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AC03-145061

Westinghouse Electric Corporation

Resource Energy Systems Division

Cost Building
2400 Ardmore Boulevard
Pittsburgh Pennsylvania 15221
(412) 636 5800
WIN 261 5800

ENG/MG:DSB:88-021

February 3, 1988

DER
FEB 5
BAQM

Mr. Clair Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399

Re: Bay County Waste-to-Energy Facility
Request for Permit Modification

Dear Clair,

Please find enclosed the permit filing fee of $500 and four copies of the additional information that your office requested during our January 9, 1988 meeting.

It was enjoyable meeting with you and your staff again and we certainly appreciate all of the attention that DER has given this project. It is our hope, and I am sure yours also, that we can resolve this matter as quickly as possible.

Should you have any questions, please don't hesitate to call.

Sincerely,

David S. Beachler

D. S. Beachler, Manager
Environmental and Quality Engineering
0478MM:0100E-1
Enclosures

cc: S. J. Brady
J. J. Zebroski (w/o enclosures)

FEDERAL EXPRESS

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AIRBILL NUMBER 3319357160

70278M

DATE 2/4/88

AIRBILL NUMBER 3319357160

DER
FEB 5
BAOM

1 From (Your Name): Spencer Brady
Your Phone Number (Very Important): (412) 636-5854
Company: WESTINGHOUSE/RESOURCE ENERGY
Department/Floor No.:
Street Address: 2400 ARDMORE BLVD COST BLDG
City: PITTSBURGH
State: PA
ZIP Required For Correct Invoicing: 15221

2 To (Recipient's Name): Mr. Clair Fancy
Recipient's Phone Number (Very Important): ( )
Company: Florida Dept. of Environmental Regulation
Department/Floor No.:
Exact Street Address *(Use of P.O. Boxes or P.O. ® Zip Codes Will Delay Delivery And Result in Extra Charge.)*: Twin Towers Office Bldg.-2600 Blair Stone Rd.
City: Tallahassee
State: FL
ZIP Street Address Zip Required: 32399

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)
BRN500

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*Declared Value Limit $100.

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Westinghouse Electric Corporation

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Mellon Bank N.A
Pittsburgh, Pennsylvania

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Date

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FLA DEPT OF ENVIR REGULATION 01/29/88 ******500.00
TWIN TOWERS OFFICE BLDG
2600 BLAIR STONE RD
TALLAHASSEE FL 32399

Headquarters Disbursing Account - 9400

VICE PRESIDENT & TREASURER

⑈691151⑈ ⑆043301601⑆ 000⑈9689⑈

Receipt #117516

Westinghouse
Electric Corporation

Resource Energy Systems
Division

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2400 Ardmore Boulevard
Pittsburgh Pennsylvania 15221
(412) 636 5800
WIN 261 5800

ENG/MG:DSB:88-021

February 3, 1988

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Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399

RECEIVED
DER - MAIL ROOM
1988 FEB -5 PM 10: 40

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Request for Permit Modification

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D. S. Beachler, Manager
Environmental and Quality Engineering
0478MM:0100E-1
Enclosures

cc: S. J. Brady
J. J. Zebroski (w/o enclosures)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

DER
FEB 05, 1988
BAQM

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Resource Recovery Facility with 2 combustor/boiler units [ ] **New**[1] [XX] **Existing**[1]

APPLICATION TYPE: [ ] **Construction** [ ] **Operation** [XX] **Modification**

COMPANY NAME: Bay Resource Management Center **COUNTY:** Bay

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) 2 MSW-fired combustor/boilers w/ESP & separate flues.

SOURCE LOCATION: Street U.S. Highway 231 City Panama City

UTM: East 644.1 North 3348.9

Latitude 30 ° 15 ' ____ "N Longitude 85 ° 30 ' ____ "W

APPLICANT NAME AND TITLE: Bay Resource Management Center

APPLICANT ADDRESS: c/o Westinghouse RESD, Cost Bldg., 2400 Ardmore Blvd., Pittsburgh, PA 15221; Attention: David S. Beachler

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Bay County

I certify that the statements made in this application for a modification permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: David S. Beachler

D.S. Beachler, Manager, Environmental Eng.
Name and Title (Please Type)

Date: 2/3/88 Telephone No. (412) 636-5806

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

---

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed

Alan F. Richter
Name (Please Type)

STV ENGINEERS, INC.
Company Name (Please Type)

11 Robinson Street, Pottstown, PA 19464
Mailing Address (Please Type)

Florida Registration No. 13826 Date: 2-1-88 Telephone No. 215/326-4600

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See Attachment A

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction NA Completion of Construction NA

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Two Electrostatic Precipitators $1,046,000

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

AC-03-84703 Jan. 31, 1988

AC-03-84704 Jan. 31, 1988

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

DER

FEB 05, 1988

BAQM

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

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D.S. Beachler, Manager, Environmental Eng.
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Two Electrostatic Precipitators $1,046,000

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

AC-03-84703 Jan. 31, 1988

AC-03-84704 Jan. 31, 1988

Receipt # 117516
DER V# 691151
$500.00
FEB 5, 1988 AC03-14506
BAQM

Class I-Visibility Impact Analysis

The nearest Class I area (according to 40 CFR 81.400) is the St. Marks National Wildlife Reserve located approximately 115 km east of Panama City. Although this Class I area is greater than 100 km, the potential for visibility degradation has been assessed.

This section discusses the results of the Level-1 visibility screening analysis at the St. Mark NWR for the Bay County facility. The Level-1 visibility screening analysis is a simple, straight-forward calculation designed to identify whether emissions from an air emission source would have any potential of adversely affecting visibility at the closest Class I area to the proposed facility. If the project passes this first screening test, it is not likely to cause adverse visibility impairment, and further analysis becomes unnecessary.

The Level-1 visibility screening analysis is described in detail by Latimer and Ireson.[5] Required inputs are source emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM), as well as the minimum distance between the source and the Class I area and the regional background visual range. The emission rates used are 1.70 g/s for PM, 6.41 g/s for NO_x, and 9.01 g/s for SO_2. The regional background visual range, taken from the workbook[5] is 25 km. The meteorology for maximum impact suggested by the workbook were assumed in the calculations.

Three parameters were calculated in the Level-1 visibility analysis: C_1 - plume contrast against the sky; C_2 - sky terrain contrast reduction; and C_3 - the change in sky terrain contrast caused by primary and secondary aerosols. If the absolute value of any of these parameters exceeds 0.10, then the source fails the Level-1 test and must proceed to the refined, Level-2 analysis. The calculated values (calculations are presented in Exhibit 1) for these parameters are $C_1 = -5.1x10^{-5}$, $C_2 = 3.91x10^{-6}$, and $C_3 = 1.14x10^{-4}$.

(5) Latimer and Ireson. Workbook for Estimating Visibility Impairment, EPA Document No. EPA 450/4-80-031, 1980.

Since the results of the Level-1 calculation show the absolute value of all three parameters to be orders of magnitude below the Level-1 test threshold, the Bay County facility is not likely to cause any visibility impairment at the St. Marks NWR.

Impact of the Facility on Soils and Vegetation

Due to the proposed modification, SO_2 will be the only pollutant emitted in greater than de minimis amounts, thereby requiring an evaluation of its potential for causing adverse impacts on soils, vegetations, and animals. This potential was evaluated using procedures contained in the EPA guideline document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (1980)".

The guideline document specifies that if compliance with the NAAQS and PSD increments for SO_2 is demonstrated, the proposed Facility will not adversely impact soils, vegetation, and animals. Compliance with these standards and increments was demonstrated in Attachment H of the January, 1988 submittal.

GEP Stack Height Analysis

Section 123 of the 1977 Clean Air Act Amendments required EPA to promulgate regulations to assure that the control of any air pollutant under an applicable State Implementation Plan (SIP) was not affected by (1) stack heights that exceed GEP or (2) any other dispersion technique. GEP is defined with respect to stack height as "the height necessary to insure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddys, and wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles" (EPA 1985).

On February 8, 1982 EPA promulgated regulations concerning GEP stack height determinations (47 FR 5864). On October 11, 1983, the U.S. Court of Appeals issued a ruling on the final stack height regulations (Sierra Club and NRDC vs U.S. EPA et al.). EPA was remanded by the Court to review and revise certain sections of the regulations. EPA promulgated final GEP stack height regulations on July 8, 1985 (50 FR 27892).

The GEP definition is based on the observed phenomena of disturbed atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) are avoided. The maximum GEP stack height allowed under the 8 July 1985 regulation is calculated by:

$$H_G = H + 1.5L$$

where: H_G is the maximum GEP stack height,
H is the height of the nearby structure, and
L is the lesser dimension (height or width) of the nearby structure, called the critical dimension.

Both the height and width of the structure are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. In all instances, the GEP stack height is based on the plane projections of any nearby building which results in the greatest justifiable height. For the purpose of determining the maximum GEP height, nearby is limited to five structure heights or widths, whichever is less, downwind from the trailing edge of the structure. In the case where a stack is isolated from nearby structures, the maximum GEP stack height is defined as 65 meters.

The dimensions of the structure which could influence the dispersion of emissions from the proposed stack are presented in Table 1 and are shown in the plot plan in Exhibit 2. The height of the GEP controlling structure (boiler building) is 100 ft. above the stack base elevation while the maximum projected width is 173 ft. These dimensions correspond to a maximum GEP stack height of 250 ft. above the reference base elevation. The facility's stack height is 125 ft.which is not high enough to avoid aerodynamic downwash under certain meteorological conditions. Therefore, an aerodynamic building downwash analysis is included.

TABLE 1
GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS FOR THE PROPOSED FACILITY
(Dimensions are in feet)

Structure	Height Above Stack Base	Length	Width	MPW*	GEP Height
Boiler Bldg.	100	140	101	173	250

*MPW = Maximum Projected Width

Building Downwash Analysis

Since the facility stack height is less than the GEP height, a building downwash screening analysis was conducted. This analysis was performed in accordance with EPA recommended guidelines.[1,2] The downwash screening procedure is divided into two major areas of concern, namely, the cavity region (up to 3L downwind, where L is the lesser dimension of the building height or projected width) and the wake region (3L to 10L downwind).

The Cavity Analysis is included in Exhibit 3. This analysis shows that the cavity height extends to 150 feet. The analysis goes on further to show that the plume height (stack height plus plume rise) extends to 162 feet. Therefore since the plume height exceeds the cavity height, it is assumed that the maximum impacts will be dominated by the wake effects and no further cavity analysis is recommended.

The wake effects screening was performed with the short term version of the Industrial Source Complex Model (ISCST), Version 6. The wake effects modeling effort was performed in accordance with EPA recommendations[2] using worst-case building dimensions and meteorological data. The modeling was conducted using an SO_2 emission rate of 9.01 gm/sec.

The maximum one hour ground-level SO_2 from the Bay County facility is 95.2 ug/m^3 and occurred at a distance of 100 m during D stability with a wind speed of 12 m/s. This maximum one-hour concentration was multiplied by the EPA recommended scaling factors listed in Table 2 to scale the one-hour SO_2 concentration prediction to longer arranging times. The computer printout is found in Exhibit 4.

---

[1] Guideline on Air Quality Models (revised). EPA Document No. EPA-450/2-78-027R, July 1986

[2] Regional Workshops on Air Quality Modeling: A Summary Report. EPA Document No. EPA 450/4-82-015, Revised October, 1983.

TABLE 2

Conversion Factors Used to Scale(3) Results for Different Averaging Times

1 hr/ 3 hr	0.9
1 hr/ 8 hr	0.7
1 hr/24 hr	0.4
1 hr/Annual	0.05(4)

The results of the SO_2 downwash modeling analysis are listed along with the monitored background SO_2 concentration in Table 3 below.

TABLE 3

SO_2 Downwash Analysis

Averaging Time	Predicted Maximum SO_2 Impact Downwash (ug/m^3)	Monitored^2 Background SO_2 Concentration^2 (ug/m^3)	Total (ug/m^3)
Annual	4.8	10.0	14.8
24-Hour	38.1	62.0	100.1
3-Hour	85.7	269.0	354.7

The total concentrations (source impact plus background) resulting from the downwash screening analysis are still below the applicable National and State Ambient Air Quality Standards.

(3)(EPA, 1977) Budney, L.J., October 1977, <u>Guidelines for Air Quality Maintenance Planning and Analysis Volume 10 (revised): Procedures for Evaluating Air Quality Impact of New Stationary Sources,</u> EPA-450/4-44-001, Research Triangle Park, North Carolina.

(4)Since there is no recommended scaling factor for estimating maximum annual concentrations from 1-hour modeled values, a conservative ratio of 0.05 will be used based upon similar modeling studies such as Camp Dresser & McKee, Inc., 1984; Application for Power Plant Site Certification of the Hillsborough County Resource Recovery--Electrical Generating Facility, submitted to the Florida DER.

Background SO_2 Data

A copy of the DER's monitored SO_2 data is included in this submittal. Using the highest second high 3-hour and 24-hour values and adding them to the proposed maximum concentrations results in:

Averaging Time	Proposed Maximum(1) Predicted Facility SO_2 Impacts (ug/m^3)	Monitored(2) Background SO_2 Concentrations (ug/m^3)	Total (ug/m^3)
Annual	0.98	10.0	10.98
24-Hour	10.60	62.0	72.60
3-Hour	36.02	269.0	305.02

(1)Taken from Attachment H - Table 1, Jan. 1988 submittal.

(2)Taken from DER data Bay County Station 002 J02 Oct-Dec. 1986 (Exhibit 5)

The total values presented above are still well below the National and State AAQS.

Growth Analysis

There will be no additional personnel hired at the Facility as a result of the proposed modification. In-migration to the area is therefore not anticipated.

Consequently, it is unlikely that the modification to increase the MSW processing rate from 350 tpd to 510 tpd will have any effect on pollutant emissions not directly related to the source.

HCl Emissions

Tests were conducted during April and May 1987 to determine the HCl emissions from the Bay County W-T-E facility. Twenty samples were taken while the combustor burned MSW at the design rated capacity (10.6 tons/hour per unit). The average HCl concentration was 467 ppm_{dv} corrected to 12% CO_2. The typical value from waste burning plants in the U.S. is 500 ppm. Table 4 shows HCl emission factors. Table 5 shows the projected annual emissions for the facility when burning 350 TPD MSW and 135 TPD wood chips and when burning 510 TPD MSW.

The overall estimated emissions for HCl would increase approximately 17 tons per year when burning 510 TPD as opposed to 350 TPD MSW and wood chips.

TABLE 4
HCl Emission Factors For The Bay County W-T-E Plant Burning 510 TPD of MSW That has a Heating Value of 4500 Btu/lb (365 days per year)

Pollutant	Emission Test Results 4/87-6/87 per train corrected to 12% CO_2	Typical Emission Factors Concentration Corrected to 12% CO_2	$lb/10^6 Btu$ (500 ppm)	lb/ton (500 ppm)
HCl	467 ppm	500 ppm	0.065	0.58

TABLE 5
Estimated Annual HCl Emissions Using 1987 Developed Emission Factor

Pollutant	Emission Factor (wood chips)	Emission Factor (MSW)	Annual Emissions (tons/year) Based on 350 TPD (MSW) 135 TPD Wood	Annual Emissions (tons/year) Based on 510 TPD MSW	Difference tons/year
HCl	0	0.58 lb/ton	37	54	17

BACT Economic Considerations

A cost estimate was obtained for installing spray dryers ahead of the existing ESP's at the Bay County facility. A cost estimate was not obtained for using a dry injection system because of the limited SO_2/HCl removal efficiency that occurs when this equipment is used in combination with an ESP. A cost estimate for a wet scrubber was not obtained because of the additional pretreatment and dewatering problems associated with this equipment.

The Bay County facility currently uses pneumatic conveyors to transport the flyash to a bifurcated chute where it is mixed with the bottom ash on a submerged drag conveyor. If acid gas scrubbers were retrofitted to the existing system, the nature of the flyash would change due to the addition of calcium chloride salts and unreacted reagents. The flyash would become hygroscopic and would cause severe handling problems. Therefore, it would be necessary to install mechanical drag conveyors to replace the existing pneumatic conveyors at an estimated capital cost of $475,000.

The capital cost estimate for spray dryer and flyash removal system is given in Table 6. As can be seen from this table, the total cost for installing this equipment in front of each existing ESP would be $2,338.000.

Table 7 contains the annual operating costs estimated by assuming a lime stoichiometric ratio of 1.3, that the power usage for operating two spray dryers is 60 kw, and that the pressure drop across the spray dryer is 3.5 inches of water. The total annual operating and maintenance cost is estimated to be $283,773.

TABLE 6
ADD-ON SPRAY DRYER CAPITAL COST ESTIMATE

Capital Cost:	$1,863,000	- Spray Dryers
	$ 475,000	- Drag Conveyors
TOTAL	$2,338,000	

Cost Breakdown Includes:

- Engineering
- Foundations and Supports
- 2 Spray Dryers
- 3 Rotary Atomizers (1 spare for two trains)
- 2 Drag Conveyors
- Lime Storage Bins and Slaker
- Piping
- Ductwork
- Insulation
- Shipping to the Site
- Installation
- Start-up Services

TABLE 7
ANNUAL OPERATING AND MAINTENANCE COST

	Each Train	Cost	Cost per Year For Both Trains
Lime	115 lb/hr	\$75/ton	\$ 75,555
Power for Spray Dryer	30 kw	\$0.05/kwh	\$ 26,280
Power for Delta P (fan cost)	Delta P=3.5 in H_2O Gas Flow-55,000 acfm for each unit	(see below)	\$ 30,438

$$\text{Fan Power} = Q \times \frac{0.7456}{6356 \times E} \times \text{Delta } P \times H$$

where: P = fan power (kwh)
Q = gas volume (acfm)
E = fan efficiency (assumed 0.65)
Delta P = pressure drop
H = annual operating rate (8760 hr/yr)

Water Cost	\$ 5,440
Routine Maintenance 880 hr per spray dryer @ \$20/hr	\$ 35,200
SPARE PARTS	
Atomizer-bearings, inserts, packing, oil pump, seals washers, etc.	\$ 50,140
Lime slaking system	\$ 28,140
INCREASE DISPOSAL Costs 1629 tpy Residue @ \$20/ton	\$ 32,580
TOTAL	\$283,773

Table 8 shows the revenues that would be lost during a 4-week shutdown (for each combustor/boiler train) because of the retrofit of the spray dryer and the mechanical drag conveyors.

TABLE 8
Lost Revenues Because of Plant Shutdown During Scrubber Installation

Assume: 4 weeks shutdown per train

Lost Electrical Revenue	$ 403,200
By-Pass Waste Costs (350 TPD x 28 days x $10/ton)	$ 98,000
	$ 501,200

Table 9 illustrates that the equivalent uniform annual cost (EUAC) for retrofitting acid gas controls is $617,379.

TABLE 9
Equivalent Uniform Annual Cost (EUAC) for Addition of Acid Gas Controls
(i=10%, N=20 yrs)

Capital Cost	$2,338,000	(Table 6)
Lost Revenue	$ 501,200	(Table 8)
Total Cost	$2,839,200	

Operation & Maintenance - $283,773 (Table 7)

EUAC = $2,839,200 (A/P, 10%, 20) + $283,773
EUAC = $ 617,379

Conclusions

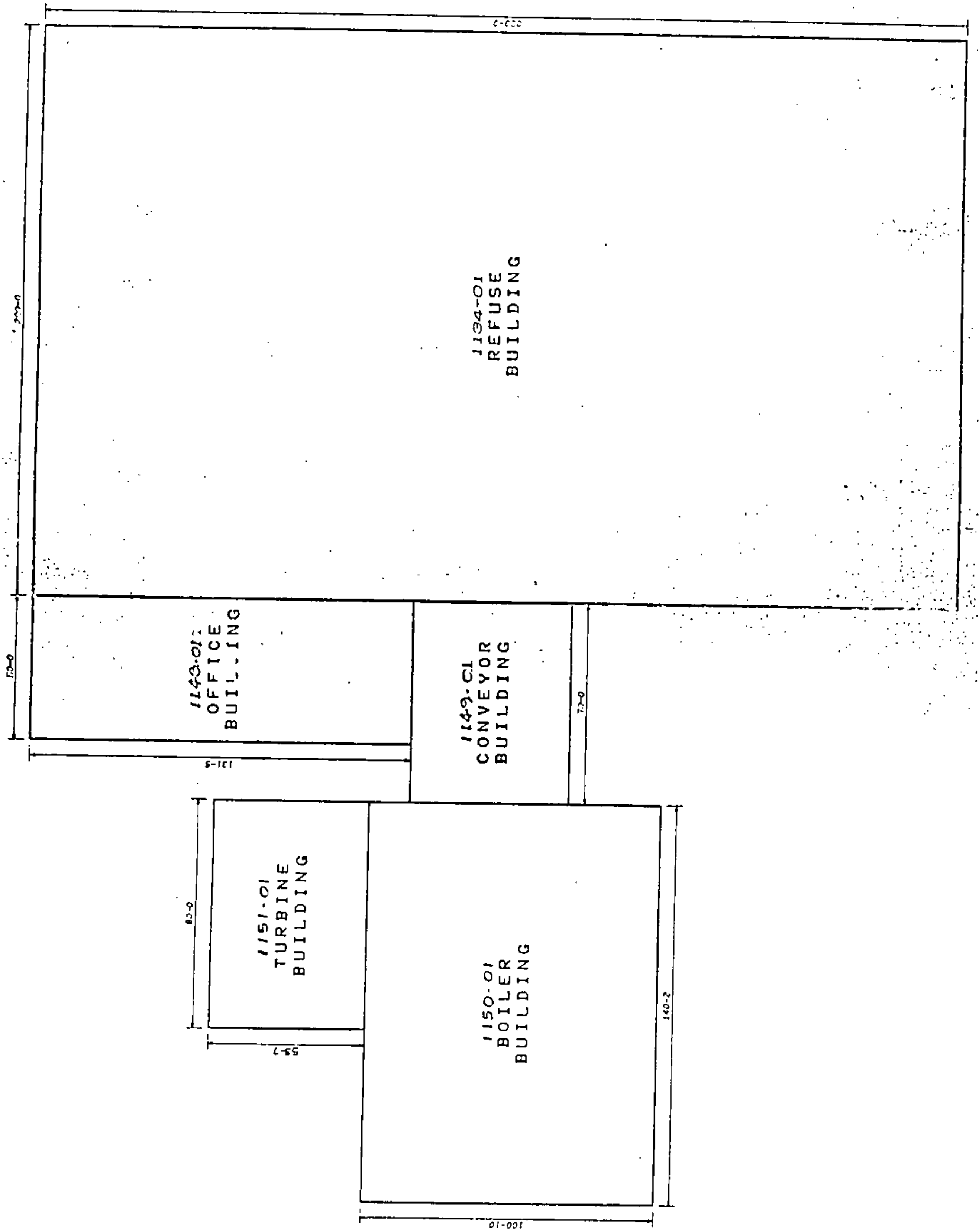
The additional annual SO_2 emissions that would be emitted when burning 510 TPD MSW instead of burning 350 TPD MSW would be a maximum of 90 tons. EPA or other State Agencies have not required any W-T-E facilities to retrofit their plants with acid gas control equipment. The high capital cost ($2,338,000), lost revenue ($501,000), annual operating cost ($283,773) and high EUAC ($617,379) cannot be justified for removing a small incremental amount of SO_2 (90 tons per year) and HCl (17 tons per year), that would be emitted if the facility were permitted at the original design capacity. In addition, the plant layout would most likely make it difficult, if not impossible, to retrofit dry scrubbers (spray dryers) in front of the existing ESP's. Therefore, BACT for this facility should be the same as approved by the Florida DER in 1984, and no add-on acid gas control equipment should be required.

