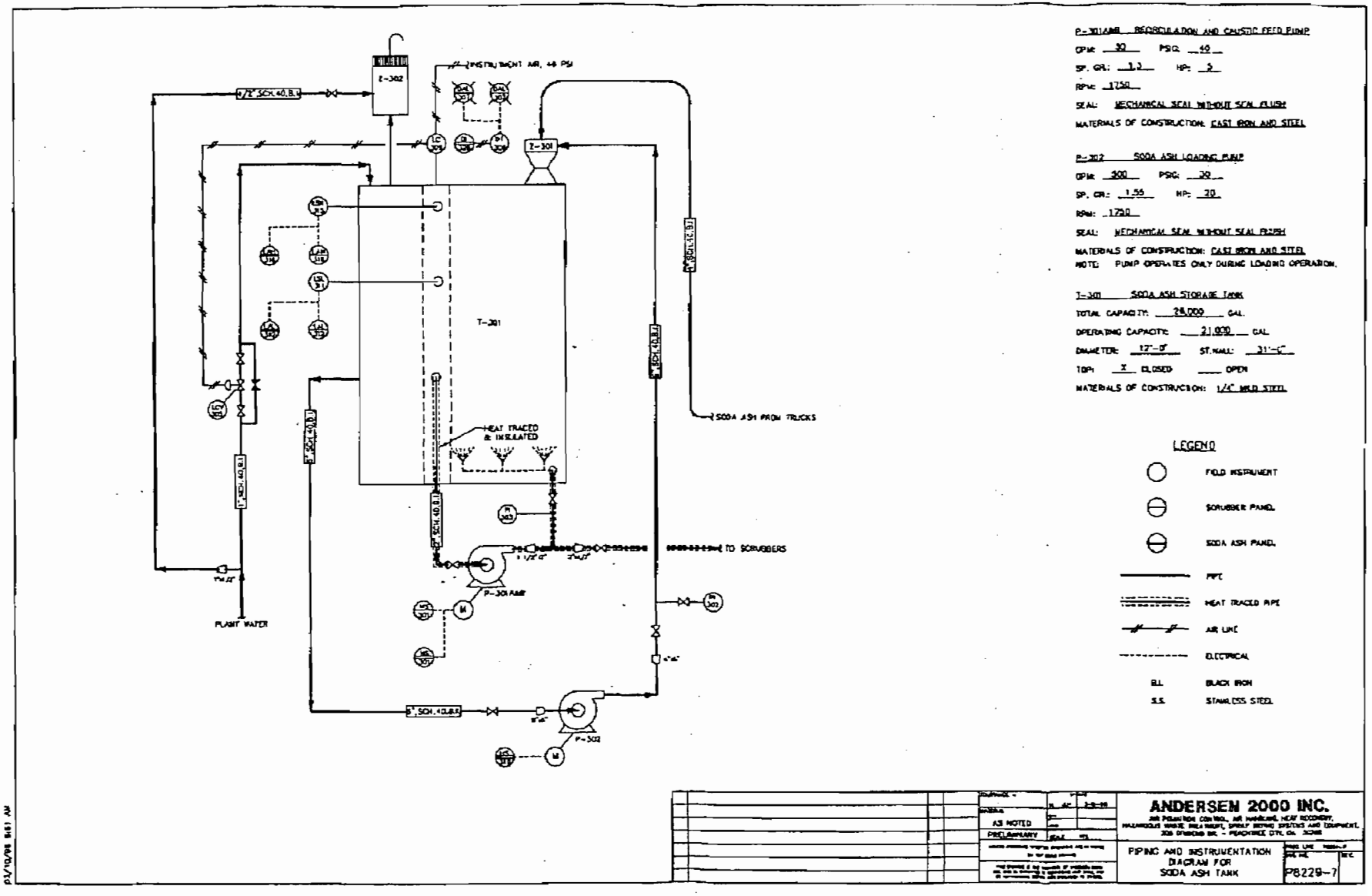
Jul-15-98 02:06P CROWN ANDERSEN INC-USA 770-631-0730 P.22



P-301A&B RECIRCULATION AND CAUSTIC FEED PUMP
GPM: 30 PSIG: 40
SP. GR.: 1.2 HP: 5
RPM: 1750
SEAL: MECHANICAL SEAL WITHOUT SEAL FLUSH
MATERIALS OF CONSTRUCTION: CAST IRON AND STEEL

P-302 SODA ASH LOADING PUMP
GPM: 300 PSIG: 30
SP. GR.: 1.55 HP: 20
RPM: 1750
SEAL: MECHANICAL SEAL WITHOUT SEAL FLUSH
MATERIALS OF CONSTRUCTION: CAST IRON AND STEEL
NOTE: PUMP OPERATES ONLY DURING LOADING OPERATION.

T-301 SODA ASH STORAGE TANK
TOTAL CAPACITY: 28,000 GAL.
OPERATING CAPACITY: 21,000 GAL.
DIAMETER: 12'-0" ST.WALL: 31'-6"
TOP: X CLOSED ____ OPEN
MATERIALS OF CONSTRUCTION: 1/4" MILD STEEL

LEGEND

- FIELD INSTRUMENT
- SCRUBBER PANEL
- SODA ASH PANEL
- PIPE
- HEAT TRACED PIPE
- AIR LINE
- ELECTRICAL
- B.I. BLACK IRON
- S.S. STAINLESS STEEL

AS NOTED
PRELIMINARY

ANDERSEN 2000 INC.
AIR POLLUTION CONTROL, AIR HANDLING, HEAT RECOVERY, HAZARDOUS WASTE INCINERATORS, SPRAY BOOTHS SYSTEMS AND EQUIPMENT
3525 ENTERPRISE DR. - PEACHTREE CITY, GA. 30269

PIPING AND INSTRUMENTATION DIAGRAM FOR SODA ASH TANK

P8229-7

01/10/98 8:51 AM