EXHIBITS

Exhibit 1

```
DATE:     02/02/88
TIME:     10:58 AM

LEVEL 1 VISIBILITY SCREENING ANALYSIS


DISTANCE TO RECEPTOR (X) Km                                 112
BACKGROUND VISUAL RANGE (Rvo) Km                             25    MT/DAY
SIGMA Z AT RECEPTOR LOCATION (Oz) m                         100     -----
SO2 EMISSION RATE (QSO2) TPY                                313     0.778
NOx EMISSION RATE (QNOx) TPY                                223     0.554
PARTICULATE EMISSION RATE (QPart) TPY                        59     0.147


P = PLUME DISPERSION PARAMETER
Tpart = PARTICULATE OPTICAL THICKNESS PARAMETER
TNOx = NITROGEN OXIDE OPTICAL THICKNESS PARAMETER
TSO2 = SULFUR DIOXIDE OPTICAL THICKNESS PARAMETER
Taerosol = AEROSOL OPTICAL THICKNESS PARAMETER
C1 = PLUME CONTRAST AGAINST THE SKY
C2 = PLUME CONTRAST AGAINST THE TERRAIN
C3 = CHANGE IN SKY/TERRAIN CONTAST CAUSED BY AEROSOL

     P = 17857.14
 Tpart = 0.002618
  TNOx = 0.001682
 Taero = 0.000308

                      C1 =    -5.10E-05
                      C2 =     3.91E-06
                      C3 =     1.14E-04
```

Exhibit 2



INRYCO No Drwg #

Exhibit 3

PROJECT BAY CO

SUBJECT PERMIT MODIFICATION

BY DMP DATE JAN 28 1988

CHKD. BY ______ DATE ______ SHEET NO. 1 OF 2

CAVITY EFFECTS SCREENING

STEP #1

CALCULATE CAVITY HEIGHT (Hc)

$$Hc = H + 0.5(L)$$

H = Height of structure = 99.7 ft (30.4 m)
L = Lesser dimension of projected height or width.

projected width = 173', therefore L = 99.7 ft

$$Hc = 99.7 + .5(99.7) = \underline{149.6 \text{ ft}}$$

STACK HGT = 125 ft

SINCE STACK HGT < CAVITY HGT GO TO NEXT STEP (STEP #2)

STEP #2

MOMENTUM FLUX (Fm) = $\frac{T_A}{T_S} \frac{V^2 d^2}{4}$

T_A = AMBIENT AIR TEMP (°K) (ASSUME 293°K)

T_S = STACK EXIT GAS TEMP (°K) (497°K)

v = STACK EXIT GAS VELOCITY (M/S) (20m/s)

d = STACK INNER DIAMETER (m) (1.94 m)

$$F_M = \left(\frac{293}{497}\right) \frac{20^2\ 1.94^2}{4} = 221.9$$

RESD - FORM 49650

PROJECT

SUBJECT

BY DATE

CHKD. BY DATE SHEET NO. 2 OF 2

CALCULATE MOMENTUM PLUME RISE (hm)

$$hm = \left[\frac{3 Fm (x)}{b^2 u^2}\right]^{1/3}$$

$b = (1/3 + 4/N) = \frac{1}{3} + \left(\frac{7.5}{20}\right) = 0.708$

u = critical wind speed (m/s) (assume 7.5 m/s)

x = downwind distance (m) (assume 2 building heights downwind)

$$hm = \left[\frac{3(221.9)(60.8)}{(.708)^2 (7.5)^2}\right]^{\frac{1}{3}} = 11.3 \text{ m} = 36.9 \text{ ft}$$

PLUME HGT = 36.9 + 125 = 161.9 ft

SINCE CAVITY HGT < PLUME HGT, IT MAY BE ASSUMED THAT MAXIMUM IMPACTS WILL BE DOMINATED BY WAKE EFFECTS AND NO FURTHER CAVITY ANALYSIS IS REQUIRED

RESD - FORM 49650

Exhibit 4

```
     ISCST (DATED 86322)
     AN AIR QUALITY DISPERSION MODEL IN
     SECTION 1.  GUIDELINE MODELS
     IN UNAMAP (VERSION 6)  JULY 86.
     BOWMAN ENVIRONMENTAL ENGINEERING REV.6.2
               *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


 CALCULATE (CONCENTRATION=1,DEPOSITION=2)                            ISW(1) =   1
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)             ISW(2) =   4
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                    ISW(3) =   2
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                            ISW(4) =   0
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                       ISW(5) =   0
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                    ISW(6) =   2

 COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
 WITH THE FOLLOWING TIME PERIODS:
   HOURLY (YES=1,NO=0)                                               ISW(7) =   1
   2-HOUR (YES=1,NO=0)                                               ISW(8) =   0
   3-HOUR (YES=1,NO=0)                                               ISW(9) =   0
   4-HOUR (YES=1,NO=0)                                              ISW(10) =   0
   6-HOUR (YES=1,NO=0)                                              ISW(11) =   0
   8-HOUR (YES=1,NO=0)                                              ISW(12) =   0
   12-HOUR (YES=1,NO=0)                                             ISW(13) =   0
   24-HOUR (YES=1,NO=0)                                             ISW(14) =   0
 PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                                ISW(15) =   0

 PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
 SPECIFIED BY ISW(7) THROUGH ISW(14):
   DAILY TABLES (YES=1,NO=0)                                        ISW(16) =   0
   HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                     ISW(17) =   1
   MAXIMUM 50 TABLES (YES=1,NO=0)                                   ISW(18) =   1
 METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)          ISW(19) =   2
 RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)  ISW(20) =   0
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)          ISW(21) =   3
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)   ISW(22) =   3
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                  ISW(23) =   0
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)              ISW(24) =   2
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)        ISW(25) =   1
 PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)              ISW(26) =   1
 CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)            ISW(27) =   2
 REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                            ISW(28) =   2
 TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                   ISW(29) =   2
 DEBUG OPTION CHOSEN (1=YES,2=NO)                                   ISW(30) =   2

 NUMBER OF INPUT SOURCES                                             NSOURC =   1
 NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                            NGROUP =   0
 TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)                IPERD =   0
 NUMBER OF X (RANGE) GRID VALUES                                     NXPNTS =  20
 NUMBER OF Y (THETA) GRID VALUES                                     NYPNTS =   1
 NUMBER OF DISCRETE RECEPTORS                                        NXWYPT =   0
 NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA                       NHOURS =  21
 NUMBER OF DAYS OF METEOROLOGICAL DATA                                 NDAYS =   1
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR                           TK=.10000E+07
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                  ZR =  10.00  METERS
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                            IMET =   5
 ALLOCATED DATA STORAGE                                               LIMIT = 43500 WORDS
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                           MIMIT =   577 WORDS
```

Exhibit 4 (continued)

```
1

                              *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***



                               *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                                      (METERS/SEC)

                                          1.54,    3.09,    5.14,    8.23,  10.80,


                                            *** RANGES OF POLAR GRID SYSTEM ***
                                                       (METERS)

       100.0,      150.0,      200.0,      250.0,      300.0,      350.0,      400.0,      450.0,      500.0,      600.0,
       700.0,      800.0,      900.0,     1000.0,     1100.0,     1250.0,     1500.0,     1750.0,     2000.0,   115000.0,



                                         *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                                       (DEGREES)


       360.0,
1

                              *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                                                  *** SOURCE DATA ***

                 EMISSION RATE                                               TEMP.   EXIT VEL.
                   TYPE=0,1                                                  TYPE=0   TYPE=0
       T W       GRAMS/SECOND                                                (DEG.K); (M/SEC);           BLDG.    BLDG.    BLDG.
       Y A NUMBER  TYPE=2                               BASE                 VERT.DIM HORZ.DIM DIAMETER  HEIGHT   LENGTH   WIDTH
SOURCE P K  PART.  GRAMS/SECOND      X        Y         ELEV.    HEIGHT      TYPE=1   TYPE=1,2  TYPE=0   TYPE=0   TYPE=0   TYPE=0
NUMBER E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS) (METERS) (METERS) (METERS) (METERS) (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     1 0 1    0    .90100E+01       .0        .0       .0     38.10   497.00    20.00     1.94    30.40    46.70    46.70
```

Exhibit 4 (continued)

```
1                                                                                    MET. DATA
                                                                                     DAY    1
                         *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                                   * METEOROLOGICAL DATA FOR DAY    1 *


                                                           POT. TEMP.
                 FLOW       WIND      MIXING                GRADIENT                WIND      DECAY
                VECTOR      SPEED     HEIGHT      TEMP.     (DEG. K    STABILITY  PROFILE  COEFFICIENT
         HOUR  (DEGREES)    (MPS)    (METERS)   (DEG. K)  PER METER)   CATEGORY   EXPONENT  (PER SEC)
         - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

           1     360.0      1.00     5000.0     293.0       .0000         1        .0700   .000000E+00
           2     360.0      3.00     5000.0     293.0       .0000         1        .0700   .000000E+00
           3     360.0      1.00     5000.0     293.0       .0000         2        .0700   .000000E+00
           4     360.0      3.00     5000.0     293.0       .0000         2        .0700   .000000E+00
           5     360.0      5.00     5000.0     293.0       .0000         2        .0700   .000000E+00
           6     360.0      1.00     5000.0     293.0       .0000         3        .1000   .000000E+00
           7     360.0      3.00     5000.0     293.0       .0000         3        .1000   .000000E+00
           8     360.0      5.00     5000.0     293.0       .0000         3        .1000   .000000E+00
           9     360.0     10.00     5000.0     293.0       .0000         3        .1000   .000000E+00
          10     360.0      1.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          11     360.0      3.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          12     360.0      5.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          13     360.0     10.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          14     360.0     12.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          15     360.0     15.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          16     360.0     20.00     5000.0     293.0       .0000         4        .1500   .000000E+00
          17     360.0      1.00     5000.0     293.0       .0200         5        .3500   .000000E+00
          18     360.0      3.00     5000.0     293.0       .0200         5        .3500   .000000E+00
          19     360.0      5.00     5000.0     293.0       .0200         5        .3500   .000000E+00
          20     360.0      1.00     5000.0     293.0       .0350         6        .5500   .000000E+00
          21     360.0      3.00     5000.0     293.0       .0350         6        .5500   .000000E+00
1                                                                                     HIGH
                                                                                      1-HR
                                                                                     SGROUP#  1
                         *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                        * HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER       *
                                              * FROM ALL SOURCES *
                                            * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS     95.21388 AND OCCURRED AT (      100.0,      360.0) *
  DIRECTION /                                           RANGE (METERS)
  (DEGREES) /           100.0                150.0                200.0                250.0                300.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /    95.21388 (  1,14)    82.10432 (  1,14)    73.56684 (  1,14)    66.63422 (  1,14)    60.59106 (  1,14)
```

Exhibit 4 (continued)

```
1                                                                                                              HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                               *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)              ***


                              * HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER        *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                            * MAXIMUM VALUE EQUALS     95.21388 AND OCCURRED AT (      100.0,      360.0) *

 DIRECTION /                                                    RANGE (METERS)
 (DEGREES) /             350.0                 400.0                 450.0                 500.0                 600.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     52.60318 (  1,14)     44.51280 (  1,14)     38.38325 (  1,14)     33.60009 (  1,14)     28.09212 (  1,21)
1                                                                                                              HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                               *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)              ***


                              * HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER        *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                            * MAXIMUM VALUE EQUALS     95.21388 AND OCCURRED AT (      100.0,      360.0) *

 DIRECTION /                                                    RANGE (METERS)
 (DEGREES) /             700.0                 800.0                 900.0                1000.0                1100.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     26.30740 (  1,21)     24.75912 (  1,21)     23.41754 (  1,21)     22.25183 (  1,21)     21.23410 (  1,21)
1                                                                                                              HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                               *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)              ***


                              * HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER        *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                            * MAXIMUM VALUE EQUALS     95.21388 AND OCCURRED AT (      100.0,      360.0) *

 DIRECTION /                                                    RANGE (METERS)
 (DEGREES) /            1250.0                1500.0                1750.0                2000.0              115000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     20.06543 (  1,20)     18.94719 (  1,20)     17.38367 (  1,20)     16.62422 (  1,20)      2.91672 (  1,20)
```

Exhibit 4 (continued)

```
1                                                                                                              2ND HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                              *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                         * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER       *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS     93.21873 AND OCCURRED AT (     100.0,     360.0) *

 DIRECTION /                                                RANGE (METERS)
 (DEGREES) /            100.0                150.0                200.0                250.0                300.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     93.21873 (  1,15)     80.69930 (  1,15)     72.05385 (  1,15)     65.12984 (  1,13)     59.62916 (  1,13)
1                                                                                                              2ND HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                              *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                         * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER       *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS     93.21873 AND OCCURRED AT (     100.0,     360.0) *

 DIRECTION /                                                RANGE (METERS)
 (DEGREES) /            350.0                400.0                450.0                500.0                600.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     51.58674 (  1,13)     43.61423 (  1,15)     37.99301 (  1,15)     33.56395 (  1,15)     27.05566 (  1,15)
1                                                                                                              2ND HIGH
                                                                                                                1-HR
                                                                                                               SGROUP#  1
                              *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***


                         * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER       *
                                                  * FROM ALL SOURCES *
                                                * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS     93.21873 AND OCCURRED AT (     100.0,     360.0) *

 DIRECTION /                                                RANGE (METERS)
 (DEGREES) /            700.0                800.0                900.0               1000.0               1100.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     23.66951 (  1,20)     22.88909 (  1,20)     22.16106 (  1,20)     21.49118 (  1,20)     20.87963 (  1,20)
```

Exhibit 4 (continued)

```
1                                                                                                                   2ND HIGH
                                                                                                                     1-HR
                                                                                                                    SGROUP#  1
                                   *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***

                               * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER      *
                                                        * FROM ALL SOURCES *
                                                      * FOR THE RECEPTOR GRID *

                                * MAXIMUM VALUE EQUALS     93.21873 AND OCCURRED AT (     100.0,     360.0) *

 DIRECTION /                                                RANGE (METERS)
 (DEGREES) /          1250.0              1500.0              1750.0              2000.0            115000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     19.93412 (  1,21)     18.22436 (  1,21)     16.42311 (  1,21)     15.36739 (  1,21)      2.02210 (  1,17)

1                                                                                                                   MAX 50
                                                                                                                     1-HR
                                                                                                                    SGROUP#  1
                                   *** DOWNWASH ANALYSIS FOR BAY CO. 1-29-88 (BCDNW2.INP)          ***

                                * 50 MAXIMUM  1-HOUR AVERAGE CONCENTRATION MICROGRAMS/CUBIC METER       *

                                                        * FROM ALL SOURCES *

                                             X      Y(METERS)                                               X      Y(METERS)
                                             OR        OR                                                   OR        OR
                                           RANGE   DIRECTION                                              RANGE   DIRECTION
       RANK        CON.      HOUR DAY    (METERS)  (DEGREES)        RANK        CON.      HOUR DAY    (METERS)  (DEGREES)
   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

         1       95.21388   14     1      100.0      360.0           26       58.52594   15     1      300.0      360.0
         2       93.21873   15     1      100.0      360.0           27       57.83393   19     1      300.0      360.0
         3       92.74844   13     1      100.0      360.0           28       55.08630   21     1      200.0      360.0
         4       85.73943   19     1      100.0      360.0           29       53.31984    9     1      150.0      360.0
         5       84.89458   16     1      100.0      360.0           30       52.60318   14     1      350.0      360.0
         6       82.10432   14     1      150.0      360.0           31       52.39719   16     1      300.0      360.0
         7       80.69930   15     1      150.0      360.0           32       52.19132   21     1      250.0      360.0
         8       79.58960   13     1      150.0      360.0           33       51.58674   13     1      350.0      360.0
         9       73.69957   16     1      150.0      360.0           34       50.95802   15     1      350.0      360.0
        10       73.56684   14     1      200.0      360.0           35       49.89961   21     1      300.0      360.0
        11       73.08064   19     1      150.0      360.0           36       49.49949   12     1      100.0      360.0
        12       72.05385   15     1      200.0      360.0           37       47.76849   19     1      350.0      360.0
        13       71.50022   13     1      200.0      360.0           38       47.72138    9     1      200.0      360.0
        14       69.72848   21     1      100.0      360.0           39       45.71952   16     1      350.0      360.0
        15       66.63422   14     1      250.0      360.0           40       44.51280   14     1      400.0      360.0
        16       66.46174   19     1      200.0      360.0           41       43.61423   15     1      400.0      360.0
        17       65.50676   16     1      200.0      360.0           42       43.42581    9     1      250.0      360.0
        18       65.12984   13     1      250.0      360.0           43       43.13208   13     1      400.0      360.0
        19       64.84527   15     1      250.0      360.0           44       40.80914   12     1      150.0      360.0
        20       62.75271    9     1      100.0      360.0           45       39.77160    9     1      300.0      360.0
        21       61.75342   19     1      250.0      360.0           46       39.66641   21     1      350.0      360.0
        22       60.59106   14     1      300.0      360.0           47       39.54180   16     1      400.0      360.0
        23       59.64697   21     1      150.0      360.0           48       38.38325   14     1      450.0      360.0
        24       59.62916   13     1      300.0      360.0           49       37.99301   15     1      450.0      360.0
        25       58.52703   16     1      250.0      360.0           50       37.48356    9     1      350.0      360.0
```

DATE: 87/04/16

COMPARISON OF AIR QUALITY DATA WITH THE NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT: SULFUR DIOXIDE STATE: 10 FLORIDA YEAR: 1986

CNTY	AREA	SITE	LOCATION	SMPLNG PERIOD	METH	NUM OBS	M A X I M A 1-HOUR		3-HOUR		24-HOUR		ARTH MEAN	GSD	EXCEEDANCES * 3HR	24HR	ANNL
							1ST	2ND	1ST	2ND	1ST	2ND			#>1300	#>260	AM>60
ALACH	1420	023 F02	GAINESVILLE/ NW 53AVE & NW 43ST BEHIND	JAN-DEC	20	8067	118	118	83	79	23	22	4	1.69			
BAY	2420	002 J02	/ SMITH S REMOTE LYNN HAVEN, BAY CO	OCT-DEC	16	2113	325	309	278	269	100	62	10	2.83			
	2420	003 J02	LYNN HAVEN/ SMITH W REMOTE LYNN HAVEN,	OCT-DEC	16	2071	118	102	80	70	27	26	5	2.04			
	2420	004 J02	LYNN HAVEN/ SMITH N REMOTE LYNN HAVEN,	OCT-DEC	16	2091	160	139	113	81	27	22	5	1.83			
	2420	005 J02	LYNN HAVEN/ SMITH E REMOTE LYNN HAVEN,	OCT-DEC	16	2117	100	97	71	55	20	17	3	1.40			
BRWRD	0910	002 G01	DAVIE/ U OF F AG RSCH, 3205 SW 70TH AV,	JAN-DEC	97	58					5	4	3	1.10			
	1260	003 G01	FT LAUDERDALE/ 2101 NW 6TH ST, FT LAUDE	JAN-DEC	97	55					9	8	3	1.29			
	1260	004 G01	FT LAUDERDALE/ 500 SW 14TH COURT #12, F	JAN-DEC	97	61					21	8	3	1.42			
	1260	004 G09	FT LAUDERDALE/ 500 SW 14TH COURT #12, F	JAN-DEC	97	61					25	12	3	1.48			
	2270	001 G01	LAUDERDALE LAKES/ AIR LAB I, 3701 N SR	JAN-DEC	97	61					6	5	3	1.20			
	2270	001 G09	LAUDERDALE LAKES/ AIR LAB I, 3701 N SR	JAN-DEC	97	61					6	6	3	1.22			
	3530	001 G01	PEMBROKE PINES/ PEMBROKE PINES PLT 2, 7	JAN-DEC	97	60					3	3	2	1.00			
CTRUS	0580	003 J02	CRYSTAL RIVER/ TWIN RIVERS MARINA OFN H	JAN-DEC	20	6112	210	183	141	104	20	17	3	1.45			
	0580	005 J02	CRYSTAL RIVER/ E OF FPC PLT, NEAR RT-D-	JAN-DEC	20	6481	254	223	203	176	45	36	6	1.98			
DADE	0860	030 N01	DADE COUNTY/ EVERGLADES NATL. PARK DAN	MAY-DEC	20	4527	26	18	20	16	12	11	3	1.44			
DUVAL	1960	032 H02	JACKSONVILLE/ KOOKER PARK 2900 BENNETT	JAN-DEC	20	7994	275	262	210	162	70	57	10	2.68			
	1960	079 H02	JACKSONVILLE/ FT CAROLINE STP, JACKSONV	JAN-DEC	20	6729	275	183	144	131	55	54	10	2.75			
	1960	080 H02	JACKSONVILLE/ 1605 MINERVA ST JACKSONVI	JAN-DEC	20	7795	603	537	541	476	217	217	13	2.90			
	1960	081 H02	JACKSONVILLE/ CEDAR BAY STP, 1840 CEDAR	JAN-DEC	20	7860	328	328	321	245	63	53	10	2.61			
	1960	093 H02	JACKSONVILLE/ 5060 CEDAR POINT ROAD	APR-OCT	20	3072	314	301	227	218	43	42	8	2.38			
	1960	094 H02	JACKSONVILLE/ 9501 AUGUST RD.	APR-DEC	20	4993	262	262	258	196	91	72	9	2.61			
ESCAM	3540	003 F02	PENSACOLA/ UNIV OF W FL, PENSACOLA, ESC	JAN-DEC	97	56					155	79	23	1.53			
	3540	003 F09	PENSACOLA/ UNIV OF W FL, PENSACOLA, ESC	JAN-DEC	97	56					93	81	29	1.29			
	3540	004 F01	PENSACOLA/ ELLYSON INDUSTRIAL PARK , PE	JAN-DEC	20	5569	1032	697	770	435	148	122	14	2.93			
	3540	007 J02	PENSACOLA/ MONSANTO RMT LONG 8714421/2	OCT-DEC	16	1862	86	47	39	38	19	17	3	1.45			
	3540	008 J02	PENSACOLA/ CHUMACKLA RMT 8710511/2 LAT	OCT-DEC	16	2005	71	65	47	43	17	17	4	1.61			
	3540	009 J02	PENSACOLA/ EASTGATE RMT LONG 871220 LAT	OCT-DEC	16	2090	3	3	3	3	3	3	3	1.02			
	3540	010 J02	PENSACOLA/ BRUNSON RMT LONG 871307 LAT	OCT-DEC	16	1866	844	726	619	541	231	171	17	3.27			
	3540	011 J02	PENSACOLA/ GREENBRIAR REMOTE, PENSACOLA	OCT-DEC	16	1857	823	781	520	500	124	112	22	3.76			
	3540	012 J02	PENSACOLA/ BRENTWOOD RMT LONG 871528 LA	OCT-DEC	16	2108	679	561	566	218	118	82	14	3.23			
GADSD	0540	001 J02	CHATTAHOOCHEE/ SCHOLZ E REMOTE, CHATTAH	OCT-DEC	16	2075	550	432	369	225	64	43	6	2.00			
	0540	002 J02	CHATTAHOOTCHEE/ SCHOLZ S REMOTE CHATTAH	OCT-DEC	16	2005	76	58	48	30	7	5	3	1.20			
HAMIL	1660	015 F02	WHITE SPRINGS/ COUNTY RD 137 AT ENTRANC	JAN-DEC	20	5182	1271	917	773	646	314	233	16	3.19		1	
HILLS	1800	021 G02	/ TECO =2 BB CO BARN ON BIG BEND RD, HI	JAN-DEC	20	8673	838	776	615	475	101	99	16	2.75			
	1300	084 G02	APALLO BEACH/ APOLLO BEACH, MILLER MAC	JAN-DEC	20	8408	776	569	488	397	110	91	13	2.80			
	1800	095 G02	TAMPA/ 5012 CAUSEWAY BLVD TAMPA(GANNON)	JAN-DEC	20	8412	786	563	364	360	90	84	22	2.83			
	1800	099 G02	HILLSBOROUGH COUNTY/ ALLEN RD. BETWEEN	JAN-DEC	20	8312	479	458	321	218	65	59	11	2.53			
	1800	106 J02	NORTH RUSKIN/ BIG BEND RD. 1.5 MI EAST	APR-DEC	20	6182	948	927	566	530	104	97	11	2.59			
	1800	107 J02	NORTH RUSKIN/ BULLFROG CREEK COUNTY PAR	APR-DEC	20	6116	1247	747	477	465	92	91	12	2.60			
	4360	035 G02	TAMPA/ COAST GUARD STA DAVIS IS, TAMPA,	JAN-DEC	20	8258	498	466	361	350	83	77	20	2.64			
	4360	052 G01	TAMPA/ HCEPC OFC, YBOR CITY, HILLSBOROU	JAN-DEC	20	8575	734	694	644	467	141	133	26	2.27			
	4360	053 G02	TAMPA/ BALLAST PT PARK, INTERBAY BLVD,	JAN-DEC	20	8475	571	479	417	340	86	84	20	2.65			
HOLME	1860	002 J02	CARRYVILLE/ ELLIS S REMOTE, CARRYVILLE,	OCT-DEC	16	2096	477	252	161	95	31	18	4	1.61			
IND R	4580	003 J01	VERO BEACH/ PUBLIC WORKS, 27TH ST, VERO	JAN-JAN	97	5					4	4	2	1.00			
	4580	004 J02	VERO BEACH/ CITY HALL-POLICE STA, VERO	JAN-JAN	97	4					4	3	2	1.00			
JACKS	1940	001 J02	SNEADS/ SCHOLZ W REMOTE, SNEADS, JACKSO	OCT-DEC	16	2012	631	576	354	342	108	68	8	2.16			

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* THE AIR QUALITY STANDARDS FOR SO2 ARE AN ANNUAL ARITHMETIC AVERAGE OF 60 UG/M3, A MAXIMUM 24-HOUR CONCENTRATION OF 260 UG/M3 NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR, AND A MAXIMUM 3-HOUR CONCENTRATION OF 1300 UG/M3 NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

Exhibit 5

**Westinghouse
Electric Corporation**

**Resource Energy Systems
Division**

Cost Building
2400 Ardmore Boulevard
Pittsburgh Pennsylvania 15221
(412) 636 5800
WIN 261 5800

ENG/MG:DSB:88-012

January 18, 1988

DER
FEB 05
BAQM

Mr. Clair Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399

Dear Clair,

Enclosed are three copies of the permit application to modify the construction permit to increase the operating capacity at the Bay County Resource Management Center from the permitted level of 350 tons per day of municipal solid waste (MSW) to 510 tons per day MSW.

As you know from previous conversations and correspondence, the facility was originally designed to combust 510 tons per day MSW based on an HHV of 4500 Btu/lb. The Bay County officials are requesting this increase in permitted capacity so that the facility can operate as a regional resource recovery facility for Bay County and the surrounding counties.

If you have any questions please call me at (412) 636-5806 or Spencer Brady at (412) 636-5854. Thank you, in advance, for the expeditious review of this permit application.

Sincerely,

David S Beachler

D. S. Beachler, Manager
Environmental and Quality Engineering

Enclosures

cc: S. J. Brady
J. J. Zebroski (w/o enclosures)

Helen,
PLEASE MAKE 1 COPY
OF ATTACHED AND MAIL
IT TO :
MR DHRUMAN SHAH
MICHIGAN DNR
AIR QUALITY DIVISION
P.O. BOX 30028
LANSING, MICHIGAN 48909
THANKS
P.

Completed

P.S. ① Return only to me.
② don't copy GREEN CARD

BAY COUNTY

RESOURCE MANAGEMENT CENTER

APPLICATION TO MODIFY THE COMBUSTION PROCESS RATE

TABLE OF CONTENTS

STATE OF FLORIDA Subcocu 03 Receipt #117346

DEPARTMENT OF ENVIRONMENTAL REGULATION

V #691151
$500.00

DER AC03-145061

FEB 05, 1988

BAQM

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Resource Recovery Facility with 2 combustor/boiler units [ ] New[1] [X] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [x] Modification

COMPANY NAME: Bay Resource Management Center COUNTY: Bay

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) 2 MSW-fired combustor/boilers w/ESP & separate flues.

SOURCE LOCATION: Street U.S. Highway 231 City Panama City

UTM: East 644.1 North 3348.9

Latitude 30 ° 15 ' ____ "N Longitude 85 ° 30 ' ____ "W

APPLICANT NAME AND TITLE: Bay Resource Management Center

APPLICANT ADDRESS: c/o Westinghouse RESD, Cost Bldg., 2400 Ardmore Blvd., Pittsburgh, PA 15221; Attention: David S. Beachler

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Bay County

I certify that the statements made in this application for a modification permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: D. S. Beachler

D. S. Beachler, Manager, Environmental Eng.
Name and Title (Please Type)

Date: 1/18/88 Telephone No. (412)636-5806

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

---

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

CHARLES B. SPEICHER
No. 15472-E

Signed Charles B. Speicher, P.E.

C. B. Speicher
Name (Please Type)

Westinghouse RESD
Company Name (Please Type)

Cost Bldg., 2400 Ardmore Blvd.,
Pittsburgh, PA 15221
Mailing Address (Please Type)

Penna. ~~Florida~~ Registration No. 15472-E Date: 1-18-88 Telephone No. (412)636-5840

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See Attachment A

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction NA Completion of Construction NA

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Two Electrostatic Precipitators $1,046,000

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

AC-03-84703 Jan. 31, 1988

AC-03-84704 Jan. 31, 1988

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

DER
FEB 5
BAQM

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Resource Recovery Facility with 2 combustor/boiler units [ ] New[1] [XX] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [XX] Modification

COMPANY NAME: Bay Resource Management Center **COUNTY:** Bay

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) 2 MSW-fired combustor/boilers w/ESP & separate flues.

SOURCE LOCATION: **Street** U.S. Highway 231 **City** Panama City

UTM: **East** 644.1 **North** 3348.9

Latitude 30 ° 15 ' "N **Longitude** 85 ° 30 ' "W

APPLICANT NAME AND TITLE: Bay Resource Management Center

APPLICANT ADDRESS: c/o Westinghouse RESD, Cost Bldg., 2400 Ardmore Blvd., Pittsburgh, PA 15221; Attention: David S. Beachler

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*Attach letter of authorization

Signed: David S. Beachler

D.S. Beachler, Manager, Environmental Eng.
Name and Title (Please Type)

Date: 2/3/88 Telephone No. (412) 636-5806

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

---

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed

Alan F. Richter
Name (Please Type)

STV ENGINEERS, INC.
Company Name (Please Type)

11 Robinson Street, Pottstown, PA 19464
Mailing Address (Please Type)

Florida Registration No. 13826 Date: 2-1-88 Telephone No. 215/326-4600

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See Attachment A

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction NA Completion of Construction NA

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Two Electrostatic Precipitators $1,046,000

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

AC-03-84703 Jan. 31, 1988

AC-03-84704 Jan. 31, 1988

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr 8760 if seasonal, describe: This facility is expected to be in continuous operation except for maintenance outages. Full capacity of the plant is 510 TPD MSW. Wood waste and bark will be burned as supplemental fuel.

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? NO
   - a. If yes, has "offset" been applied? N/A
   - b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A
   - c. If yes, list non-attainment pollutants. N/A
2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. YES
3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. YES
4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? YES
5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? NO

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? NO

   - a. If yes, for what pollutants?
   - b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable: N/A

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): 42,500 lb/hr MSW total (21,250 lb/hr each)
2. Product Weight (lbs/hr): 136,000 lb/hr total steam (68,000 lb/hr per unit)

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

FOR EACH UNIT - SEE ATTACHMENT B

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/	T/yr	
Particulate Matter	6.76	29.5	0.03 gr/dscf*	6.76	676	2962	
SO_2	35.8	157			35.8	157	
CO	38.0	167			38.0	167	
NO_x	25.6	112			25.6	112	
HC	2.1	9			2.1	9	
Pb	0.041	0.18			4.23	18.5	

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

[4] Emission, if source operated without control (See Section V, Item 3).

*Per permit conditions AC-03-84703 and AC-03-84704.

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Electrostatic Precipitator	particulate/lea	99+	1 to 20 microns	manufacture guarantee
Environmental				and stack test 6/87.
Elements Corp.				

E. Fuels FOR EACH UNIT

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Municipal Solid Waste	21,250	23,375	95.6
Wood Waste and Bark	--	9,201	48.2
NO. 2 Fuel Oil	Start-up & Shutdown 200 gph		30

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: 0.16 Percent Ash: 27.58

Density: N/A lbs/gal Typical Percent Nitrogen: 0

Heat Capacity: 4500 BTU/lb N/A BTU/gal

Other Fuel Contaminants (which may cause air pollution): Primary fuel is MSW. Small quantities of lead are present. No hazardous waste will be accepted for burning.

F. If applicable, indicate the percent of fuel used for space heating. N/A

Annual Average ______ Maximum ______

G. Indicate liquid or solid wastes generated and method of disposal.

Bottom ash and fly ash are comingled and transported to Bay County landfill. All sanitary waste water, boiler blowdown, building washdown, and some cooling tower blowdown flow through the sanitary sewer to the Bay County Sewage Treatment Plant.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 2 flues, 1 stack, 125 ft. Stack Diameter: 4.5 ft.

Gas Flow Rate: 54,800 ACFM 26,300 DSCFM Gas Exit Temperature: 435 °F.

Water Vapor Content: 16 % Velocity: 66 FPS

SECTION IV: INCINERATOR INFORMATION

PER UNIT

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated	638	--3	188--	17425			
Uncontrolled (lbs/hr)	---	372 lb/hr	max ---	---			

Description of Waste MSW occasionally supplemented by wood waste

Total Weight Incinerated (lbs/hr) 21,250 per unit Design Capacity (lbs/hr) 21,250 per unit

Approximate Number of Hours of Operation per day 24 day/wk 7 wks/yr. 52

Manufacturer Westinghouse/O'Connor Corporation

Date Constructed 1986 Model No. RC-120 (two units)

N/A	Volume (ft)^3	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: 125 ft. Stack Diamter: 4.5 ft each flue Stack Temp. 435°F

Gas Flow Rate: 54,800 ACFM 26,300 DSCFM* Velocity: 66 FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☒ Other (specify) ESP

Brief description of operating characteristics of control devices: Electrostatic precipitator with approximately 99+% particulate emission removal efficiency and designed to meet 0.02 gr/dscf corrected to 12% CO_2 and guaranteed to meet 0.03 gr/dscf corrected to 12% CO_2.

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

Bottom ash and fly ash are co-mingled and transported to Bay County landfill. All sanitary wastewater, boiler blowdown, building washdown, and some cooling tower blowdown flow into the sanitary sewer and are treated in the Bay County Sewage Treatment plant.

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
   SEE ATTACHMENT C
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
   SEE ATTACHMENT B
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   SEE ATTACHMENT D
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
   SEE ATTACHMENT J
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).
   SEE ATTACHMENTS D AND E
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
   SEE ATTACHMENT F
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
   SEE ATTACHMENT G
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
   SEE ATTACHMENT G

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation. Check for $1000 ($500 per combustor/boiler) to be submitted later.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit. Previously submitted application for "Operation Permit" to district office in October 1987.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[X] Yes [ ] No

Contaminant	Rate or Concentration
Particulate Matter	0.08 grams per dscf, corrected to 12% CO_2 from 40 CFR Part 60.52

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [X] No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
Particulate Matter	0.03 gr/dscf, corrected to 12% CO_2
CO	38.0 lb/hr
NO_X	25.6 lb/hr
SO_2	35.8 lb/hr

D. Describe the existing control and treatment technology (if any).

1. Control Device/System: ESP's
2. Operating Principles: electrostatic precipitation
3. Efficiency:* 99+%
4. Capital Costs: $1,046,000

*Explain method of determining Stack Test 6/87, see Attachment B.

5. **Useful Life:** 20 years

6. **Operating Costs:** $30,000/yr

7. **Energy:** 60 kw

8. **Maintenance Cost:** $30,000/yr

9. **Emissions:** Less than 0.03 gr/dscf

Contaminant	Rate or Concentration
Particulate Matter	Less than 0.03 gr/dscf
Lead	0.041 lb/hr
Visible Emissions	Less than 10% opacity and up to 20% for 3 minutes in any hour according to permit conditions

10. **Stack Parameters**

a. Height: 125 ft, 2 flues ft.

b. Diameter: 4.5 ft.

c. Flow Rate: 54,800 ACFM

d. Temperature: 435 °F.

e. Velocity: 66 FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary). See BACT analysis as provided as Attachment E.

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

---

[1] Explain method of determining efficiency.

[2] Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

---

[1] Explain method of determining efficiency.

[2] Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

---

[1] Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data No preconstruction monitoring was required.

1. ________no. sites ________ TSP ________( ) SO^2* ________ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded ________________________________

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling See Attachment H.

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)______________________

3. Upper air (mixing height) data obtained from (location)______________________

4. Stability wind rose (STAR) data obtained from (location)______________________

C. Computer Models Used See Attachment H.

1. ______________________ Modified? If yes, attach description.

2. ______________________ Modified? If yes, attach description.

3. ______________________ Modified? If yes, attach description.

4. ______________________ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	NA	grams/sec
SO^2		grams/sec

E. Emission Data Used in Modeling See Attachment H.

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review. See Attachment H.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources. See Attachment E.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology. See Attachment E.

ATTACHMENT A

ATTACHMENT A

GENERAL PROJECT INFORMATION

This project involves the modification of a resource recovery facility that generates steam-electric power by burning the combustible fraction of municipal solid waste generated within Bay County. The project is the major part of the Bay County Commission's response to solid waste management planning for the future. Please note that the plant capacity will be sufficient to accommodate Bay County's municipal solid waste for well into the 21st century.

The facility consists of two (2) O'Connor RC 120 combustor units with provision for future addition of a third unit. By this application, an increase in the maximum municipal solid waste capacity from the currently permitted 350 tons per day to 510 tons per day is requested. Waste wood and bark is used as a supplemental fuel to maximize plant capacity factor and revenues. Steam produced in the two incinerator/boilers is used to produce electrical energy by turbine generators, which is sold to Gulf Power Company.

Electrostatic precipitators are used for control of particulate emissions from the incinerator/boilers. This choice is based upon successful operating experience with this control technology in resource recovery facilities utilizing waterwall boilers for the incineration of municipal solid waste in Nashville, Tennessee; Saugus, Massachusetts; Hampton, Virginia; and Pinellas County, Florida. The design criteria for particulate emissions from the precipitators will be 0.03 grains per standard cubic foot, corrected to 12% CO_2. This represents a particulate removal efficiency of approximately 99%. The electrostatic precipitator is a proven method in use on MSW fired waterwall boilers in the United States that meets or exceeds all air quality standards.

ATTACHMENT B

ATTACHMENT B-1

BAY COUNTY, FLORIDA WASTE-TO-ENERGY FACILITY AIR EMISSION TESTS

DAVID S. BEACHLER, JILL WELDON, D. MICK POMPELIA
WESTINGHOUSE ELECTRIC CORPORATION
RESOURCE ENERGY SYSTEMS DIVISION (RESD)
PITTSBURGH, PA 15221

Air emissions were measured at the Bay County Waste-to-Energy Plant in Panama City, Florida. Concentrations for particulate and gaseous emissions were measured using test methods established by the U.S. Environmental Protection Agency (EPA) or by using continuous emission monitors.

The Bay County Facility is a 510-ton per day facility that uses two Westinghouse-O'Connor combustors and boiler trains to recover energy to generate approximately 11.5 MW of electricity. Each water-walled rotary combustor is designed to mass burn 255 tons of municipal solid waste (MSW) per day or a mixture of MSW and wood chips.

The plant began burning MSW during the spring of 1987. Emission compliance tests conducted in May and June, 1987 showed that the facility met the permit requirements of the Florida Department of Environmental Regulations.

Introduction

The Bay County Resource Management Center is located 10 miles Northeast of Panama City, Florida. Panama City is a resort community approximately 100 miles east of Pensacola, Florida, on the northwest coast of Florida's panhandle. The average population of this area is approximately 115,000. The average quantity of municipal solid (MSW) waste generated in Bay County during most of the year is 300 tons per day. However, during the summer months when the population increases to more than 150,000, the community must handle in excess of 350 tons of MSW per day. The County decided to design the facility to ultimately burn 510 tons of MSW to allow additional waste to be processed as the population and quantity of waste increased.

The facility began initial start-up equipment check-out, and instrument calibration in February 1987. Equipment start-up and adjustment was done from February through May. Emission testing was conducted from late April through early June. The emission compliance tests were completed on June 4-5, 1987. The facility acceptance test and emission compliance test were completed five months ahead of the original projected schedule.

Facility Description

The Bay County Resource Management Facility uses two Westinghouse-O'Connor water-walled rotary combustors to mass burn up to 510 tons per day of MSW. The combustors can also burn a mixture of MSW and wood waste. Heat generated by the combustion of waste produces steam to drive a turbine generator. A process flow diagram of the Bay County facility is shown in Figure 1.

The plant consists of two combustor/boiler units, a turbine-generator, a truck scale, tipping floor, front end loaders, conveyors, air emission control equipment, a stack, ash handling equipment, a central control room, and all required ancillary equipment. The facility also includes administration offices, change rooms, parking areas, roadways, and security fencing.

All MSW received at the plant enters through an automatic gate system and is unloaded on the tipping floor. Solid waste collection vehicles hauling the material to be processed are weighed at the scale prior to entering the plant and are then directed to a specific bay on the tipping floor. The weight is automatically entered into a computer system that records and files all pertinent data for each transaction. The vehicles enter the designated bay and discharge their load on the floor. The tipping floor accommodates approximately 1500 tons of waste while allowing room for maneuvering the incoming trucks and front end loaders.

A man-operated front-end loader disperses MSW on the tipping floor to separate large and unprocessible objects. Large items are separated from MSW; the large combustible items are processed through a shear shredder; the large noncombustible items are removed and stored temporarily for landfill disposal. After sorting, the MSW is thoroughly mixed and then pushed onto the horizontal apron conveyor by the front-end loader. The horizontal apron conveyor transfers the MSW to the inclined apron conveyor and then into the combustor charging chute. The inclined apron conveyor contains a weigh scale that continuously measures the weight of MSW being fed into the charging hopper. When one line of apron feed conveyors is down for maintenance, a transfer conveyor at the charging hopper level feeds both combustors by changing the moving direction of the conveyor apron belt.

From the combustor charging chute, the MSW is pushed into the combustor by the hydraulic ram feeders (see Figure 2). The speed of the ram feeders and, consequently, the amount of solid waste fed to the combustor are controlled by the automatic combustion control system. The feed throat of the combustor chute is provided with a water-cooled isolation door to prevent the flames in the rotary combustor barrel from reaching the solid waste in the charging chute. The combustion process begins when the MSW is pushed into the combustor. The slightly inclined combustor barrel rotates slowly, causing the waste to tumble and advance as combustion proceeds. A forced draft fan draws combustion make-up air from the tipping area to reduce odor and dust levels in the tipping hall and to prevent them from escaping the building. The air is preheated before entering the multiple zone windbox located beneath each combustor barrel.

Figure 3 shows the cross-section of the rotary combustor and the flow of underfire and overfire air into the combustor. The combustor barrel has a diameter of 10 feet and is constructed by alternating steel tubes with carbon steel perforated webs and welding them together. The steel webs have a width of 1-1/2 inches with 3/4 inch diameter holes used to bring in combustion air. The tubes direct cooling water through the outside wall of the combustor barrel which upon heating is delivered to the boiler through the rotary joint.

The flow of waste is maintained to provide a steady mass flow rate into each combustor. The mass flow rate setpoint can be adjusted by the operator, based on the observed waste (fuel) characteristics and the average flow. The air flow is readily controllable, and can be quickly and precisely adjusted to respond to measured process variables.

The air flow to Zone A is used to promote drying of the waste without initiating combustion in that zone. The combustor inlet temperature, read by a thermocouple in the front wall of the combustor, provides the signal on which to base the air flow control to this zone.

The air flow to Zone B, where most of the devolatilization and surface combustion takes place, is adjusted to control the total combustion rate. Air flow to Zone C is introduced to complete combustion of the devolatilized gases.

The oxygen concentration of the flue gas in the furnace is continuously read by an oxygen monitor located in the boiler convection section. The air flow to Zone C is adjusted to maintain the oxygen concentration setpoint (approximately 6%). The air flow to Zone C is increased as the oxygen concentration goes below the set point and is decreased as the oxygen concentration goes up. If the oxygen setpoint is not reached after the air flow adjustments to Zone C have been made, then a change in air flow to Zone B is initiated. The air flow to Zone B is reduced if the oxygen concentration goes below the set point level and increased if the oxygen concentration goes above the set point level. The main purpose in adjusting the air flow in this manner is to maintain a constant firing rate in the barrel. For example, if a load of waste having a high heating value (paper, asphalt shingles, wood, etc.) is burning in Zone B, the total air flow will not be able to keep up with the excess air requirements of the burning waste. Therefore, the amount of air to Zone B is reduced to slow down the burning process.

The heat released from the combustion process is recovered through the rotary combustor walls, boiler water walls and tubes, primary and secondary superheater, and the air preheater. Hot gases, produced during the combustion process, flow from the combustor barrel through the boiler's radiant, superheater, and convection sections. To maximize energy recovery and expedite combustion of high-moisture waste, the combustion gases exiting the convection section pass through a heat exchanger that preheats the incoming combustion air. To prevent corrosion problems in the lower part of the boiler air heater, a steam preheater is located at the air heater inlet to increase the air temperature from ambient to 150°F.

The flue gases from the air heater enter the electrostatic precipitator (ESP) to remove particulate matter before exiting the stack. The ESP's are arranged into three mechanical fields, each with its own electrical field and ash removal hopper. They are designed to meet the Florida Department of Environmental Regulations permit condition for particulate matter of 0.03 gr/dscf corrected to 12% CO_2. The ESP's are sized to accommodate a nominal gas flow rate of 56,000 ACFM (400°F) and a particulate inlet loading of 3 gr/dscf.

The flue gas is drawn from the ESP by an induced draft fan before being discharged to the atmosphere through a separate flue in the common stack. The stack is made of precast concrete with two 4-ft, 6-in. diameter flues that are constructed of 4-in. thick acid resistant bricks. The stack is 125 feet tall and has air emissions monitoring ports located 60 feet from the stack base.

Three types of ash by-products are produced by the process: fly ash, siftings, and bottom ash. Fly ash is collected in hoppers under the convection, superheater, air heater, and ESP sections of each combustor/boiler train and is conveyed pneumatically to the bottom ash conveyor. Siftings are collected underneath the combustor by the siftings conveyor and are transferred by an ash drag system to the bottom ash conveyor. Bottom ash falls from the rotary combustor onto a fixed afterburning grate located beneath the combustor outlet. The afterburning grate provides additional time for the remaining combustibles to be consumed prior to their discharge through a bifurcated chute into one of two submerged wet drag conveyors. The fly ash, siftings, and bottom ash mixture are water quenched, dewatered, and removed by one of two redundant bottom ash drag conveyors into trucks, then disposed of in a landfill.

Heat from the combustion of MSW produces steam to drive the turbine-generator. Boiler feedwater moves through the boiler tubes by natural circulation as it is transformed into a mixture of saturated steam and water. Pumps circulate water through the rotary combustor by drawing water from the lower drum of the boiler through the rotary joint and into one of the combustor barrel's ring headers. The water passes through the combustor tubes and returns to the boiler steam drum as a mixture of saturated water and steam. Steam leaves the drum and passes through the primary and secondary tubes of the superheater section where the steam is heated to the design steam condition for the turbine (750°F).

The steam flows from the superheater to the multiple extraction condensing turbine-generator where a portion of its energy is converted to electricity. The generator produces 3-phase, 60 Hz electrical power. Transformers provide power at reduced voltage for in-plant use, and at increased voltage for distribution to the utility grid. Turbine exhaust steam is condensed in a shell and tube condenser that is cooled by an external cooling tower. Steam condensate is pumped back to the boiler through feedwater heaters and a deaerator.

Emission Compliance Test Results

Emission tests for determining the particulate matter concentration were conducted from April 22 through June 5, 1987. Individuals from Westinghouse RESD and stack testing engineers from ETS, Inc. participated in the testing program. Some tests were witnessed by observers from Roy F. Weston, the consulting engineer for Bay County.

The results of scheduled testing indicate that both Units 1 and 2 are in compliance with the particulate and visual emission levels required by the State of Florida Department of Environmental Regulations. The Method 5 particulate measurements conducted for determining compliance on June 4 and 5 are given in Table 1. The particulate matter concentration levels at the design capacity of 255 tons of MSW per day per unit averaged 0.0193 gr/dscf at 12% CO_2 for Unit 1 and 0.0243 gr/dscf at 12% CO_2 for Unit 2. Method 9 opacity measurements were consistently at or less than 10% for both units during the test runs. Additional testing, conducted at the plant for verification and troubleshooting purposes, are listed in Table 2. The results confirm the low emission levels measured during the compliance test runs indicating an average particulate emission concentration from Unit 1 of 0.0229 gr/dscf at 12% CO_2 and 0.0196 gr/dscf at 12% CO_2 from Unit 2. The air quality compliance tests clearly demonstrate that the plant meets the air quality permit conditions established by the Florida Department of Environmental Regulations. These conditions require particulate matter emissions to be less than 0.03 gr/dscf corrected to 12% CO_2 and limits plume opacity to no more than 10%.

Gaseous Emission Testing

Gaseous emissions testing was conducted from April through June to determine the stack gas concentration of SO_2, NO_x, and HCl. The testing was conducted to verify the emission factors used to project the annual emission rates in the PSD permit application.

The SO_2 emissions were determined using U.S. EPA Reference Method 8. The results of nine tests performed on five days are contained in Table 3. The average flue gas SO_2 concentration was 111 ppm_{dv}, corrected to 12% CO_2.

NO_x emissions were measured continuously using a Theta Sensor CEM over a nine-day test program. NO_x levels measured by the CEM were verified during an eight-hour period by simultaneously sampling using EPA Reference Method 7. Table 4 contains the eight-hour NO_x emissions data showing the average NO_x levels measured by the CEM and EPA Method 7. The average of NO_x emissions data from the CEM and Reference Method 7 were 180 and 157 ppm_{dv} corrected to 12% CO_2, respectively, for the eight-hour test. NO_x emissions measured by the CEM during the nine-day test period were in the range of 150 to 200 ppm_{dv} with a maximum of 300 ppm_{dv} during boiler excursions.

HCl concentrations determined using NIOSH Method 112B are listed in Table 5. Twenty samples were taken on seven different days with an average HCl concentration of 467 ppm_{dv} corrected to 12% CO_2.

Future Testing

Westinghouse is planning to conduct a comprehensive test program at the Bay County facility in the fall of 1987. The primary goal of the testing is to fully document the environmental and thermal performance of the facility while varying the feed rate of MSW in the combustor, burning MSW having various heating values (approximately 3000 to 6000 Btu/lb), burning MSW along with other materials including sewage sludge, and additives such as lime. The plant's thermal efficiency will be measured using ASME power tests codes. Emission testing using CEM's will be conducted to determine stack gas concentrations of SO_2, NO_x, CO, CO_2, THC, and NMHC. Manual samples will be taken to determine the concentration of SO_3, HF, HCl, NH_3, vinyl chloride, CO, CO_2, SO_2, NO_x, dioxins, furans, chlorophenols, PCB's, chlorobenzenes, and PAH including BaP. The dioxin and furan samples will be analyzed for tetra through octa-isomers cogeners including the 2,3,7, 8-isomer. Particulate matter concentration and heavy metal analysis for Hg, Cd, As, Pb, Be, Ni and Cr^{+6} will also be measured. A detailed report should be available in early spring 1988.

TABLE 1

EMISSION COMPLIANCE TEST RESULTS FROM THE BAY COUNTY RESOURCE MANAGEMENT CENTER

Bay County Compliance Test Results - Unit 1

Date	Time	Flue Gas Flow kdscfm	Flue Gas Flow kacfm	Stack Temp deg F	Steam Flow klb/hr	Percent of Rated Capacity	Particulate Matter gr/dscf @ 12% CO_2
6/5	959	25.8	52.4	425.0	71.1	104.5	0.0140
6/5	1140	27.9	55.1	429.0	66.5	97.8	0.0240
6/5	1307	25.8	52.8	427.0	65.0	95.6	0.0200
AVERAGE					67.5	99.3	0.0193

Bay County Compliance Test Results - Unit 2

6/5	945	27.7	52.6	429.0	69.7	102.5	0.0250
6/5	1310	28.4	58.1	449.0	62.7	92.2	0.0190
6/5	1525	29.2	59.0	451.0	62.3	91.6	0.0290
AVERAGE					64.9	95.4	0.0243

TABLE 2

ADDITIONAL TEST RESULTS FROM THE BAY COUNTY RESOURCE MANAGEMENT CENTER

Bay County Additional Test Results - Unit 1

Date	Time	Flue Gas Flow kdscfm	Flue Gas Flow kacfm	Stack Temp deg F	Steam Flow klb/hr	Percent of Rated Capacity	Particulate Matter gr/dscf @ 12% CO_2
4/22	1436	25.0	45.5	373.0	58.6	86.2	0.0176
4/22(1)	1652	25.9	50.3	387.0	70.4	103.5	0.0279
4/27	1505	24.9	48.1	441.0	68.9	101.3	0.0265
4/29	1214	19.9	39.0	441.0	61.1	89.9	0.0252
5/20	1542	29.8	49.8	426.0	70.4	104	0.0256
6/1	1903	25.5	51.2	426.0	64.0	94.1	0.0177
6/1	2029	23.7	52.3	436.0	57.2	84.0	0.0195
AVERAGE					64.4	94.7	0.0229

Bay County Additional Test Results - Unit 2

4/23	925	28.9	56.8	422.0	64.0	94.1	0.0161
4/23	1148	24.3	48.2	422.0	65.6	96.5	0.0215
4/23	1356	23.4	45.4	405.0	62.6	92.1	0.0192
4/30	957	27.4	51.7	427.0	NO DATA	NO DATA	0.0167
5/12	1350	25.7	54.2	437.0	76.0	112	0.0246
5/13(2)	1635	23.7	48.2	408.0	72.0	106	0.0355
5/14	826	25.3	51.3	421.0	80.0	118	0.0157
5/21	1016	34.1	57.3	431.0	72.6	107	0.0172
5/21(3)	1705	30.6	50.2	411.0	69.9	103	0.0184
6/1	927	25.9	54.4	436.0	64.5	94.8	0.0164
6/1	1045	24.3	52.3	428.0	60.8	89.4	0.0173
6/1	1215	25.2	55.4	426.0	57.8	85.0	0.0177
6/3	1023	25.8	52.0	438.0	59.8	87.9	0.0191
AVERAGE					67.1	98.7	0.0196

---

(1) Test discontinued after 1/2 hour due to plant shutdown.

(2) Furnace went positive for a few minutes while conducting this test when an air actuator valve was being repaired.

(3) Incinerator was fired with municipal waste and wood chip mixture.

TABLE 3 UNCONTROLLED SO2 EMISSIONS DATA FROM WESTINGHOUSE BAY COUNTY RESOURCE RECOVERY FACILITY

DATE	TIME	UNIT	FLUE GAS FLOW KSCFM	TEMP OF GAS DEG F	BOILER STEAM FLOW Klb/hr	H2O VOL%	CO2 DRY VOL%	SO2 DRY PPMv	SO2-DRY CORRECTED TO 12% CO2 PPMv
4/27	1100	1	25.1	428	64.7	13.3	12.1	113	112
4/27	1505	1	24.9	440	68.9	12.3	11.7	89	91
4/29	1214	1	19.9	441	61.1	14.6	11.0	213	233
4/29	1456	1	17.8	418	63.5	13.9	11.5	171	178
5/13	920	1	29.7	436	66.0	19.1	8.8	36	49
5/13	1337	2	26.4	451	65.6	19.5	9.7	68	84
5/13	1632	2	23.7	408	72.0	19.2	9.6	36	46
5/13	1850	2	28.0	434	70.5	16.4	9.7	82	102
5/14	826	2	25.3	421	80.0	17.8	9.7	85	105
AVERAGE			24.5	431	68.0	16.2	10.4	99	111

TABLE 4 NOX EMISSIONS DATA USING METHOD 7 AND A CEM ON BOILER 2 AT THE WESTINGHOUSE BAY COUNTY RESOURCE RECOVERY FACILITY

						METHOD 7		CEM	
DATE	TIME	FLUE GAS FLOW KSCFM	TEMP OF GAS DEG F	BOILER STEAM FLOW Klb/hr	CO2 DRY VOL%	NOX DRY PPM	NOX-DRY @ 12% CO2 PPM	NOX DRY PPM	NOX-DRY @ 12% CO2 PPM
5/20	2252	29.5	414	72.6	10.9	166	183	165	182
5/20	2254	29.5	414	72.6	10.9	186	204	165	182
5/20	2352	27.0	410	72.3	10.3	136	158	155	181
5/20	2353	27.0	410	72.3	10.3	191	223	155	181
5/21	52	27.3	415	72.0	12.0	92	92	155	155
5/21	53	27.3	415	72.0	12.0	122	122	155	155
5/21	152	26.6	418	71.9	11.7	85	87	140	144
5/21	153	26.6	418	71.9	11.7	148	152	140	144
5/21	249	29.7	412	72.0	11.5	167	174	155	162
5/21	251	29.7	412	72.0	11.5	180	187	155	162
5/21	361	28.2	405	71.6	11.5	191	199	210	219
5/21	352	28.2	415	71.6	11.5	129	135	210	219
5/21	451	26.7	405	71.4	12.1	140	139	220	218
5/21	452	26.7	415	71.4	12.1	141	140	220	218
AVERAGE		27.9	413	72.0	11.4	148	157	171	180

TABLE 5 UNCONTROLLED HCL EMISSIONS DATA FROM WESTINGHOUSE BAY COUNTY RESOURCE RECOVERY FACILITY

DATE	TIME	UNIT	FLUE GAS FLOW KSCFM	TEMP OF GAS DEG F	BOILER STEAM FLOW Klb/hr	H_2O VOL%	CO_2 DRY VOL%	HCL DRY PPMv	HCL-DRY CORRECTED TO 12% CO_2 PPMv
4/22	1436	1	25.0	373	58.6	13.3	11.9	591	596
4/22	1652	1	25.9	387	70.4	17.5	14.0	432	371
4/23	925	2	28.9	422	64.0	15.1	12.8	857	802
4/23	1148	2	24.3	422	65.6	15.8	12.6	703	669
4/23	1356	2	23.4	405	62.6	15.5	13.7	657	577
4/26	1200	1	17.8	468	61.8	20.0	15.0	819	655
4/26	1352	1	29.7	473	61.8	22.1	15.1	422	336
4/26	1545	1	30.5	481	60.0	18.8	12.0	677	675
5/12	1350	2*	25.7	488	76.0	19.6	10.2	473	556
5/12	1350	2	25.7	437	76.0	19.6	10.2	301	354
5/13	920	1	29.7	436	66.0	19.1	10.4	481	555
5/13	1130	1	30.5	466	69.0	19.3	10.7	456	511
5/13	1337	1	26.4	451	65.6	19.5	11.4	301	316
5/13	1632	2	23.7	408	72.0	19.2	10.4	523	603
5/14	825	2	25.3	421	80.0	17.8	10.2	581	684
6/2	1139.0	1	26.6	461	66.7	16.9	10.2	167	196
6/2	1338.0	1	24.8	460	68.4	17.8	10.4	260	300
6/2	1512.0	1	25.6	455	ND	15.1	9.1	148	195
6/3	910.0	2	28.3	437	70.2	13.7	8.3	151	218
6/3	1023.0	2	25.9	438	59.8	15.7	12.0	161	161
AVERAGE			26.2	439	67.1	17.6	11.5	458	467

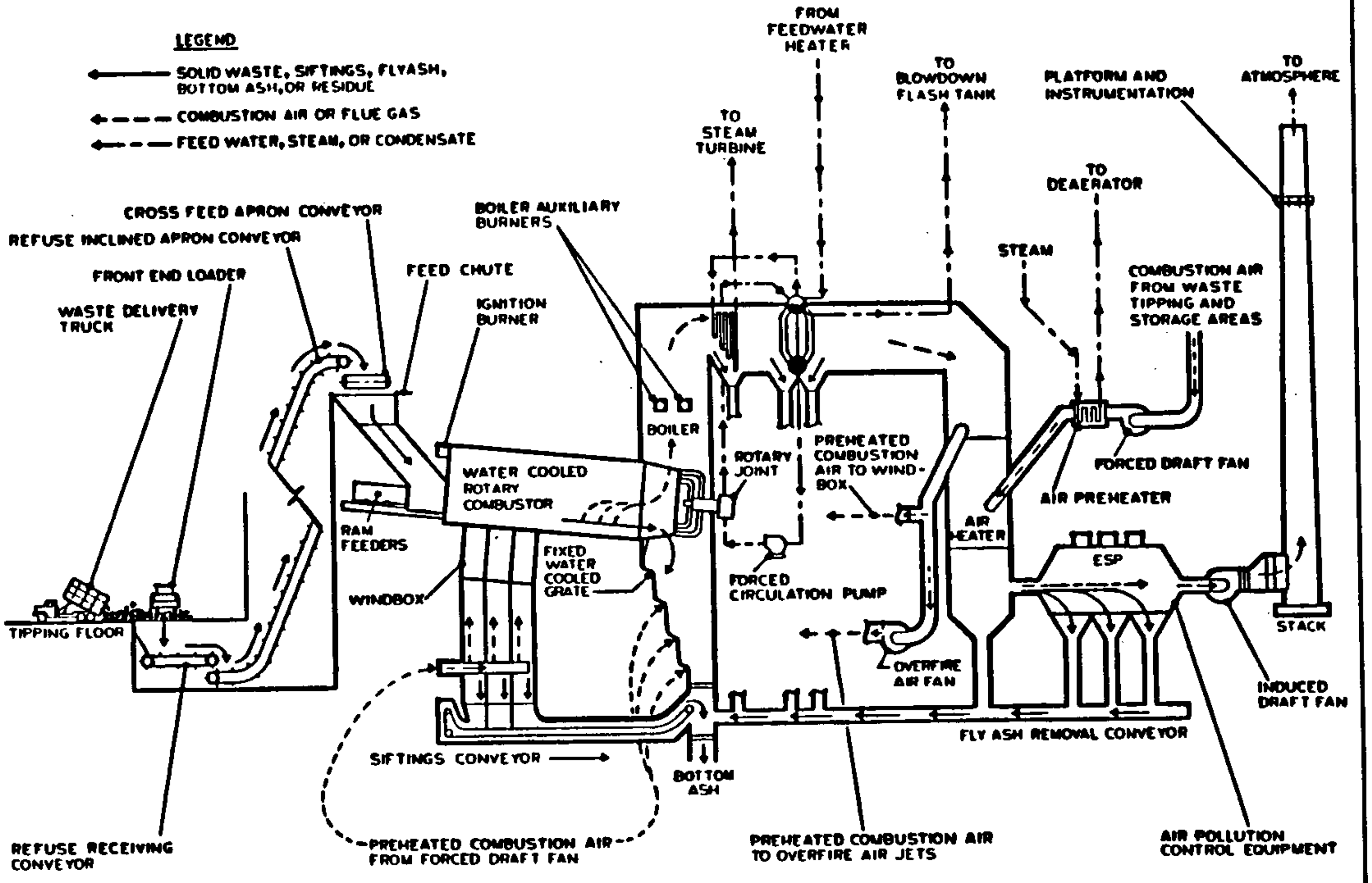
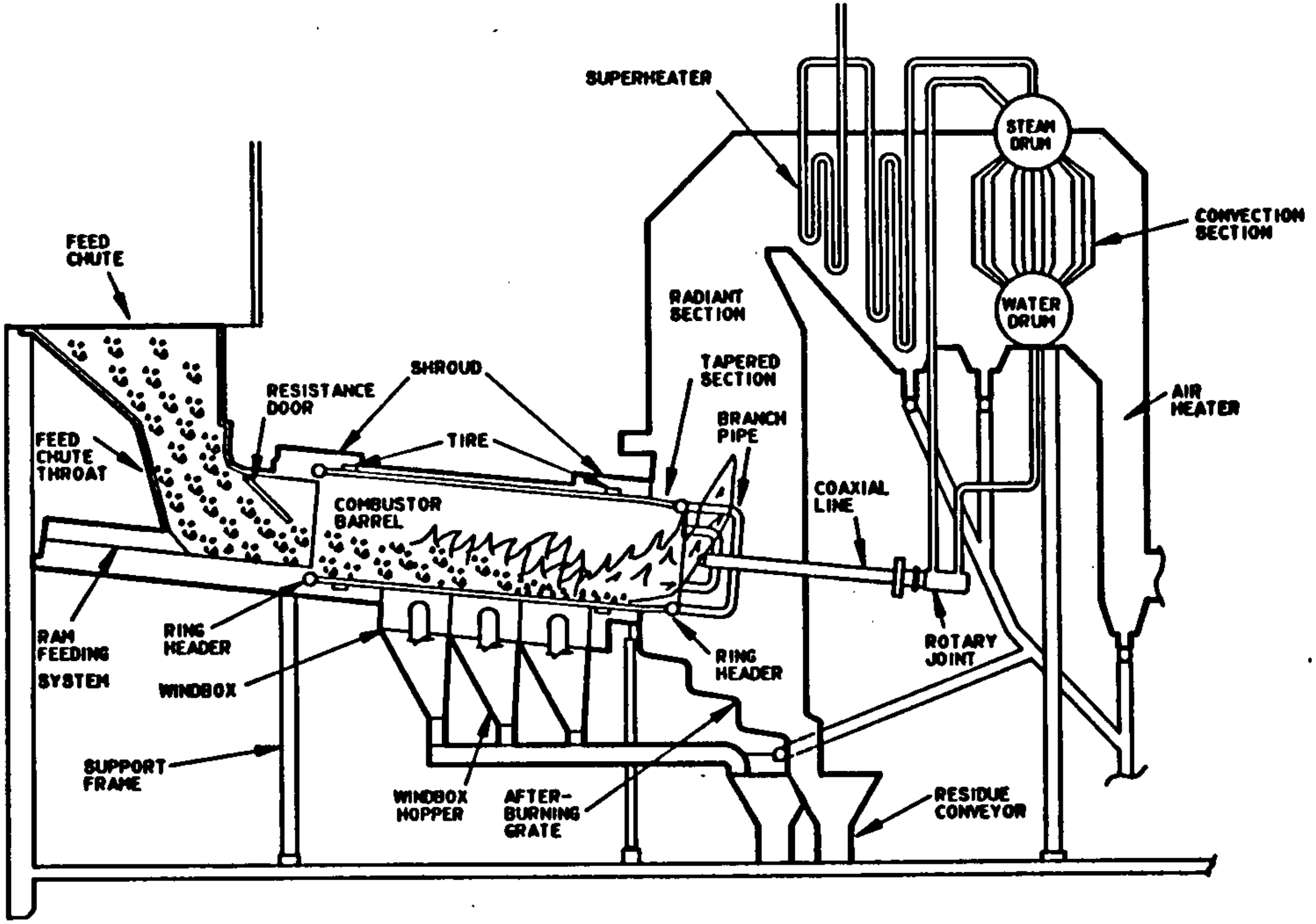


Figure 1. Simplified Process Flow Diagram, Gas Cycle for the Westinghouse-Bay Resource Management Center



WESTINGHOUSE-O'CONNOR WATER-COOLED ROTARY COMBUSTOR AND BOILER

FIGURE 2

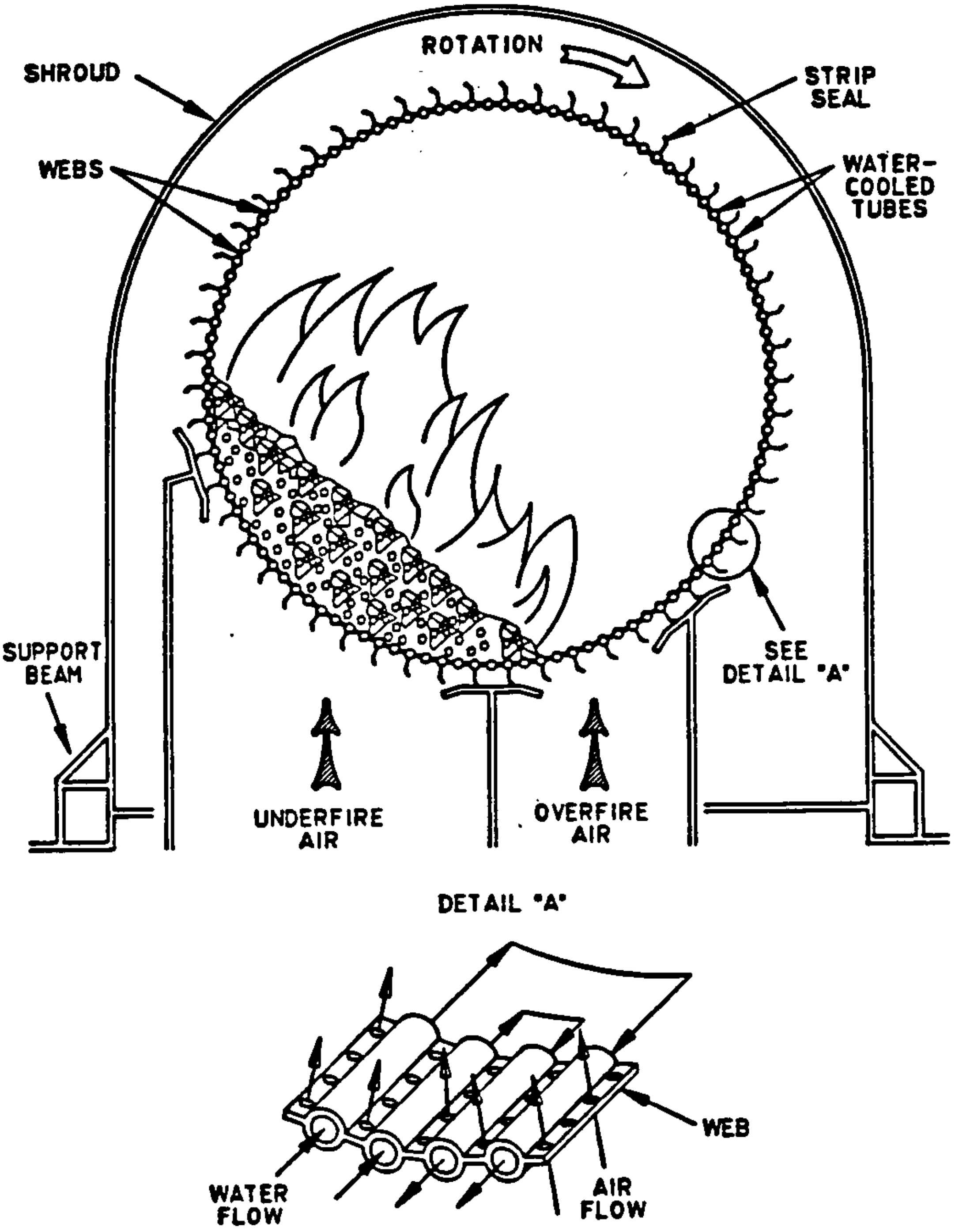


Figure 3. Cross-Section of the Westinghouse O'Connor Water-Cooled Rotary Combustor

ATTACHMENT C

ATTACHMENT C

Wood Waste Analysis:

Sulfur	0.07%
Ash	0.36%
Nitrogen	0.04%
Hydrogen	3.55
Carbon	27.90
Oxygen	18.15
Moisture	50% as rec'd
Density	20-25 lb/cu ft
HHV	5230 Btu/lb

Ref: Hayes Testing Laboratories, Pensacola, Florida

Standard Municipal Solid Waste Analysis:

	Percent by Weight
Carbon	25.53
Hydrogen	3.35
Oxygen	21.38
Sulfur	.16
Moisture	22.00
Inerts	27.58
TOTAL	100.00
HHV	4500 Btu/lb

Ref: O'Connor Combustor Corporation

ATTACHMENT D

ATTACHMENT D

BAY COUNTY RESOURCE MANAGEMENT CENTER REVISED EMISSION ESTIMATES

EMISSION ESTIMATES

Emission factors and estimated annual emission rates for various pollutants were prepared and submitted to the Florida DER in the facility's permit application in 1984. Table 1 contains the emission estimates for particulate matter, CO, NO_x, SO_2, HC and lead. These estimates were based on worst case air pollution conditions for each pollutant; i.e. for SO_2 350 TPD MSW and 135 TPD woodchips; for NO_x, CO, and HC, 250 TPD MSW and 220 TPD wood chips.

TABLE 1
PERMITTED EMISSION RATES
BURNING MSW AND WOOD WASTE

Pollutant	Annual Emissions (tons/year per train)	Total Annual Emissions (tons/year - 2 trains)
Particulate Matter	25	50
CO	505	1010
NO_x	107	214
SO_2	96	192
Pb	0.15	0.3
HC	39	78
Hg(1)	0.64	1.28

---

(1) - This was permitted for burning sewage sludge.
Note: No sewage sludge will be incinerated.

Emission factors for burning 510 TPD of MSW with a heating value of 4500 Btu/lb are given in Table 2. These emission factors are based, in part, on the recent test results at Bay County, as well as previous emission test data and/or emission factors proposed at other waste-to-energy facilities.

TABLE 2

EMISSION FACTORS[1] FOR THE BAY COUNTY FACILITY BURNING 510 TPD OF MSW THAT HAS A HEATING VALUE OF 4500 BTU/LB (365 DAYS PER YEAR)

Pollutant	Emission Test Results 4/87-6/87 Per Train Corrected to 12% CO_2	Typical Emission Factors Concentration Corrected to 12% CO_2	$lb/10^6$ Btu	lb/ton	Total TPY
Particulate Matter	<0.03 gr/dscf	0.03 gr/dscf	0.07^2	0.64^2	59^2
CO	<400 ppm_{wv}	<400 ppm (max 4 day average)	0.398	3.58	333
NO_x	157 ppm_{dv} to 180 ppm_{dv}	150 ppm (annual)	0.267	2.41	223
SO_2	111 ppm_{dv}	150 ppm (annual)	0.375	3.36	313
HC	--	35 ppm (annual)	0.0218	0.196	18.24
Pb	--	--	$4.3x10^{-4}$	0.0039	0.37
Hg	--	--	$1.9x10^{-4}$	0.0017	0.16
Be	--	--	$5.4x10^{-8}$	$4.8x10^{-7}$	$4.5x10^{-5}$

---

1 - Based on emission test data from Bay County and other facilities.

2 - Based on a gas flow rate of 26,300 dscf/min and 0.03 gr/dscf per train. The actual grain loading measured during testing was 0.0215 (for 26 tests) which is equivalent to 21.25 tons/year per train or 42.5 tons per year total for particulate matter.

Table 3 shows the projected annual emissions from the facility when burning 350 TPD MSW and 135 TPD wood chips and when burning 510 TPD MSW. The annual emissions for both cases were calculated using emission factors developed from recent test data completed at the Bay County Facility and from data reported from other W-T-E facilities throughout the U.S. These emission factors are somewhat conservative for predicting the annual emissions. For example, the SO_2 emissions measured during testing at the Bay County Plant averaged 111 ppm_{dv} corrected to 12% CO_2. The typical uncontrolled emission rate for SO_2 at numerous W-T-E facilities ranges from 100 ppm to 150 ppm. The CO

TABLE 3

ESTIMATED ANNUAL EMISSIONS USING 1987 DEVELOPED EMISSION FACTORS

Pollutant	Emission Factor (Wood Chips)	Emission Factor (MSW)	Annual Emissions (tons/year) Based on 350 TPD MSW 135 TPD Wood	Annual Emissions (tons/year) Based on 510 TPD MSW	Difference (tons/year)
Particulate Matter	0.03 gr/dscf	0.03 gr/dscf	50[1]	59[2]	9
CO	20 lb/ton	3.58 lb/ton	722	333	-389
NO_x	2.8 lb/ton	2.41 lb/ton	223	224	1
SO_2	0.3 lb/ton	3.36 lb/ton	223	313	90
HC	1.7 lb/ton	0.196 lb/ton	54	18	-36
Pb	0	0.0039 lb/ton	0.25	0.36	0.11
Hg	0	0.0017 lb/ton	0.11	0.16	0.05
Be	0	$4.8x10^{-7}$ lb/ton	$3.1x10^{-5}$	$4.5x10^{-5}$	$1.36x10^{-5}$

---

1 - Based on a gas flow rate of 22,280 dscf/min per train (from the 1984 permit application).

2 - Based on a gas flow rate of 26,300 dscf/min per train (Bay County Test Data).

emission factor is also conservative. Current emission data, as measured by a continuous emission monitor at the facility, have shown that a level of 100 ppm CO has been obtained.

The overall estimated emissions for SO_2 would increase approximately 90 tons per year when burning 510 TPD as opposed to 350 TPD MSW. This is the only criteria pollutant that would be more than the "de minimus" levels. In the PSD application submitted in 1984, a BACT analysis was prepared for all of the criteria pollutants. Therefore, the BACT analysis will be done SO_2 only (see Attachment E).

ATTACHMENT E

ATTACHMENT E

BEST AVAILABLE CONTROL TECHNOLOGY

The basic control technology requirement for new and modified major sources is the application and evaluation of BACT. BACT is defined as "an emission limitation based on the maximum degree of reduction for any regulated contaminant emitted from or which results from any regulated facility which the Department on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through an application of control of production processes and available methods, systems, and techniques for each such contaminant."

A major stationary source must apply BACT for all regulated pollutants emitted in significant quantities, as defined by de minimis emission rates (see Table 1).

TABLE 1

ESTIMATED EMISSION RATES (WHEN INCREASING TO 510 TPD MSW FROM 350 TPD) COMPARED TO DE MINIMIS LEVELS

Pollutant	Annual Increase TPY	De Minimis Rate TPY
Particulate Matter	9	25
Carbon Monoxide	0	100
Nitrogen Oxide	0	40.0
Sulfur Dioxide	90	40.0
Hydrocarbons (Ozone)	0	40.0
Lead	0.11	0.6
Mercury	0.05	0.1
Beryllium	$1.36\text{x}10^{-5}$	$4.0\text{x}10^{-4}$

A Best Available Control Technology analysis was prepared and submitted in 1984 to the Florida DER as part of the PSD permit application. The proposed BACT for this facility burning MSW at the design rated capacity (510 TPD @ 4500 Btu/lb) is the same as that proposed and accepted in 1984.

BACT FOR SO_2

When the facility was originally designed and permitted in 1984, BACT for waste-to-energy (WTE) plants did not call for add-on control equipment to remove SO_2 emissions. Some new WTE facilities coming on-line recently (1987) have been equipped with acid gas control equipment such as a spray dryer followed by an ESP, a spray dryer followed by a baghouse, and a dry injection system followed by a baghouse. Wet scrubbers have been used in Europe and Japan, but have not been routinely used on WTE facilities in the U.S. There is no evidence that the control equipment has been retrofitted on any WTE facility in the U.S. Therefore, no add-on control equipment will be proposed as BACT for this existing source.

TECHNICAL CONSIDERATIONS

Dry Scrubber

Dry scrubber in combination with either ESP's or baghouses have received a wide application on fossil fuel boilers. These systems have received considerable experience as flue gas desulfurization (FGD) systems on coal-fired boilers, mainly firing low-sulfur coal.

In a dry scrubber, acid gases are removed from the gas stream by means of absorption, adsorption, and neutralization. This is accomplished by contacting the acid gases with a finely atomized alkaline spray slurry. The spray can be injected into the gas stream through dual-phase (two-fluid) nozzles or a mechanical (rotary) atomizer.

Neutralization of SO_2 and the acid gases occurs as the droplets evaporate prior to exiting the spray dryer. Evaporating water cools the flue gas stream. The droplet exiting the spray dryer is a dry particle comprised of open pored reaction salts and unreacted reagent. The flue gas existing the spray dryer is ducted to and collected in the baghouse or the ESP.

Dry Injection System

A dry injection system can be used in combination with a baghouse to remove SO_2 emissions from flue gas streams. Dry injection can also be used with an ESP. However, the SO_2 emission control efficiency is drastically lower in the ESP system than with the baghouse system.

In a dry injection system, hydrated lime (dry $Ca(OH)_2$) is injected into the ductwork or into a vessel such as a venturi prior to the baghouse. SO_2 emission reduction occurs as the SO_2 reacts with the hydrated lime to form dried calcium sulfate/sulfite salts. This reaction occurs in the vessel, ductwork, and on the dust cake that forms on the bags. Because the bags act as potential acid gas control devices, a dry injection system used in combination with a baghouse is much more effective than when used with an ESP.

WET SCRUBBERS

Wet scrubbers have been applied to waste incinerators primarily as a particulate control device; however, most of these installations are incapable of complying with the stringent emission standards applicable to new facilities. If wet scrubbers are applied to waste combustion for acid gas control, a high-efficiency particulate control device would have to precede the scrubber to ensure compliance with these standards. ESP's have been used in combination with wet scrubbers as FGD systems on coal-fired boilers.

Wet scrubbers use either calcium or sodium-based sorbents. Calcium-based processes produce insoluble salts which must be dewatered before disposal. These systems are also subject to scaling caused by the precipitation of calcium sulfite and sulfate. The sodium-based processes produce an aqueous solution of sodium salts. However, this solution may require pretreatment prior to disposal to a municipal wastewater treatment plant. The effluent produced by wet scrubbers require dewatering or pretreatment prior to disposal, unlike the spray dryer which produces dry salts which may be disposed of as part of the facility residue.

Economic Considerations

A cost estimate was obtained for installing spray dryers ahead of the existing ESP's at the Bay County facility. A cost estimate was not obtained for using a dry injection system because of the low SO_2 removal efficiency that occurs when this equipment is used in combination with an ESP. A cost estimate for a wet scrubber was not obtained because of the additional pretreatment and dewatering problems associated with this equipment.

The cost estimate is given in Table 2. As can be seen from this table, the total cost for installing a spray dry system in front of each existing ESP would be $1,863,000. Table 3 contains the annual operating costs estimated by assuming a lime stoichiometric ratio of 1.3, that the power usage for operating two spray dryers is 60 kw, and that the pressure drop across the spray dryer is 3.5 inches of water. The total annual operating cost is estimated to be $112,432.

TABLE 2

ADD-ON SPRAY DRYER COST ESTIMATE

CAPITAL COST AND ESTIMATE ANNUAL OPERATING COST

Total Cost:	$1,863,000
Cost Breakdown Includes:	Engineering Foundations and Supports 2 Spray Dryers 3 Rotary Atomizers (1 spare for two trains) Lime Storage Bins and Slaker Piping Ductwork Insulation Shipping to the Site Installation Start-up Services

TABLE 3
ANNUAL OPERATING COST

	Each Train	Cost	Cost per Year For Both Trains
Lime	115 lb/hr	\$75/ton	\$ 64,222
Power for Spray Dryer	30 kw	\$0.05/kwh	\$ 22,338
Power for Delta P (fan cost)	Delta P = 3.5 in H_2O Gas Flow = 55,000 acfm for each unit	(see below)	\$ 25,872
TOTAL			\$112,432

NOTE: Assume 85% plant availability.

$$\text{Fan Power} = Q \times \frac{0.7457}{6356 \times E} \times \text{Delta } P \times H$$

where: P = fan power (kwh)

Q = gas volume (acfm)

E = fan efficiency (assumed 0.65)

Delta P = pressure drop

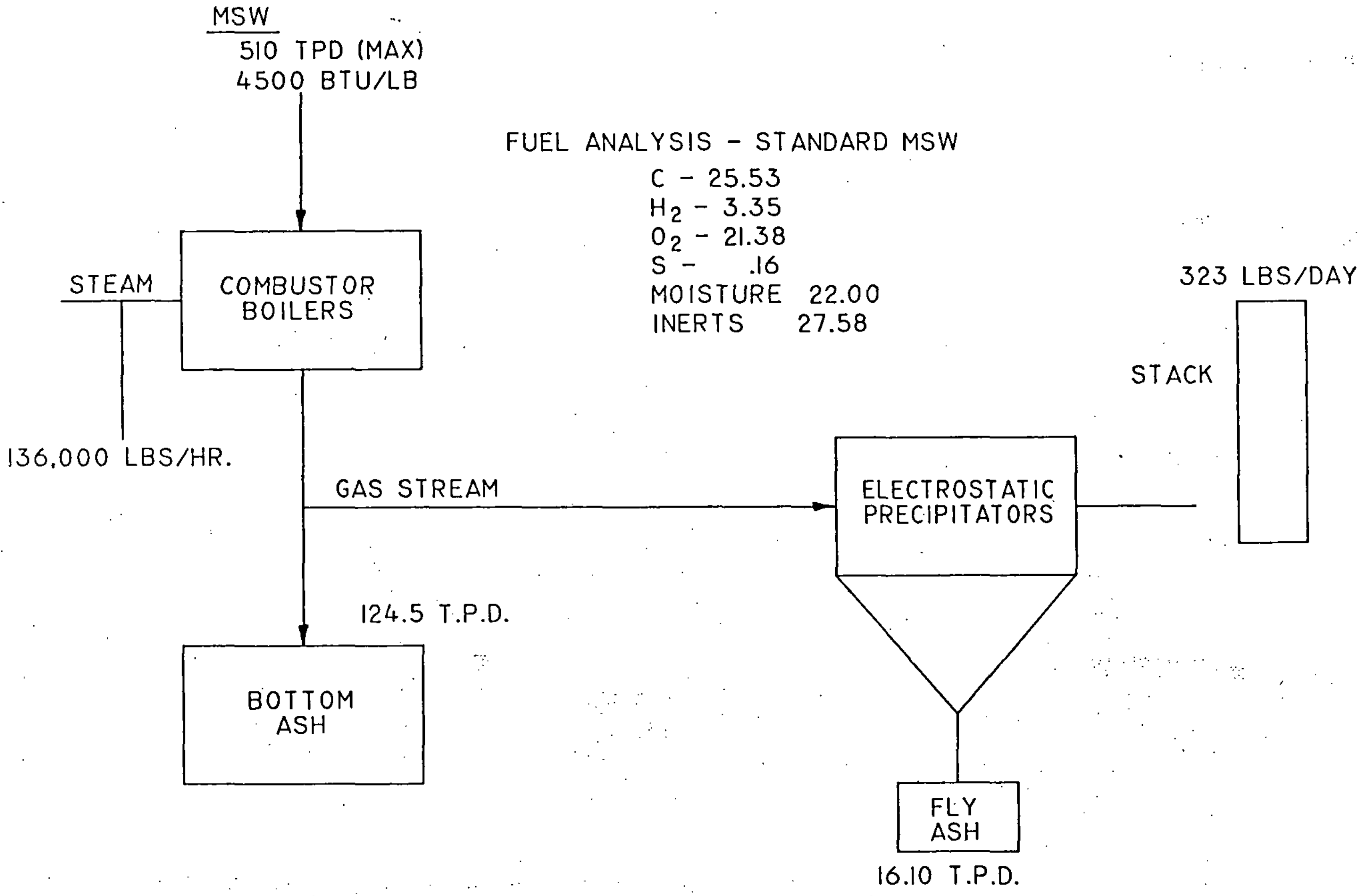
H = annual operating rate (7446 hr/yr)

Conclusions

The additional annual SO_2 emissions that would be emitted when burning 510 TPD MSW instead of burning 350 TPD MSW would be a maximum of 90 tons. EPA or other State Agencies have not required any WTE facilities to retrofit their plants with acid gas control equipment. The high capital cost (\$1,863,000) and annual operating cost (\$112,432) cannot be justified for removing a small amount of SO_2 (90 tons per year). In addition, the plant layout would most likely make it difficult, if not impossible, to retrofit dry scrubbers (spray dryers) in front of the existing ESP's. Therefore, BACT for this facility should be the same as approved by the Florida DER in 1984, and no add-on acid gas control equipment should be required.

ATTACHMENT F

FLOW DIAGRAM



FUEL ANALYSIS - STANDARD MSW

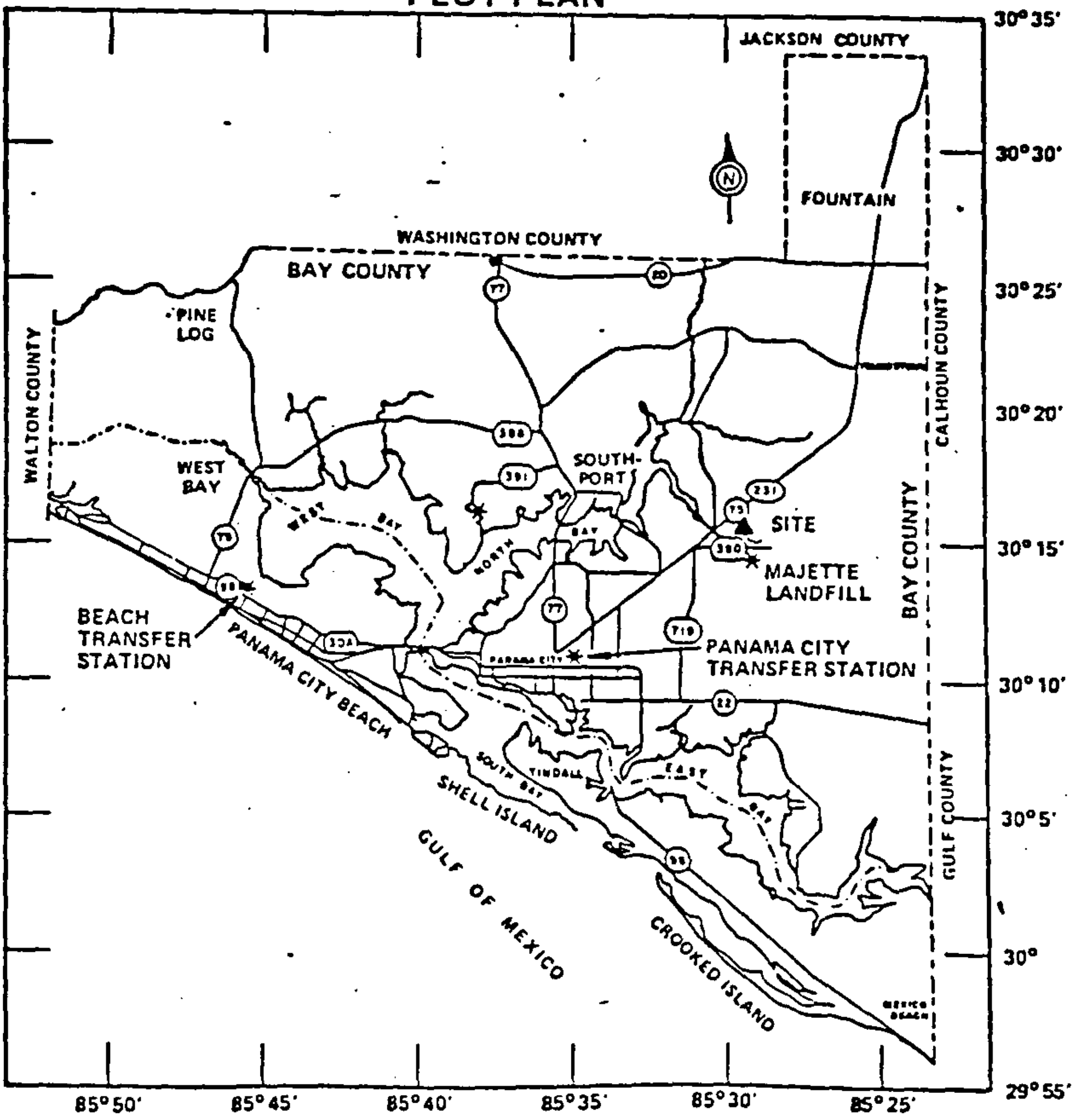
C - 25.53
H_2 - 3.35
O_2 - 21.38
S - .16
MOISTURE 22.00
INERTS 27.58

ATTACHMENT G

Ⓦ Westinghouse

Bay County Waste to Energy Project

PLOT PLAN



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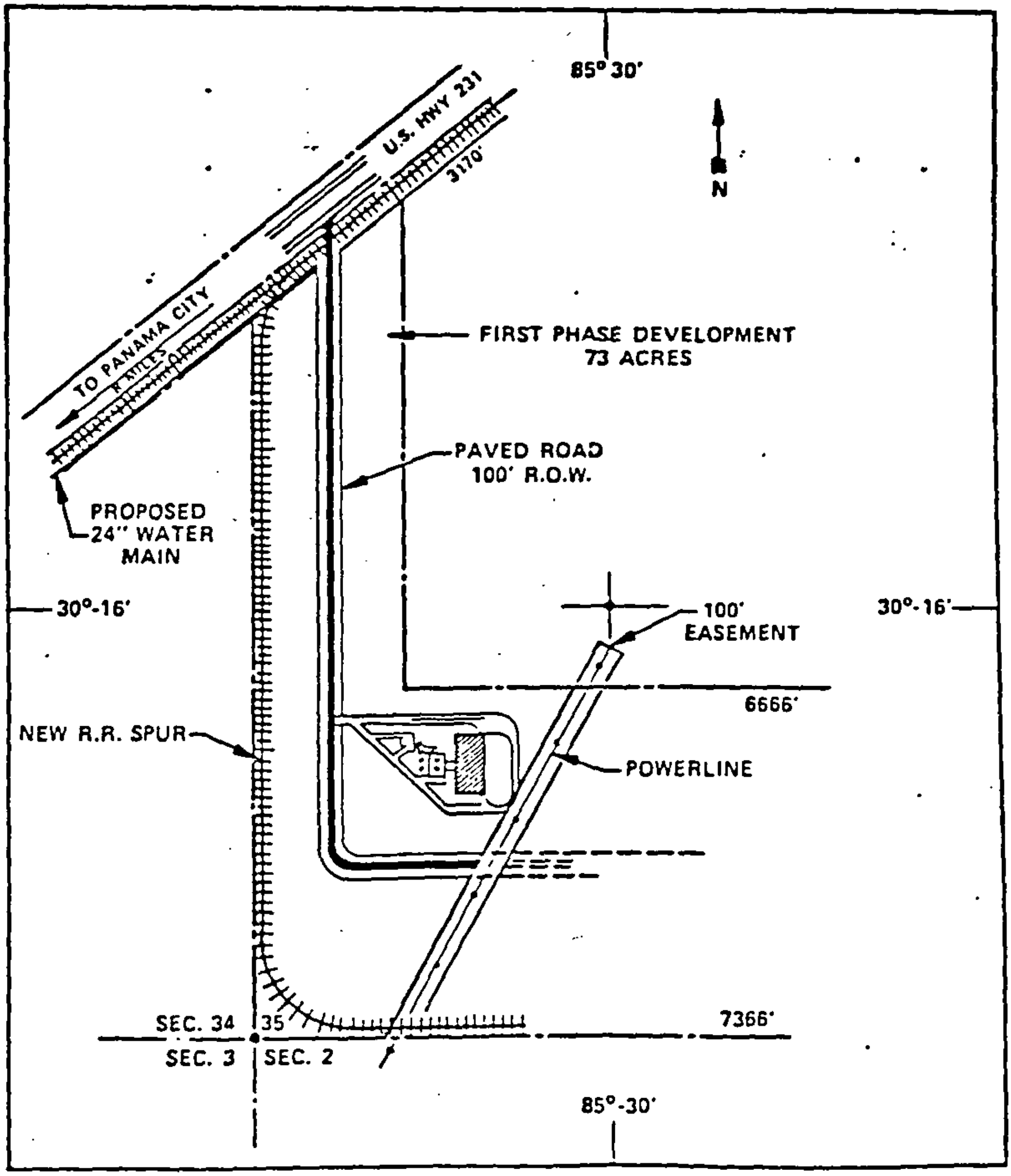
Westinghouse

Bay County Waste to Energy Project

SITE PLAN



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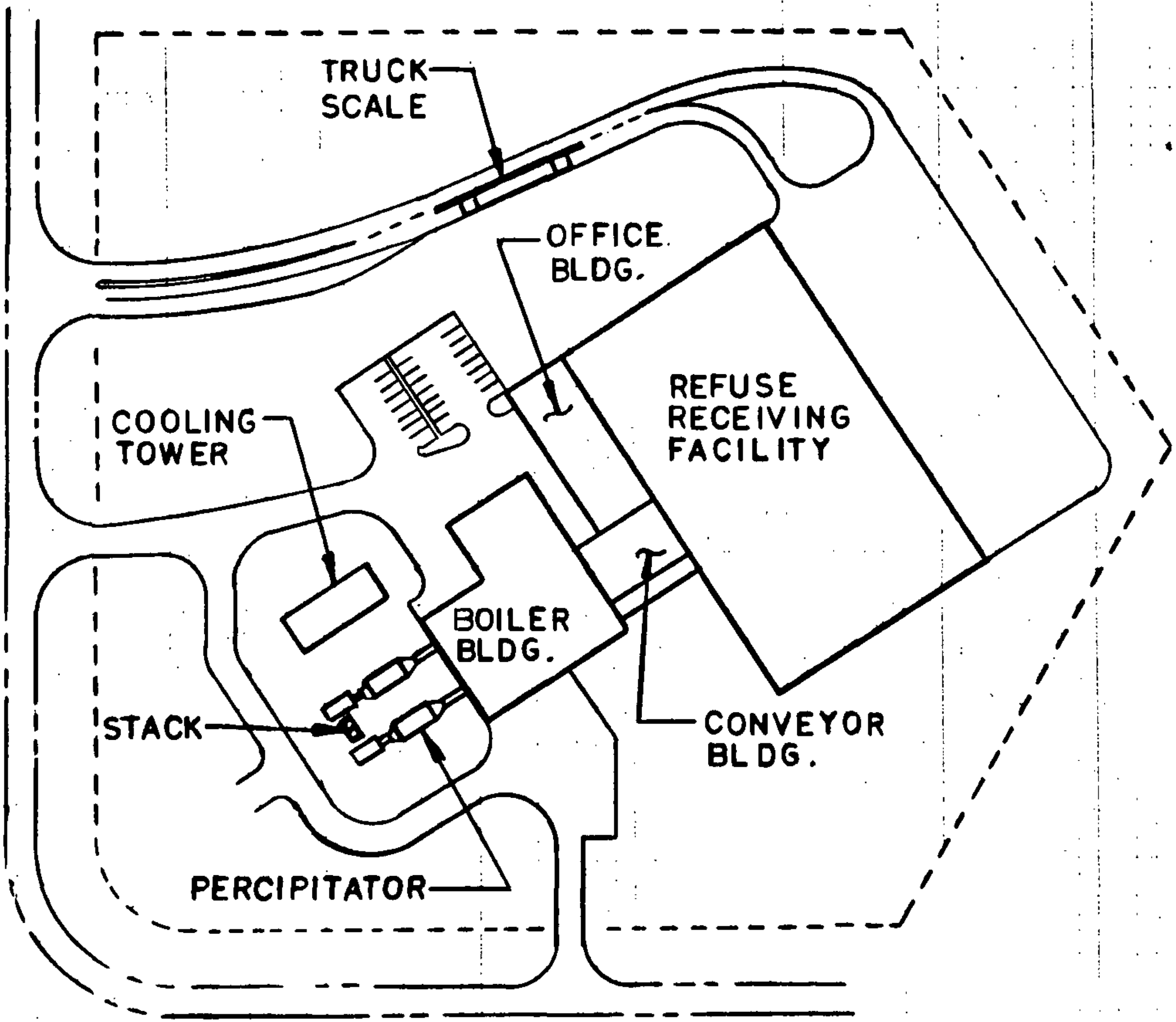

BAY COUNTY
WASTE TO ENERGY FACILITY
PLANT LAYOUT

ATTACHMENT H

ATTACHMENT H

AIR QUALITY MODELING

Attached is the air quality modeling report that was submitted with the permit application in 1984. Since SO_2 is the only criteria pollutant whose emission rate will increase above de minimis levels, it will be the only pollutant considered in this analysis.

The "worst case" SO_2 emissions were used in the 1984 modeling study. Considering that the permitted annual emission rate was 192 tons/year relates to:

$$\frac{192 \text{ ton}}{\text{year}} \times \frac{2000 \text{ lb}}{\text{ton}} \times \frac{1 \text{ year}}{8760 \text{ hr}}$$

$$= \frac{43.8 \text{ lb}}{\text{hr}} \text{ (both units)}$$

The proposed "worst case" SO_2 annual emission rate is 313 tons/year or 71.15 lb/hr (both units).

Therefore, it is estimated the maximum predicted SO_2 concentrations will increase by:

$$\left(\frac{71.5}{43.8} - 1\right) \times 100 = 63\%$$

Based upon the equation:

$$C(X,0,Z,N) = \frac{Q}{2\,\bar{u}\,\sigma_y \sigma_z} \times \left[\text{EXP}^{-\left[\frac{(z-h)^2}{2\sigma_z^2}\right]}\right]$$

where: C = concentration
Q = emission rate

C corresponds linerally with Q, therefore it is appropriate to ratio the two emission rates and arrive at an equivalent concentration.

Presented below are the 1984 maximum predicted SO_2 concentrations and the proposed SO_2 maximum predicted concentrations. The proposed concentrations were derived by multiplying the 1984 values by 1.63.

It was impossible to determine from the 1984 analysis what the facility's contribution was when modeled with the other sources. Therefore, it was assumed that the maximum predicted (highest second high) SO_2 concentration resulting from the facility alone occurred at the location that had the highest predicted concentration (highest second high) when modeling all of the other sources.

TABLE 1

SO_2 MODELING ANALYSIS

Averaging Time	1984(1) Maximum Predicted* Concentrations (ug/m^3)	Proposed Maximum Predicted* Concentrations (ug/m^3)	Class II PSD Increment (ug/m^3)
Annual	0.6	0.98	20
24-hour	6.5	10.60	91
3-hour	22.1	36.02	512

---

* - Highest second high values.

(1) - From Table 1 in the 1984 analysis.

TABLE 2

SO_2 MODELING ANALYSIS

IMPACTS ASSOCIATED WITH THE FACILITY ALONE ON THE BRADWELL BAY CLASS I AREA

Averaging Time	1984(1) Maximum Predicted* Concentrations (ug/m^3)	Proposed Maximum Predicted* Concentrations (ug/m^3)	Class I PSD Increment (ug/m^3)
Annual	0.02	0.03	2
24-hour	0.6	0.98	5
3-hour	2.9	4.72	25

---

* - Highest second high values.
(1) - From Table 2 in the 1984 analysis.

Based on burning 510 TPD of MSW, the maximum predicted SO_2 concentrations shown above are still well below the allowable increment consumption for both PSD Class I and II areas.

TABLE 3

SO_2 MODELING ANALYSIS

IMPACTS ASSOCIATED WITH THE FACILITY AND OTHER SOURCES

Averaging Time	(1)All Sources Max. Predicted Concentrations* (ug/m^3)	(2)Max. Predicted Incremental Concentrations* (ug/m^3)	Total (ug/m^3)	SO_2 NAAQS (ug/m^3)
Annual	7.2	0.38	7.58	80
24-hour	116.9	4.1	121.0	365
3-hour	408.7	13.9	422.6	1300**

---

* - Highest second high values.
** - Secondary standard.
(1) - From Table 3 in the 1984 analysis.
(2) - From Table 1 - this analysis (proposed value minus 1984 predicted value).

As demonstrated above, the predicted incremental difference added to the original calculated concentrations are far below the National Ambient Air Quality Standards. Therefore, increasing the MSW firing rate to 510 TPD will have little impact on the surrounding air quality.

ATTACHMENT "H-1"

1984

AIR QUALITY EVALUATION FOR
BAY COUNTY RESOURCE RECOVERY FACILITY

Bay County Energy Resources, "A Joint Venture" proposes to construct a resource recovery facility in Bay County, Florida. This report represents an evaluation of the effect on air quality that would result from the operation of the new facility.

As shown in Tables 1 and 2 (Attachments 1 and 2), the results of the modeling for the source alone indicate that the predicted pollutant concentrations for the facility are less than significant impact levels except for sulfur dioxide; de minimis monitoring levels; Class II Prevention of Significant Deterioration (PSD) increments; and Class I PSD increments in the Class I Bradwell Bay area. Modeling with other SO_2 sources in the area indicates that the facility will not contribute to any violation of the National Ambient Air Quality Standards (NAAQS) in the area (Attachment 3). Air quality modeling for the proposed facility was performed with the air quality modeling procedures recommended in the EPA document <u>Guideline on Air Quality Models</u>, OAQPS No. 1.2-080, April 1978, and with the SCSTER model, which has been approved for use by the U.S. Environmental Protection Agency (EPA) as equivalent to the recommended EPA models CRSTER and MPTER (Attachment 4).

For the PSD modeling, a single source was assumed in the model with the exhaust characteristics given in Table 4 (Attachment 5). The emission rate for this source was hypothetical for the purpose of obtaining significant figures in the results printouts. Predicted concentrations were adjusted by emission rate ratio and by the number of stacks to correspond to the operation of the proposed facility. The modeling for evaluation of NAAQS attainment considered the sources described in Table 5 (Attachment 6) and used the emission rate for both stacks at the new facility. Five years (1965-1969) of meteorological data were used for the modeling: surface data from Panama city and upper air data from Eglin Air Source Base near Fort Walton. Receptor distances were selected with the PTPLU screening model, and a total of 11 receptor rings were used for the initial model runs, as shown in Table 6

(Attachment 7). For the PSD analysis, the maximum predicted concentrations and the highest, second highest predicted concentrations for the 3-hour and 24-hour averages were refined with receptor spacings of 0.1 km. A summary of the predicted concentrations for each of the five years of meteorological data is shown in Tables 7 and 8 (Attachments 8 and 9). For the NAAQS analysis of the area sources, a summary of the predicted concentrations for each of the five years of meteorological data is shown in Tables 9 and 10 (Attachments 10 and 11). Attachment 12 is the PTPLU model run; Attachment 13 is the 0.1 km refinement of the highest 1-hour (required for carbon monoxide), 3-hour and 24-hour predicted concentrations for each of the five meteorological years in the PSD analysis, respectively; and Attachment 14 is the initial 5-year model run for the single source PSD analysis. Attachment 15 is the 5 year model run for the multi-source NAAQS analysis.

Bryan Baldwin
Blanche M. McIntyre
Southern Company Services
June 13, 1984

ATTACHMENT 1

TABLE 1
AIR QUALITY MODELING RESULTS
FOR BAY COUNTY RESOURCE RECOVERY FACILITY ALONE

Pollutant	Averaging Time	Maximum* Predicted Concentration (μ/m^3)	Significant Impact Level (μ/m^3)	De Minimis Monitoring Level (μ/m^3)	Class II PSD Increment (μ/m^3)
SO_2	Annual	0.6	1	--	20
	24-Hour	6.5	5	13	91
	3-Hour	22.1	25	--	512
TSP	Annual	0.1	1	--	19
	24-Hour	1.7	5	10	37
NO_2	Annual	0.7**	1	14	--
CO	8-Hour	74.2	500	575	--
	1-Hour	147.27	2000	—	--
Lead	24-Hour	0.01***	--	0.1	--

*Highest, second highest

**Assumes 100% conversion of NO_x to NO_2

***Maximum 24-hour average

ATTACHMENT 2

TABLE 2
AIR QUALITY MODELING RESULTS FOR BRADWELL BAY CLASS I AREA

Pollutant	Averaging Time	Maximum* Predicted Concentration (μ/m^3)	Class I PSD Increment (μ/m^3)
SO_2	Annual	0.02	2
	24-Hour	0.6	5
	3-Hour	2.9	25
TSP	Annual	0.1	5
	24-Hour	0.2	10

*Highest, second highest

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ATTACHMENT 3

TABLE 3
AIR QUALITY MODELING RESULTS
FOR BAY COUNTY RESOURCE RECOVERY FACILITY AND OTHER SOURCES

Pollutant	Averaging Time	Maximum* Predicted Concentration (μ/m^3)	Florida AAQS (μ/m^3)	NAAQS (μ/m^3)
SO_2	Annual	7.2	60	80
	24-Hour	116.9	260	365
	3-Hour	408.7	1300	1300
TSP**	Annual	1.86	60	75
	24-Hour	30.26	150	260
NO_2**	Annual	2.06	100	100
CO**	8-Hour	3003.1	10,000	10,000
	1-Hour	943.6	40,000	40,000
Lead**	24-Hour	0.2	1.5	1.5

*Highest, second highest

**Resource Recovery Facility only

0295b

3/18/82 Research Triangle Park, North Carolina 27711

Equivalent Air Quality Models

Signed

Joseph A. Tikvart, Chief
Source Receptor Analysis Branch (MD-14)

Chief, Air Programs Branch, Regions I-X

Some time ago, we agreed to provide an opportunity for model developers to demonstrate that their models are equivalent to EPA models. The intent was that a new justification for applying their models would not have to be made every time the models are used in a regulatory context. Several test data sets were prepared for a variety of source/climatic/topographic conditions that would allow a convincing demonstration of equivalency (see attachment). This demonstration has been successfully completed for three models. If other developers submit additional demonstrations to us, we will inform you of our review and decision.

SCSTER (Southern Company Services), PLUME5 (Pacific Gas and Electric Co.), and MPSDM (Environmental Research and Technology, Inc.) have all been shown to provide nearly identical estimates to recommended EPA models (CRSTER and MPTER) when specific options in these three models are implemented. Thus, the use of these models with the specific options that provide equivalent estimates should be acceptable for those situations discussed in the Guideline on Air Quality Models. I have not attempted to tabulate the specific options in question since that would require a lengthy listing. If your staff requires further specific information, please contact J. Dicke at FTS 629-5581.

The purpose of this memorandum is to document for you that these three models can be made to provide estimates consistent with those routinely calculated by your staff. However, this is not intended to be a general endorsement of these models. Obviously, if options other than those employed for the equivalency tests are used, a separate case-by-case demonstration is likely to be necessary.

Some further clarification is perhaps appropriate here. In part, due to the question of equivalency demonstrations, we have been criticized for requiring "numerical agreement" with EPA models before a nonguideline model can be used. This is simply not true. We have always maintained and have stated in the introduction to the Guideline that: "The preferred model is that which best simulates transport and dispersion in the area of interest. However, deviations from this guide should be fully supported and documented."

The purpose of the equivalency demonstration discussed above is to facilitate documentation for model developers who choose to use that mechanism. If you have any questions, please contact me.

Attachment

cc: Regional Modeling Contact, Regions I-X
J. Dicke
C. Hopper
J. Mersch

bcc: ✓B. Baldwin
B. Egan
M. Mooney
R. Smith
F. White

TABLE 4

BAY COUNTY RESOURCE RECOVERY FACILITY

STACK CHARACTERISTICS

SO_2 Emission Rate:	22.1 lb/hr (2.78 g/s)
Particulate Matter Emission Rate:	5.72 lb/hr (0.7207 g/s)
NO_x Emission Rate:	24.5 lb/hr (3.087 g/s)
CO Emission Rate:	115.4 lb/hr (1.4540 g/s)
Lead Emission Rate:	0.0358 lb/hr (0.00451 g/s)
Stack Diameter:	4 ft. (1.22m)
Stack Exit Temperature:	400°F (477.6°K)
Stack Exit Velocity:	3403 fpm (17.3 m/s)

ATTACHMENT 6

TABLE 5

BAY COUNTY EMISSIONS INVENTORY

	Height (m)	Dia. (m)	Exit Vel. (m/s)	Flow Rate (m^3/s)	Exit Temp. (°K)	SO_2 Emission Rate (g/s)
Southwest Forest Industries UTM 16 632.6 E 3335.1 N						
Recovery Boilers 1 & 2	73.3	2.0	24.51	77.0	440	36.54
Bark Boilers 3 & 4	62.4	2.4	24.01	108.62	349	67.38
Power Boiler 5	87.2	3.7	5.00	52.60	484	11.07
Power Boiler 6	73.4	2.4	25.81	120.69	532	26.78
Lime Kiln	18.2	2.0	10.28	32.30	365	1.50
Arizona Chemical UTM 16 633.1 E 3335.4 N						
Boilers 1 & 2	30.5	1.2	17.90	20.92	464	10.46
Lansing Smith UTM 16 625.2 E 3349.0 N						
Units 1 & 2	60.96	5.49	19.64	464.82	401	27.13

ATTACHMENT 7

TABLE 6
BAY COUNTY RESOURCE RECOVERY FACILITY
RECEPTOR DISTANCES

Receptor Distances Calculated From PTPLU	Receptor Distances Used in SCSTER Model
	0.4 km*
0.474 km	0.5
0.616	0.6
	0.7*
0.806	0.8
1.090	1.1
1.422	1.4
1.850	1.9
2.465	2.5
3.223	3.2
4.266	4.3
	92.5**
	84.4**
	88.0**

*Additional receptors

**Receptors at Bradwell Bay Class I PSD area

ATTACHMENT 8

TABLE 7
BAY COUNTY RESOURCE RECOVERY FACILITY ALONE*
MAXIMUM PREDICTED CONCENTRATIONS FOR SULFUR DIOXIDE

	3-HOUR	24-HOUR	ANNUAL
1965 Maximum	22.36µg/m^3	6.68µg/m^3	0.44µg/m^3
Distance	0.6km	0.8km	1.1km
Direction	60°	10°	30°
Day	187	209	
1966 Maximum	22.64µg/m^3	11.79µg/m^3	0.44µg/m^3
Distance	0.6km	1.7km	1.1km
Direction	80°	230°	70°
Day	186	21	
1967 Maximum	26.56µg/m^3	6.72µg/m^3	0.58µg/m^3
Distance	0.5km	0.7km	0.8km
Direction	220°	60°	60°
Day	185	145	
1968 Maximum	25.06µg/m^3	7.22µg/m^3	0.58µg/m^3
Distance	0.7km	0.8km	0.8km
Direction	80°	210°	60°
Day	140	156	
1969 Maximum	26.10µg/m^3	6.66µg/m^3	0.52µg/m^3
Distance	0.5km	1.7km	0.8km
Direction	20°	60°	60°
Day	175	192	

*Two stacks, each with an emission rate of 22.1 lb/hr.

ATTACHMENT 9

TABLE 8

BAY COUNTY RESOURCE RECOVERY FACILITY ALONE*
HIGHEST, SECOND HIGHEST PREDICTED CONCENTRATIONS FOR SULFUR DIOXIDE

	3-Hour	24-Hour
1965 High 2nd High	20.16μg/m^3	5.06μg/m^3
Distance	0.7km	0.8km
Direction	30°	60°
Day	163	188
1966 High 2nd High	19.66μg/m^3	6.52μg/m^3
Distance	0.6km	1.9km
Direction	60°	230°
Day	200	20
1967 High 2nd High	22.12μg/m^3	6.32μg/m^3
Distance	0.6km	1.9km
Direction	60°	330°
Day	215	111
1968 High 2nd High	20.68μg/m^3	5.34μg/m^3
Distance	0.6km	0.8km
Direction	20°	60°
Day	87	177
1969 High 2nd High	21.42μg/m^3	5.96μg/m^3
Distance	0.6km	1.9km
Direction	50°	230°
Day	210	303

*Two stacks, each with an emission rate of 22.1 lb/hr.

ATTACHMENT 10

TABLE 9
BAY COUNTY RESOURCE RECOVERY FACILITY AND OTHER SOURCES*
MAXIMUM PREDICTED CONCENTRATIONS FOR SULFUR DIOXIDE

	3-HOUR	24-HOUR	ANNUAL
1965 Maximum	370.3µg/m^3	112.7µg/m^3	7.2µg/m^3
Distance	3.2km	4.3km	4.3km
Direction	310°	300°	290°
Day	321	282	
1966 Maximum	354.7µg/m^3	99.1µg/m^3	7.2µg/m^3
Distance	4.3km	4.3km	4.3km
Direction	20°	320°	280°
Day	185	96	
1967 Maximum	404.6µg/m^3	91.8µg/m^3	6.4µg/m^3
Distance	3.2km	4.3km	4.3km
Direction	160°	250°	280°
Day	108	108	
1968 Maximum	401.0µg/m^3	116.9µg/m^3	6.6µg/m^3
Distance	4.3km	4.3km	4.3km
Direction	20°	220°	330°
Day	229	62	
1969 Maximum	408.7µg/m^3	108.1µg/m^3	6.4µg/m^3
Distance	1.1km	3.2km	4.3km
Direction	60°	280°	260°
Day	206	206	

*Two stacks, each with an emission rate of 22.1 lb/hr.

0295b

ATTACHMENT 11

TABLE 10

BAY COUNTY RESOURCE RECOVERY FACILITY AND OTHER SOURCES*
HIGHEST, SECOND HIGHEST PREDICTED CONCENTRATIONS FOR SULFUR DIOXIDE

	3-Hour	24-Hour
1965 High 2nd High	297.1µg/m^3	85.6µg/m^3
Distance	4.3km	4.3km
Direction	30°	310°
Day	121	256
1966 High 2nd High	305.1µg/m^3	6.52µg/m^3
Distance	4.3km	1.9km
Direction	310°	310°
Day	91	194
1967 High 2nd High	322.5µg/m^3	74.6µg/m^3
Distance	3.2km	2.5km
Direction	270°	240°
Day	217	345
1968 High 2nd High	383.5µg/m^3	82.1µg/m^3
Distance	4.3km	2.5km
Direction	320°	240°
Day	302	106
1969 High 2nd High	305.1µg/m^3	102.0µg/m^3
Distance	1.4km	3.2km
Direction	40°	280°
Day	207	207

*Two stacks, each with an emission rate of 22.1 lb/hr.

```
VMRBHM14     D1955934     6/13/84     9:10:54  G.M.T.  WAS THE ORIGIN

DEST: R5          FILE: 5991  NAME: PTPLU        OUTPUT        DIST: BLANCHE   RECS: 00000096
```

```
FILE: PTPLU   OUTPUT   A   INFORMATION SERVICES ORGANIZATION - BIRMINGHAM, AL.                        PAGE 001

1                    PTPLU  (VERSION 80364)
                     AN AIR QUALITY DISPERSION MODEL IN
                     SECTION 3. MODELS PROPOSED SEP80 FOR 81 GUIDELINES.
                     IN UNAMAP (VERSION 4) DEC 80
                     SOURCE: FILE 13 ON UNAMAP MAGNETIC TAPE FROM NTIS.
         PTPLU TRIAL RUN  BAY CO PROJECT 100%
0
 ***SOURCE***                                       >>>INPUT PARAMETERS<<<
 EMISSION RATE =  2784.55 (G/SEC)     ***OPTIONS***                               ***METEOROLOGY***
 STACK HEIGHT  =    38.10 (M)         IF = 1, USE OPTION                          AMBIENT AIR TEMPERATURE =   293.00 (K)
 STACK DIAM.   =     1.22 (M)         IF = 0, IGNORE OPTION                       ANEMOMETER HEIGHT       =     7.00 (M)
 EXIT VELOCITY =    17.29 (M/SEC)     IOPT(1) = 0 (GRAD PLUME RISE)               MIXING HEIGHT           =  5000.00 (M)
 STK GAS TEMP  =   477.59 (K)         IOPT(2) = 0 (STACK DOWNWASH)                WIND PROFILE EXPONENTS  = A: .10, B: .15, C: .20
                                      IOPT(3) = 0 (BUOY. INDUCED DISP.)                                     D: .25, E: .30, F: .30
                                                                                  RECEPTOR HEIGHT         =     0.0  (M)

 VOLUMETRIC FLOW =    20.21 (M**3/SEC)          >>>CALCULATED PARAMETERS<<<
                                                   BUOYANCY FLUX PARAMETER =    24.38 (M**4/SEC**3)

 ANALYSIS OF CONCENTRATION AS A FUNCTION OF STABILITY AND WIND SPEED
0
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT         ****EXTRAPOLATED WINDS****
              (M/SEC)     (G/CU M)       (KM)          (M)         WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT
     1          0.50    1.0046E-02      0.971       508.3(2)        (M/SEC)     (G/CU M)       (KM)          (M)
     1          0.80    1.1483E-02      0.794       332.0(2)          0.59    1.0573E-02      0.902       435.0(2)
     1          1.00    1.2109E-02      0.724       273.2(2)          0.95    1.1964E-02      0.741       286.2(2)
     1          1.50    1.3039E-02      0.617       194.8             1.18    1.2538E-02      0.677       236.6(2)
     1          2.00    1.3448E-02      0.555       155.6             1.78    1.3311E-02      0.580       170.4
     1          2.50    1.3572E-02      0.514       132.1             2.37    1.3560E-02      0.523       137.3
     1          3.00    1.3638E-02      0.472       116.5             2.96    1.3635E-02      0.474       117.5
0                                                                     3.55    1.3615E-02      0.442       104.3
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT         ****EXTRAPOLATED WINDS****
              (M/SEC)     (G/CU M)       (KM)          (M)         WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT
     2          0.50    4.5095E-03      3.100       508.3(2)        (M/SEC)     (G/CU M)       (KM)          (M)
     2          0.80    6.0848E-03      2.100       332.0(2)          0.64    5.3239E-03      2.506       402.8(2)
     2          1.00    6.9255E-03      1.758       273.2(2)          1.03    7.0455E-03      1.716       266.0(2)
     2          1.50    8.5178E-03      1.291       194.8             1.29    7.9223E-03      1.445       220.4(2)
     2          2.00    9.5997E-03      1.052       155.6             1.93    9.4794E-03      1.076       159.7
     2          2.50    1.0338E-02      0.905       132.1             2.58    1.0430E-02      0.887       129.3
     2          3.00    1.0836E-02      0.808       116.5             3.22    1.0999E-02      0.774       111.0
     2          4.00    1.1358E-02      0.683        96.9             3.87    1.1316E-02      0.695        98.9
     2          5.00    1.1496E-02      0.606        85.1             5.16    1.1495E-02      0.597        83.7
0                                                                     6.45    1.1344E-02      0.537        74.6
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT         ****EXTRAPOLATED WINDS****
              (M/SEC)     (G/CU M)       (KM)          (M)         WIND SPEED   MAX CONC    DIST OF MAX   EFFECT HT
     3          2.00    8.0154E-03      1.906       155.6           (M/SEC)     (G/CU M)       (KM)          (M)
     3          2.50    8.8833E-03      1.593       132.1             2.81    9.2972E-03      1.458       121.9
     3          3.00    9.5197E-03      1.387       116.5             3.51    9.9869E-03      1.239       105.1
     3          4.00    1.0307E-02      1.134        96.9             4.21    1.0412E-02      1.095        93.9
     3          5.00    1.0673E-02      0.983        85.1             5.61    1.0765E-02      0.919        80.0
     3          7.00    1.0742E-02      0.817        71.7             7.02    1.0740E-02      0.815        71.6
     3         10.00    1.0176E-02      0.691        61.6             9.82    1.0218E-02      0.697        62.0
     3         12.00    9.6699E-03      0.643        57.7            14.03    9.1462E-03      0.609        54.9
     3         15.00    8.9037E-03      0.595        53.8            16.84    8.4610E-03      0.575        52.1
0                                                                    21.05    7.5576E-03      0.541        49.3
                                                                   ****EXTRAPOLATED WINDS****
```

```
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX    EFFECT HT       WIND SPEED    MAX CONC     DIST OF MAX    EFFECT HT
              (M/SEC)    (G/CU M)        (KM)           (M)            (M/SEC)     (G/CU M)         (KM)           (M)
     4          0.50    7.2574E-04      45.171        508.3(2)           0.76    1.3123E-03       23.082         345.9(2)
     4          0.80    1.3919E-03      21.492        332.0(2)           1.22    2.3220E-03       11.193         230.5(2)
     4          1.00    1.8339E-03      15.131        273.2(2)           1.53    2.9397E-03        8.463         192.0
     4          1.50    2.8875E-03       8.672        194.8              2.29    4.2367E-03        5.062         140.7
     4          2.00    3.7779E-03       5.987        155.6              3.05    5.2418E-03        3.628         115.1
     4          2.50    4.5392E-03       4.554        132.1              3.82    5.9857E-03        2.946          99.7
     4          3.00    5.1786E-03       3.692        116.5              4.58    6.4765E-03        2.482          89.4
     4          4.00    6.1180E-03       2.814         96.9              6.11    7.0506E-03        1.951          76.6
     4          5.00    6.6799E-03       2.300         85.1              7.64    7.2797E-03        1.653          68.9
     4          7.00    7.2148E-03       1.760         71.7             10.69    7.2282E-03        1.335          60.1
     4         10.00    7.2760E-03       1.389         61.6             15.27    6.6992E-03        1.114          53.5
     4         12.00    7.1050E-03       1.254         57.7             18.33    6.2862E-03        1.031          50.9
     4         15.00    6.7358E-03       1.124         53.8             22.91    5.6849E-03        1.000          48.4
     4         20.00    6.0647E-03       1.000         49.9             30.55    4.7987E-03        0.973          45.8
0                                                                    ****EXTRAPOLATED WINDS****
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX    EFFECT HT       WIND SPEED    MAX CONC     DIST OF MAX    EFFECT HT
              (M/SEC)    (G/CU M)        (KM)           (M)            (M/SEC)     (G/CU M)         (KM)           (M)
     5          2.00    6.1925E-03       6.578        106.5              3.32    4.9913E-03        5.337          95.8
     5          2.50    5.6459E-03       5.988        101.6              4.16    4.5140E-03        4.876          91.7
     5          3.00    5.2216E-03       5.569         97.9              4.99    4.1468E-03        4.558          88.5
     5          4.00    4.5937E-03       4.957         92.4              6.65    3.6091E-03        4.099          83.9
     5          5.00    4.1419E-03       4.549         88.5              8.31    3.2192E-03        4.000          80.6
0                                                                    ****EXTRAPOLATED WINDS****
 STABILITY   WIND SPEED   MAX CONC    DIST OF MAX    EFFECT HT       WIND SPEED    MAX CONC     DIST OF MAX    EFFECT HT
              (M/SEC)    (G/CU M)        (KM)           (M)            (M/SEC)     (G/CU M)         (KM)           (M)
     6          2.00    4.6760E-03      14.132         94.9              3.32    3.8252E-03       11.141          86.0
     6          2.50    4.2926E-03      12.742         90.8              4.16    3.4786E-03       10.093          82.6
     6          3.00    3.9907E-03      11.681         87.7              4.99    3.2089E-03        9.312          80.0
     6          4.00    3.5368E-03      10.242         83.2              6.65    2.8089E-03        8.278          76.1
     6          5.00    3.2052E-03       9.314         79.9              8.31    2.5210E-03        7.568          73.4
0 (1) THE DISTANCE TO THE POINT OF MAXIMUM CONCENTRATION IS SO GREAT THAT THE SAME STABILITY IS NOT LIKELY
       TO PERSIST LONG ENOUGH FOR THE PLUME TO TRAVEL THIS FAR.
0 (2) THE PLUME IS OF SUFFICIENT HEIGHT THAT EXTREME CAUTION SHOULD BE USED IN INTERPRETING THIS COMPUTATION AS THIS
        STABILITY TYPE MAY NOT EXIST TO THIS HEIGHT. ALSO WIND SPEED VARIATIONS WITH HEIGHT MAY EXERT A DOMINATING
        INFLUENCE.
0 (3) NO COMPUTATION WAS ATTEMPTED FOR THIS HEIGHT AS THE POINT OF MAXIMUM CONCENTRATION IS GREATER THAN 100 KILOMETERS
        FROM THE SOURCE.
```

ATTACHMENT I

ATTACHMENT "I"

NOV 23 1987

Board of County Commissioners
Bay County
POST OFFICE BOX 1818
PANAMA CITY FLORIDA 32402
PHONE: (904) 784-4000

COMMISSIONERS:
JOHN B. HUTT, JR
DISTRICT I
RALPH BURGESS
DISTRICT II
S. RICHARD SELTZER
DISTRICT III
HAROLD T. PHILLIPS
DISTRICT IV
TOMMY LOFTIN
DISTRICT V

November 18, 1987

Mr. Thomas W. Moody, P.E.
Special Programs Supervisor
Department of Environmental Regulation
Northwest District
160 Governmental Center
Pensacola, FL 32501

RE: ADDITIONAL INFORMATION FOR APPLICATION NUMBERS 140648 AND 140649

Dear Mr. Moody:

In response to your letter of November 6, 1987, addressed to Mr. D. S. Beachler of Westinghouse Electric Corporation, please be advised that the Bay County Board of County Commissioners have designated Mr. D. S. Beachler and Mr. John J. Zebroski of Westinghouse Electric Corporation as the Authorized Representatives of the Resource Recovery Facility in Bay County, Florida.

If we may be of further assistance, please let us know.

Sincerely,

BAY COUNTY COMMISSION

J. Ralph Burgess

J. Ralph Burgess
Chairman

RB/jsb

cc. Mr. D. S. Beachler
Mr. J. J. Zebroski
Mr. Nevin Zimmerman

"For Public Service"

ATTACHMENT J

OPERATING AND MAINTENANCE MANUAL

FOR

ENVIRONMENTAL ELEMENTS ELECTROSTATIC PRECIPITATOR

AT

BAY COUNTY WASTE TO ENERGY FACILITY

PANAMA CITY, FLORIDA

JULY, 1986

Environmental Elements Shop Order

420201

ENVIRONMENTAL ELEMENTS CORPORATION
3700 KOPPERS STREET
BALTIMORE, MARYLAND 21227
301-368-7000

Sales
Gene Schickling
301-368-7291
301-368-7343

Service
Jack Stuart
301-368-7255
301-368-7256

INDEX

1k

WARNING

FIRES CAN OCCUR IN ANY PRECIPITATOR AND DUCTWORK. TO REDUCE THIS RISK, BOILER OPERATION SHOULD BE CLOSELY MONITORED. COMBUSTIBLE AND OXYGEN LEVELS MUST BE CONTROLLED. BOILER UPSET OR TRIP CONDITIONS ARE PARTICULARLY DANGEROUS. PRECIPITATOR HOPPERS SHOULD BE CONTINUOUSLY EMPTIED AND ALL HIGH LEVEL ALARMS ATTENDED TO IMMEDIATELY. ATTENTION TO THESE PARAMETERS CAN REDUCE THE RISK OF FIRE IN ANY PRECIPITATOR.

SECTION I - INTRODUCTION

This manual is prepared to acquaint the Purchaser of Environmental Elements Electrostatic Precipitators with basic operating and maintenance information. Anything beyond its scope should be referred to the Environmental Elements Air Cleaning Department.

A. Introduction

The Environmental Elements Electrostatic Precipitator provides an extremely efficient means for the separation and collection of suspended solids or liquids from gases. The equipment has been designed and constructed to provide the utmost in ease, simplicity, and safety of operation, while requiring a minimum of maintenance.

In plants where the use of electrostatic precipitation is new, the operator will find the principles underlying this process somewhat different from those of other electrical equipment, particularly in the relation between operating voltage and dust concentration. Section V of this manual "Operation of Precipitator", is intended to provide the operator with sufficient information concerning the fundamental principles of electrostatic precipitation in which to enable him to understand and adjust the precipitator most efficiently under the various conditions that may be encountered.

Section VI, "Maintenance and Service", is intended as a general guide to the principal items of inspection, maintenance and service. This guide does not attempt to encompass all details, and it is recommended that these be amended by the operator as indicated by experience. The frequencies of inspection recommended should be considered approximate, as these are in large measure affected by operating conditions and may be modified as found necessary.

B. Safety

It must be remembered, at all times, that an electrostatic precipitator uses EXTREMELY DANGEROUS HIGH VOLTAGE!!!!! The interlocks afford a large measure of protection against contact with energized parts of the precipitator high voltage system, although this means of protection must not be considered as supplanting established safety measures attending the operation of industrial electrical equipment.

All high voltage parts of the precipitator and electrical equipment must be physically ground-connected after shut-down has been achieved, and before any attempt is made to enter the precipitator, the insulator compartments or bus ducts. Safety grounding devices, with clamps at both ends, are provided for this purpose.

When using the safety grounding devices one end should be clamped to a metal part of the precipitator structure that is connected to the station ground first, then the free end of the cable will be attached to the high voltage system member nearest the point of access.

The doors which provide access to the hoppers of the precipitator should be opened VERY CAREFULLY. Care must be taken to insure that no accumulation of collecting dust is impounded behind the hopper inner doors. Before these doors are opened an internal inspection must be made from one top of the collecting surfaces to be certain no buildups are still present in the corners of the unit or in the valley's of the pyramidal hoppers. If side access doors are available on the unit, with catwalks between fields they should also be entered subsequent to the top inspection, to get a closer, more definitive look into the hoppers. The hopper doors should not be opened nor should personnel go into hoppers unless it is absolutely necessary for maintenance or for an inspection that cannot be performed otherwise.

The hopper inner doors are provided with two design features which, if properly utilized, will insure that no dust is impounded behind the door. There is a ½" NPT coupling and plug installed in the door. By removing the plug, the presence of dust behind it can be determined. If this test is positive, steps should be taken to empty the hopper. Other inspections noted above should be repeated when it is felt that the hopper is empty. In addition to the above steps, one other design feature is present to insure that the inner-door is not removed with dust behind it. There are "U" shaped catches that capture the end of the latch bar used to provide the pressure to keep the door firmly against the shell. With the bar inside the "U" shaped catches, the pressure on the door must be relaxed by backing off on the screw until the door can be moved away from the shell. When the door moves away from the shell, if any dust is impounded behind the door, it will run out the gap between the door and the shell. The door will still be kept in place by the latching bar until the pressure behind the door caused by the dust is eliminated, then it can be moved and the latching bar can be removed from the catches and the door removed.

However, under most circumstances, the hopper will be empty and the inner door, when struck by a blunt object such as a hammer, will resound with a ring indicating that there is nothing against the inside surface. The inner door can then be opened normally. Instructions given above concerning the always present possibility of buildups in other areas should be followed..

SECTION II - EQUIPMENT - DRY DUST

The Environmental Elements Electrostatic Precipitator consists of two essential units, the precipitator proper, where the gas is cleaned of suspended particles, and a high voltage electrical set capable of supplying high voltage, unidirectional direct current to the discharge electrode.

A. Precipitator

The precipitator is formed by a rectangular casing, open to the ductwork on the ends. Gas enters one end (inlet) and is discharged through the other (outlet).

1. Collecting Surfaces

The precipitator through area is partitioned by vertical arrangement of the collecting surfaces into multiple gas passages. The gas passages are open to the ductwork at the inlet and the outlet of the precipitator.

2. Discharge Electrodes

The discharge electrodes are suspended from high voltage structures located in the area above the gas passages. The high voltage structures are suspended from insulator, electrically isolating them from the precipitator casing.

The discharge electrodes pass down through the gas passages. They are guided by a rigid frame which is in the area below the gas passages. The rigid frame is suspended from the high voltage structure by the discharge electrodes.

The discharge electrodes are centered in the gas passages by adjustment of the high voltage structure support rods.

3. Gas Distribution Devices

As an aid to gas distribution, gas distribution devices are provided at the inlet and outlet of the precipitator chamber. The purpose is to provide uniform velocity in all gas passages.

4. High Voltage System Support Insulators

Insulators supporting the high voltage system are of porcelain or alumina and must be kept free of dust and moisture to prevent "arc-over". The insulator compartment purging system assures dryness of the insulators and must be operating when gas is passing through the precipitator, and should be kept on during all but lengthly outages. Purging system is to be started at least two hours before energizing the precipitator. (When supplied, see Section VII for details).

5. Discharge Electrode and Collecting Surface Cleaning Systems

Collected material must be periodically removed from both the discharge electrodes and the collecting surfaces. An excess deposit of collected material on the surface of either will lower the efficiency of collection.

Automatic cleaning systems are installed on all ENELCO Dry Dust Precipitators. Initial adjustment of the cleaning system will be determined by the ENELCO Test and Service Engineer at the time of start up.

6. Collected Material Conveying System

Collected materials, dislodged from the discharge electrodes and collecting surfaces, falls through the open bottom of the gas passages into the hopper. Collected material is then removed from the precipitator by means of the dust removal system.

Details of Items A:1-6 may be found under Section VIII or on the enclosed prints. Print names and numbers appear on the Appendix.

SECTION II - EQUIPMENT (continued)

B. High Voltage Electrical Set

The Environmental Elements high voltage electrical set is designed to supply high voltage unidirectional current to the high voltage system. In general, each high voltage electrical set consists of a high voltage transformer-rectifier, which is located on top of the precipitator, (see Section VIII for details) and operating controls for the transformer-rectifier unit which are remotely located in a self-contained control equipment console. Each control equipment console is completely factory assembled, ready for location in the field. All that is required at the plant site is mounting the units on their foundations and connecting the high voltage conductors, installing wiring between the transformer-rectifier and the control equipment console, and installing the ground connections and external signal system (optional). The principle instruments and control equipment provided with each control equipment console are as follows:

1. Meters

   a. Voltmeter (VM) to indicate the voltage to the primary of the high voltage transformer-rectifier.

   b. Ammeter (AM) to read the current to the primary of the high voltage transformer-rectifier.

   c. Kilovolt (KV) meter shows the secondary voltage of the transformer-rectifier.

   d. Milliammeter (MA) connected in the ground side of the rectifier to read DC current to the precipitator. The milliammeter is protected from high voltage in the event of an open circuit by surge arrestors SR-1 on side of which are grounded.

   The value of meter readings to obtain optimum performance is determined by ENELCO T&S Engineers during testing and will be reported to the Purchaser.

2. Description of Operation of SCR Precipitator Control

   a. Closing the circuit breaker applies power to the control bus. In order to operate the control key interlock switch must be closed. The key is then held captive. (The key is available only when the high voltage switches in the rectifier are in the proper operating position. See key interlock system drawing).

   b. The white light WIL should light indicating control power is energized.

c. Reset alarm relay ALR by returning selector switch MS to the left, "OFF-RESET" position.

d. For automatic control operation place the automatic-manual selector switch AMS in the automatic position. Refer to Instruction Manual-Automatic Power Control for operation of the automatic control.

e. For manual control turn selector switch AMS to the manual position and regulate precipitator voltage by turning the manual control potentiometer R8. The manual control is only for testing circuits and precipitator performance. It is not recommended that the precipitator be operated on manual control unattended.

f. Before closing contactor M, be sure the manual control potentiometer, R8 is turned fully counter-clockwise.

g. Contactor M may now be closed by turning selector switch MS to the "ON" position. This energized the high voltage transformer, the rectifier, and turns on the red light RIL.

h. If contractor M opens due to an overload or loss of line voltage, reset the alarm circuit by means of MS.

i. The current transformer CT provides lower-than-line currents for the operation of the AC ammeter AM. It also provides a voltage signal proportional to precipitator line current for the automatic power control.

j. Should an overload develop in the precipitator, relay OL will operate to energize the coil of relay ALR causing it to seal in and in turn open contactor M.

k. A normally open contact on ALR in series with contacts on MS, which are closed in the on position, will sound the alarm if the rectifier goes off due to overcurrent. The alarm will not sound if the rectifier is turned off by means of MS. The alarm may be silenced by turning MS to "RESET".

l. Transformer IT provides control power to the automatic power control chassis RC, the fan and the controls.

m. Thyrite resistor SR-2 is used to prevent damage from overvoltage in the event of open circuit in the milliammeter.

n. Spark currents provide a voltage drop across resistor R6 & R7 to operate the Digicon and MVSC Boards.

o. Fixed iron core reactor 1CLR attenuates line current surges as precipitator spark over occurs to prevent damage to high voltage diodes and SCR's.

p. R1 & R2 are bleed resistors which prevent transients in the rectifier primary winding.

q. The firing circuit turns the SCR on and off and controls the voltage applied to the gate of the SCR. The amount of conduction of the SCR is regulated by the automatic power control.

NOTE: For a complete description of operation, parts description, start up procedure and troubleshooting guide, refer to the attached "Rectifier Control Console and Digicon 2 Automatic Power Control Operation Manual".

B. 3. Integral Grounding Device

The transformer-rectifier has an internal oil immersed selector switch located within its tank. The external operating handle is key interlocked, prohibiting movement while energized.

The switch can be turned to be locked in the ground position, after de-energizing the transformer-rectifier and removing the operating key (KI) from the control console to its alternate lock in the transformer-rectifier switch.

In the case of the double half wave transformer/rectifier, (two outlet bushings) three switch positions, other than FULL WAVE AND GROUND, are supplied. The two transformer-rectifier outlet bushings may be positioned alternately on ground or full wave, for access to one field or the other. Also double half wave may be directed to both outlet bushings simultaneously.

4. Magnetic Overload

The main contactor within the control equipment console is controlled by a magnetic overload relay having an inverse time function. The relay guards the high voltage transformer-rectifier and other elements of the load circuit in event the automatic voltage control should fail to compensate for arcing or short circuits within the precipitator. The relay is adjusted to the proper settings, and the settings should not be changed except upon the recommendation of the Koppers Test and Service Engineer.

5. High Voltage Milliammeter Cutout

In parallel with the milliammeter (MA) which measures precipitation current is a Thyrite arrestor. The resistance of this arrestor is sufficiently high in comparison with the resistance of the meter coil so that under normal operating conditions the meter reading is not affected by its presence.

In the event of an open circuit in the wiring or in the meter itself, the Thyrite resistor carries the precipitator current without danger of a high voltage buildup in the control compartment wiring, thereby eliminating danger to personnel operating the equipment.

SECTION III - PLACING THE PRECIPITATOR IN OPERATION

A. Preliminary Precautions for Energizing the Transformer-Rectifier

Before energizing the transformer-rectifier for the first time or after a prolonged shutdown, the following procedure must be followed to insure proper operation and prevent damage.

1. Check rating of all fuses as listed on equipment legend.
2. Check line voltage in order to be certain it conforms to the transformer-rectifier rating.
3. Check liquid level in transformer-rectifier tank.

B. Precautions before Energizing the Precipitator

1. The first step in readying the precipitator for operation is a physical inspection of the precipitator and insulator compartments to ascertain that there are no unintentional grounds, materials, or tools left by workmen. As a check for unobserved grounds within the precipitator, it is advisable to disconnect the high voltage bus and megger each field. This can be done at the insulator compartment, and should be done, if possible, with a 1000 volt megger. The result should be between 100 megs and infinity. (See Test Procedure, Silicon Rectifier - Appendix). In general, the tolerance on collecting electrodes and discharge wire electrode spacing must not exceed 1/4 inch less than the design distance.
2. The insulator compartment's purging system (See Section VIII for number, size, type, etc.) must be turned on for a minimum of two (2) hours before energizing the precipitator. (When supplied).
3. When the precipitator and insulator compartment doors have been closed and locked, the precipitator is ready for gasing-in and application of power. Gas should flow through until the temperature of the precipitator and the gases are well above the dewpoint. The precipitator may then be energized.

C. Procedure for Starting the Transformer-Rectifier and Regulating for Proper Operation

To start the transformer-rectifier and regulate for proper operation, a fixed procedure must be followed. Below are listed the proper steps in their normal sequence.

C. 1. The selector switch, located on the transformer-rectifier tank, must be in the full wave position. (The alternate would be double half wave, only if proven to be more effective during efficiency tests). Once all access doors on the precipitator chambers are closed and locked, keys are released which permit the selector switch to be turned to the full wave position. With the switch in this position the operating key is released, which permits the KI switch to be unlocked and power applied to the unit by turning switch MS to "ON" position. (See the Key Interlock drawing for a detailed description of this sequence).

2. If the automatic power control has been previously adjusted for the precipitator load, then the precipitator power, as indicated by the voltmeters and current meters on the control consoles, will come up to normal operating levels. If adjustment of the automatic power control appears to be necessary, refer to the "Instruction Manual - Control Console and T/R Power Unit.

3. As soon as high voltage has been applied, the indicating meters on the control console should be reviewed.

AM is an A.C. ammeter located in the primary of the high voltage transformer.

VM is a voltmeter which reads voltage on the primary of the high voltage transformer.

MA is a D.C. milliammeter located in the ground side of the rectifier circuit to read D.C. current.

KV is a D.C. micro-ammeter to indicate the D.C. voltage to discharge electrodes.

NOTE:

a. If, at any time, there is evidence that the automatic voltage control is not functioning properly, refer to the "Instruction Manual - Control Console and T/R Power Unit". Once adjusted at time of start up, the automatic voltage control should not require readjustment unless precipitator operating conditions change greatly.

CAUTION: It is important that the transformer/rectifier should not be disconnected from the load while energized. The rectifier switches are interlocked in such a manner as to prevent this occurrence while operating the switches. The control console circuit breaker should be open before the rectifier switch is moved.

b. Collected material, conveying system must be in operation when gas is passing through the precipitator. (See Section VIII for details).

c. Discharge electrode and collecting surface cleaning systems must be in operation when precipitator is energized (Not Sprays). (See Section VIII for details).

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SECTION IV - SHUTTING DOWN THE PRECIPITATOR

A. Transformer-Rectifier

In an emergency, the transformer-rectifier may be shut down completely by opening the service switch. To shut down normally, proceed as follows:

1. Do not disturb the setting of AMS or the control adjustments.
2. De-energize the unit by turning selector switch MS to the left, "OFF".
3. Open the service switch.
4. Move the transformer-rectifier selector switch (top of transformer-rectifier) to the "ground" position. The key from lock KI is necessary for this purpose.
5. The keys for the precipitator door interlock system are released by placing and locking the selector switch in the "ground" position (see Appendix for "Key Interlock System" print showing this sequence).

B. Precipitator

CAUTION: BEFORE ANY ATTEMPT IS MADE TO ENTER THE PRECIPITATOR OR INSULATOR COMPARTMENTS, GROUND THE HIGH VOLTAGE SYSTEM WITH SAFETY GROUND DEVICES. (See "Safety" Section I, B). CHECK TO INSURE THAT NO HARMFUL GAS IS PRESENT IN, OR IS ENTERING THE PRECIPITATOR.

1. Precipitator should be completely emptied of collected materials before entering. This is also true for a prolonged shutdown.
2. Auxiliary equipment may be turned off during prolonged shutdown. (Refer to Section III when starting up).

SECTION V - OPERATION OF PRECIPITATOR

The precipitator should normally operate at the value of primary voltage on the high voltage transformer, as read on voltmeter, VM, as determined by the ENELCO Test and Service Engineer. The observance of this value of transformer voltage will yield the optimum precipitator collection efficiency that is consistent with continuous operation without exceeding the rating of the electrical equipment.

The operating value recommended is governed by the conditions of gas loading (usually at rated gas volume) which exist at the time of determination. In general, the operating value will hold good when the gas load conditions vary, although it is important for the operator to understand that a substantial variation of any one or a combination of several conditions within the precipitator will reflect in the instruments of the transformer-rectifier. The more important factors that occur in normal precipitator operation follow:

It has been established that precipitator collecting efficiency increases rapidly as the applied voltage increases and that, for best results, the voltage on the precipitator should be kept at a point which produces a light sparking condition.

For practical reasons, the high voltage output of the transformer-rectifier is not metered directly, and so voltage measurement on the primary side of the high tension transformer is used to give a relative indication of the voltage being applied to the precipitator. The voltage output of the transformer-rectifier is maintained at an optimum condition by the automatic power control. The object of the high voltage gradient is the formation of a corona discharge. At the above a critical voltage, the dielectric strength of the gas medium is exceeded, and a corona discharge takes place in the region of the negatively charged discharge electrode. The corona discharge is a visible manifestation of the ionization of the gas between the discharge electrodes and the collecting surfaces, resulting in the formation of positive and negative gas ions in the region near the discharge electrodes. The ions are attracted to surfaces of opposite polarity. In moving toward these surfaces, the ions attach themselves to solid or liquor particles entrained in the gas, charging the particle positive or negative as the case may be. The particles themselves are then attracted to the surface of opposite polarity, on which they are deposited. From this, it can be seen that particles are deposited on both discharge electrodes and collected surfaces, however, since the ions are formed in the immediate neighborhood of the negative discharge electrodes, the negative ions have a much longer average distance to travel. Hence, more dust or mist particles are charged negatively then positively, resulting in a greater collection of grounded collecting surfaces than on the negative discharge electrode.

When operating the precipitator at or below its rated volume of gas, the applied voltage becomes the primary factor in collection efficiency. The voltage which can be applied is influenced chiefly by the following factors.

A. The electrical conductivity of the gas and the particles in the gas stream.

B. The gas temperature.

C. The concentration of suspended matter in the gas stream.

D. The gas pressure.

E. The amount of moisture (water vapor).

F. The degree of cleanliness of the collecting surfaces and the discharge electrodes.

The electrical conductivity of the gas and suspended matter both materially affect sparking voltage. Although conductivity is generally fixed by gas composition, an increase in the moisture content of the gas would increase electrical conductivity, with a resulting increase of sparkover voltage and increase in precipitator current. The presence of water vapor (within certain limits) improves precipitation.

Other conditions remaining constant, an increase in gas temperature above the normal operating temperature usually lowers sparkover voltage of the gas stream and, conversely, a decrease in gas temprature is accompanied by a high sparkover voltage.

Usually an increase in concentration of dust will be accompanied by a decrease in precipitating current, a decrease in sparkover voltage of the gas stream, and will result in increased over-all collecting efficiency. A decrease in dust loading results in the reverse of these conditions. A substantial increase in dust concentration above the operating range, however, requires an increase in the frequency of discharge electrode and collecting surface cleaning.

The relation of sparkover voltage to gas pressure is a corollary to the change in sparkover voltage with respect to gas density. Considered by itself, therefore, sparkover voltage varies with gas pressure although these effects are scarcely noticeable with the small pressure variation usually encountered.

One of the most important factors in the operation of the precipitator is the cleanliness of discharge electrodes and collecting surfaces. Deposits on collecting surfaces reduce the voltage across the gas lane (besides affecting the stability of the corona discharge) since, with a sufficiently high resistance of the deposit layer, a potential difference is set up in the layer. When this happens the deposit layer accounts for a high percentage of the total voltage across the discharge electrode to collecting surface spacing, leaving a comparatively low voltage across the gap. When the dust build up on the surface becomes excessive, the consequence is lowering of the precipitation current and decreased collecting efficiency, and is frequently characterized by intermittent arcing due to the decreased flashover voltage. The principle effect of deposit on the discharge electrodes is the reduction of corona discharge and thus less current emission.

Arcing in the precipitator, characterized by violent fluctuations of the milliammeter, is the result of lowering the sparkover point of the gas stream below that of the peak voltage supplied by the transformer-rectifier. Occasional sparking of small intensity and short duration does not indicate abnormal operation. However, if arcing becomes persistent and is of such intensity as to cause violent fluctuations of the precipitating current and voltage, the efficiency of the precipitator will be impaired, and could result in tripping-off the transformer-rectifier by means of its overload protection relay. If such a situation exists, it could indicate that the automatic control is not properly regulated, or, if the voltage is being controlled manually, that the manual control potentiometer is set so that too high a voltage is being applied to that precipitator.

Arcing may be caused by a decrease in electrical clearance in the precipitator. The precipitator is constructed to have an equidistant electrical spacing between discharge electrodes and collecting surfaces; and should this clearance be lessened in just one place, the sparkover voltage of the system will be reduced in proportion. When sparking is traced to this cause, the obvious remedy is correction of the reduced clearance. The discharge electrode should, at all times, be spaced centrally in the gas passage. The position of the discharge electrodes can be corrected by adjusting the supporting devices.

SECTION VI - MAINTENANCE AND SERVICE

A. Electrical Equipment

1. General Cleaning of the Electrical Equipment

The primary consideration for servicing the electrical equipment is the cleanliness of the insulators. At frequent intervals, dictated by the general cleanliness of the plant, transformer-rectifier bushings and stand-off insulators should be thoroughly cleaned. (Section B.3).

2. Magnetic Overload Relay

The main contactor within the control console is controlled by Allen-Bradley bulletin 810 magnetic overload relay having an inverse time element. The relay is adjusted to the correct settings and these settings must not be changed except upon the recommendation of the Environmental Elements engineer.

3. Care of Transformer-Rectifier Unit

(Refer to attached brochure for detailed discussion of this component).

The high voltage transformer-rectifier unit supplied as part of all ENELCO installations are self-cooled and depend entirely upon the surrounding air for carrying away their heat. Precautions must be taken to insure adequate ventilation and a flow of air around the tank.

The transformer-rectifier units are shipped filled with transformer-fluid. Samples of the fluid from the transformer-rectifier tank should be taken and tested at least once every six months.

4. Control Console

Components contained in the control console should be vacuumed occasionally to remove dust accumulations. Care should be taken not to disturb wiring or connections. The control console exterior should be waxed to preserve its finish.

5. Automatic Voltage Control

The automatic voltage control requires no maintenance other than keeping the amplifier chassis and components free of dust accumulations which prevent heat dissipation.

B. Precipitator

1. The requirements for precipitator maintenance will be dictated by the observations from periodic inspections of the unit. It is difficult for the manufacturer to specify the frequency of inspection because of external and operating conditions that vary from plant to plant, but it is recommended that the period between inspection be not greater than six months. If inspection indicates considerable buildup of collected material on the discharge electrodes or collecting surfaces within the precipitator they should be cleaned before re-energizing.

   When an interior inspection is to be made, the structural condition and positioning of the discharge electrodes and collecting surfaces should be carefully examined.

2. While examining discharge electrodes it is pertinent to keep in mind that all discharge electrodes of a precipitator chamber are operated at the same high potential; and a reduced clearance or discontinuity in but a single one will reduce the performance of that field. It is essential in such an inspection that each discharge electrode be examined. All discharge electrodes should be spaced equidistant from the adjacent collecting surfaces. The maximum permissible tolerance is one-quarter (1/4) inch off the center line between the collecting surfaces.

3. The precipitator insulators must be kept clean and dry if proper operation is to be maintained. During shutdowns it is advisable to open the insulator compartments and inspect and clean as necessary, the surface of the high voltage system support insulator, and the exposed surfaces of the transformer-rectifier bushings. The operator may use any agent that is manufactured for the purpose of cleaning porcelain, taking care not to damage the surface glazing of the insulator. Once the insulator surface is entirely clean, nothing should be applied to the clean surfaces. Polishing of the cleaned surfaces is entirely unnecessary, and the addition of any substance to the cleaned surface of an insulator may well induce electrical flashover, resulting in a broken insulator.

4. The condition of the insulator compartments' purging system should be checked occasionally to insure maximum performance.

5. Inspection services are available from Environmental Elements Corporation.

C. Daily Operating and Maintenance Procedure

1. Record readings from meters AM, VM and MA. Low voltage and high current, or normal voltage and low current indicate trouble and should be investigated. (See Section VII).
2. Check the discharge electrode and collecting surface cleaning systems to insure that all components are operating properly.
3. Check the collected material conveying system. Be sure it is functioning properly.
4. Check the insulator compartment purging system to be sure it is operating properly.

D. General Maintenance

The following items of general maintenance should be inspected on a semi-annual or on a "service as needed" basis.

1. Check the insulator compartment purging system. (See Section VIII for details).
2. Check gaskets for deterioration and replace as necessary (insulator and door flanges).
3. Inspect the alignment and straightness of all discharge electrodes. All should be straight and spaced not more than ¼ in. maximum off center. If a misaligned discharge electrode is found, it should be re-aligned immediately.
4. Lubricate all interlocks. This may be done by applying powdered graphite on a key and then working the lock with the key. DO NOT USE OIL.
5. If for any reason a high voltage system support insulator is replaced, care should be taken to keep the suspension rods centered. (new gaskets must be used). The high voltage structure must be releveled and re-aligned.
6. Make a general inspection of the whole precipitator to determine if any leaks have developed. (Door gaskets, welds, etc.)

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7. Obtain sample of fluid from the transformer-rectifier and have dielectric checked. Records should be maintained so that any deterioration may be noticed.

8. Check precipitator and ductwork thoroughly for any areas of deterioration which may require repair.

9. Check the gas distribution device (perforated plates) at inlet and outlet of precipitator for cleanliness and positioning. Clean and repair as necessary.

10. Refer to Section VIII - Auxiliary Equipment - for required maintenance on precipitator auxiliaries supplied.

SECTION VII - PROCEDURE TO BE FOLLOWED IN THE EVENT OF FAILURE OF ELECTRICAL EQUIPMENT TO START OR TO OPERATE CORRECTLY

(Refer to Schematic Wiring Diagram and Physical Wiring Diagram - Listed in Appendix)

1. Following is a list of items to be checked and the order to be followed in trouble shooting the electrical equipment in event the transformer-rectifier cannot be started or that normal operation is not obtainable. "Instruction Manual - Automatic Power Control for Electrostatic Precipitator" outlines suggestions for trouble shooting the automatic power control. Note: While tracing trouble in the equipment it may be necessary to energize and de-energize the unit a number of times; the same basic procedure and sequence as outlined in "Description of Operation - Silicon Rectifier Control" should be applied each time.

   A. Main contactor M does not remain closed after switch MS is turned to the Reset, then to the "ON" position.

      1. Make certain that overload relay, OL, is not operating.
      2. Check fuses.
      3. Check to see that 110 volts appear across the secondary of transformer 1T.

   B. When contactor M is closed, the meters indicate high current and low voltage or main contactor M does not remain closed due to operation of the overload relay, check the following possibilities to ascertain if there is a ground or insufficient clearance within the precipitator.

      1. Double half wave transformer-rectifier

         (Full wave trouble shooting procedure is identical except for double cell switching).

         (After going through the Key Interlock System, and with power off, having ascertained that the contactor M is in open position, and the service is off and padlocked.)

         Move the high voltage switch on top of the transformer-rectifier tank to the position which grounds one cell and permits full wave rectification to the other. Energize the unit. If normal operation is obtained, the trouble is in the cell which is grounded through the switch.

      2. Reverse the position referred to above. Energize the unit again. If the contactor M trips or if the meters indicate high current and low voltage there is either a ground or insufficient clearance in the precipitator cell, trouble in the transformer-rectifier, or trouble in the control console to the high voltage transformer-rectifier. The next step is to disconnect the high voltage bus bar from each rectifier bushing and megger voltage bus bar from each rectifier bushing and megger each cell of the precipitator. This can be done at one of the insulator compartments. (It is best to damper off

1. B. 2. the cell being meggered if gas is flowing through). If the megger indicates 100 mg ohms or more the trouble is not in the precipitator. If the megger indicates a low resistance, refer to a,b, and c following.

    a. Check all clearances between the discharge electrodes and collecting surfaces (example: bowed discharge electrodes, bowed collecting surfaces, misaligned high voltage structures, scrap or tools left in the unit by mistake, etc.)

    b. Failed rapper insulators, high voltage system support insulators, bus support insulators, and bus clearances.

    c. Sufficient dust buildup to reduce electrical clearance.

3. If the precipitator meggers clear, the main transformer-rectifier should be meggered according to Test Procedure - Silicon Rectifier Units (see Appendix). If the approximate values given on the drawing are not obtained, Environmental Elements Corp. should be notified.

4. Assuming the main transformer-rectifier is all right, the next step is to lift leads 1L1 and L3 in the control console going to the main transformer-rectifier and energize the unit. If the breaker trips or the meters indicate high current and low voltage, the trouble is in the control console and must be traced. A normal voltage reading means the trouble is probably in the wiring from the control console to the main transformer-rectifier. To be certain, disconnect leads 10 and 11 in the low voltage junction box of the transformer-rectifier. Reconnect leads A and B in the control console and energize the unit. If the breaker trips or the meters indicate high current and low voltage, the wiring must be checked for ground.

   It is conceivable, though very unlikely, that the trouble is in the main transformer of the transformer-rectifier unit. This can be checked by removing the wires from 10 and 11 at the low voltage junction box on the transformer-rectifier and meggering between 10 and 11 and ground. The megger readings should be infinity.

C. Milliammeter gives abnormally low reading.

1. Check milliammeter.

2. Check primary voltage in high voltage transformer.

3. Check discharge electrodes in precipitator for buildup.

GENERAL PRECIPITATOR STARTUP PROCEDURE

(Refer to Instruction Manual for complete details.)

1. Close and lock all access openings and complete interlock sequence as per Key Interlock drawing.

2. Turn on insulator compartment purging system two (2) hours before energizing precipitator. (When supplied).

   Turn on hopper heaters and casing heaters, if available two (2) hours before energizing precipitator.

3. Start the collected material conveying system.

4. Admit gas to unit and allow to flow through until the precipitator temperature is well above the dew point.

5. Energize the discharge electrode and collecting surface cleaning systems and ascertain that they are functioning properly. (When supplied - See Section VIII for details).

6. After completing lock sequence turn transformer-rectifier switches to full wave position, releasing operation keys. (Unless double half wave has proven to be better during efficiency tests).

7. Using operating keys, unlock KI switches.

8. Close contactor by turning switch MS to the "Reset" and then "ON" position, applying power to the precipitator.

9. If the precipitator power control has been previously adjusted for "Automatic" operation and plant is operating at rated capacity, no further adjustments are necessary.

10. To de-energize the precipitator, merely turn MS switch (front of console) to the "OFF" position. The service switch should also be opened at this time and padlocked for safety. Switch to the position grounding both fields.

11. If trouble develops in one cell on units with double half wave transformer-rectifier, or if one cell is out of service, the transformer-rectifier switch must be turned to position 2 or 3 (refer to interlock drawing), thus supplying full wave power to the remaining cell. In this event, it may be necessary to readjust the automatic power control or to operate on manual control.

SECTION VIII - AUXILIARY EQUIPMENT FOR ONE MSW RECOVERY PRECIPITATOR

A. Purging System, Insulators

Filtered, air is supplied to the high voltage system support insulators by 1-3 HP blower. Filters must be kept clean to insure an adequate flow of air. Insulators are heated by .4 KW contact heaters.

Blower and heater systems to be kept running during short outages. Blower and heater systems to be started at least two hours before energizing the precipitator.

B. Transformer-Rectifier by NWL

1st Field 1-300 MA silicon diode - FW
2nd Field 1-300 MA silicon diode - FW
3rd Field 1-300 MA silicon diode - FW

C. Collected Material Conveying System

Via Customer's System

D. Cleaning System, Discharge Electrodes (Rigitrodes)

Environmental Elements' Electric Rappers - Model ESI - 6 total.

E. Cleaning System, Collecting Surfaces (Plates)

Environmental Elements; Electric Rappers - Model ESI - 12 total

F. Cleaning System, Gas Distribution Devices (Perforated Plates)

Environmental Elements' Electric Rappers - Model ESI - 1 total.

G. Hopper Rapper System

Environmental Elements' Electric Rapper - Model V-85 3 total.

H. Hopper Heating System

Hoppers are heated by 3-5.3 KW heaters.

APPENDIX

A. MECHANICAL DRAWINGS

Drawing Number	Title
420201-D3	Sections and Plans
D5	Collecting System Arrangement
D6	RIGITRODE System Assembly
D7	Discharge Electrode Suspension and Bus Arrangement Penthouse
D11	Penthouse Blower Assembly

B. ELECTRICAL DRAWINGS

420201-D801	One Line Diagram
D802	Rapper Wiring Diagram
D805	Rectifier Control Console Electrical Schematic (FW)
D806	Rectifier Control Console Wiring Diagram (FW)
D807	Rectifier Control Console Parts and General Arrangement
D808	Field Connections Std Rectifier
D809	Transformer Rectifier General Arrangement
D810	Key Interlock System
D811	OPTICON II Revision A General Arrangement
D814	Rapper Control Panel General Arrangement
D817	Insulator Heater Wiring Diagram
D818	Insulator Heater Fuse Box
D819	Typical Penthouse Blower System Wiring Schematic
D822	Level Indicator Installation and Wiring
D823	OPTICON II Data Acquisition System
C825	Hopper Level Panel G.A. & Wiring
D826	Hopper Level Panel Wiring & Schematic
C827	Hopper Vibrator Wiring
D832	Hopper Heater Panel G.A.
D833	Hopper Heater Panel Schematic
D834	Hopper Heater Panel Wiring Diagram
C836	Hopper Heater Junction Box/Wiring Diagram
PC0469	Expandable Band Heaters 480 Volts, 400W, 1ø
PB0565	Grounding Cable
PB0625	RS422-RS232 Converter - Modem Cable
PB0626	RS422-RS232 Converter - CRT Cable
PB0628	OPTICON II Controller Serial Port - Converter Cable
PB0629	OPTICON II Controller-CRT OKI Data Printer Cable
PB0630	OPTICON II Controller - Rapper Panel Cable
PB0632	OPTICON Control RS422-RS232 Converter
PB0698	OPTICON II DIGICON II/Slave Module + UVSC Cable
PC0757	Crimp Connector Assembly Instructions

APPENDIX

C. Auxiliary Equipment Manuals

ME-9 Rectifier Control Console and DIGICON II Automatic Power Control Operation Manual

ME-9A DIGICON Rectifier Control Console Installation and Checkout

ME-12 OPTICON II Data Management System Operation Manual

ME-12A OPTICON II Data Management System Installation and Maintenance

ME-12 OKIDATA Printer Addendum

NWL Transformer Rectifier Manual

Single Bushing Full Wave T/R Drawing No. PA0538

ME 16 ENELCO Microprocessor Rapper Control Panel

E-60 F Rapper Service Manual and Parts List

ME-7 The ESI Impulse Rapper

Bindicator Hopper Level Alarm Manual

American Davidson Centrifugal Fan Manual

Superior Interlock Data Sheet

OKIDATA Microline 84 Matrix Printer

Racal-Vadic Modem Manual

Televideo 955 Display Terminal Operator's Manual

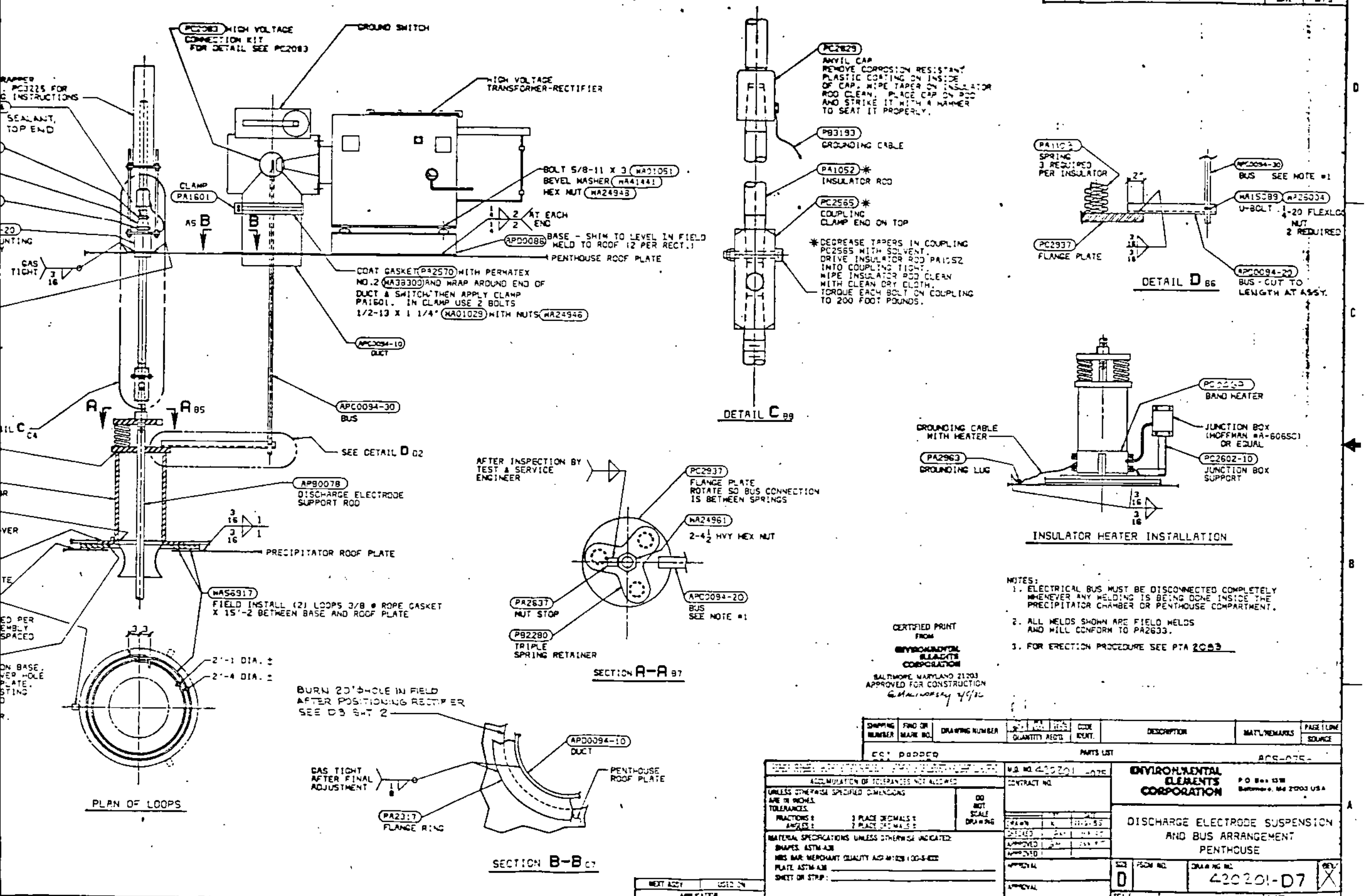
United Electric Control Company Installation and Maintenance Instruction 400 Series Temperature Controls

Hartzell Installation, Operation and Maintenance Manual

Briskheat Hopper Heating System Operation and Maintenance Manual

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPD



NOTES:
1. ELECTRICAL BUS MUST BE DISCONNECTED COMPLETELY WHENEVER ANY WELDING IS BEING DONE INSIDE THE PRECIPITATOR CHAMBER OR PENTHOUSE COMPARTMENT.
2. ALL WELDS SHOWN ARE FIELD WELDS AND WILL CONFORM TO PA2633.
3. FOR ERECTION PROCEDURE SEE PTA 2083

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ACCUMULATION OF TOLERANCES NOT ALLOWED

UNLESS OTHERWISE SPECIFIED DIMENSIONS
ARE IN INCHES.
TOLERANCES.
FRACTIONS ± 3 PLACE DECIMALS ±
ANGLES ± 2 PLACE DECIMALS ±

DO NOT SCALE DRAWING

MATERIAL SPECIFICATIONS UNLESS OTHERWISE INDICATED:
SHAPES ASTM-A36
HRS BAR MERCHANT QUALITY
PLATE ASTM-A36
SHEET OR STRIP:

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DISCHARGE ELECTRODE SUSPENSION
AND BUS ARRANGEMENT
PENTHOUSE

SIZE D | FSCM NO. | DRAWING NO. 420201-D7 | REV X
SCALE | SHEET

420201-D6 X

REVISIONS

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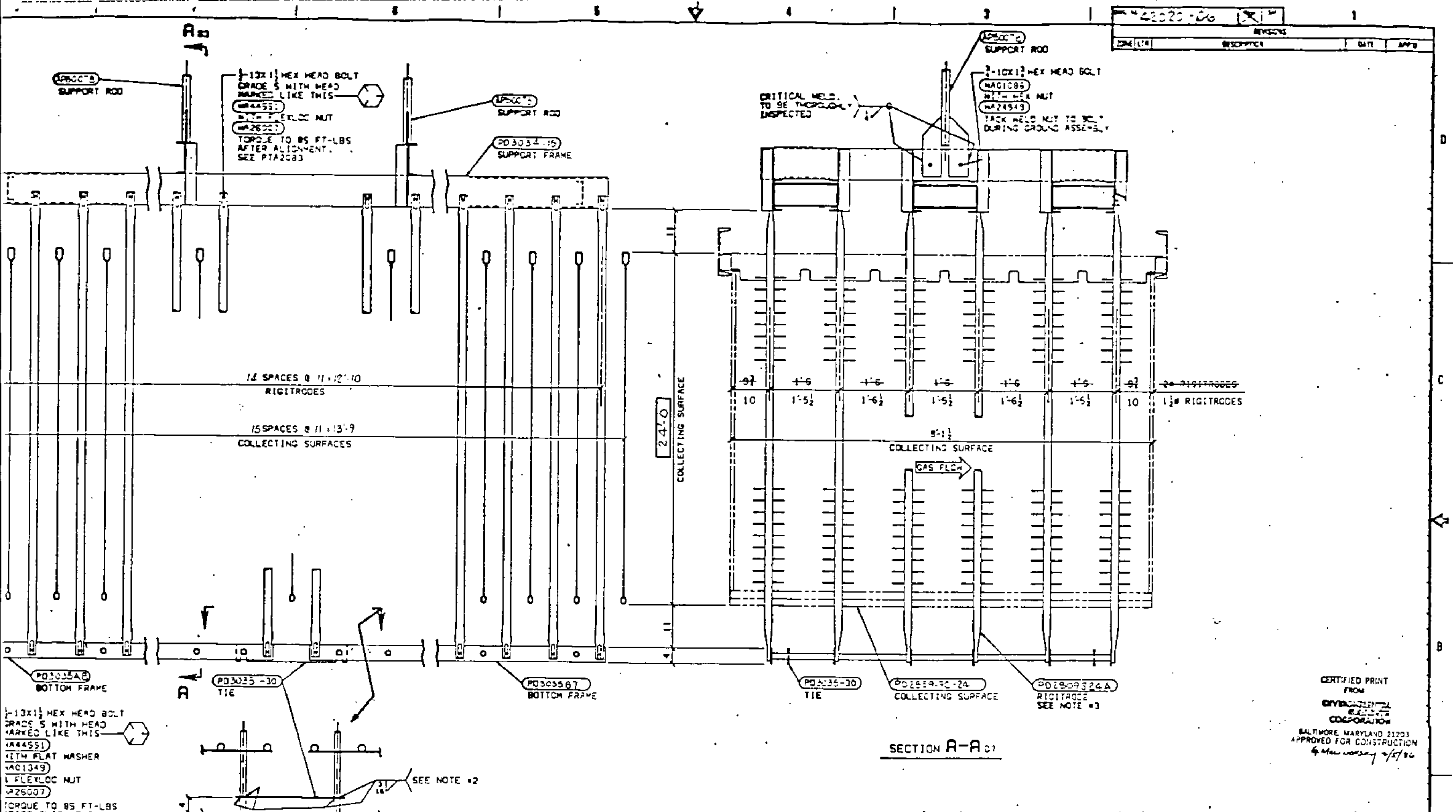

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L WELDS SHOWN ARE FIELD WELDS
D WILL CONFORM TO PA2633.

CK WELD ONLY IF REQUIRED FOR ALIGNMENT PURPOSES.
NAL WELD TO BE MADE ONLY AFTER RELEASE BY TEST AND SERVICE
GINEER.

GITRODES ARE SHOWN WITH PINS OPPOSITE ONE ANOTHER, RIGITRODES
Y BE SUPPLIED WITH STAGGERED PINS.

TOTAL ASSEMBLY WEIGHT= 4214#

TOTAL ASSY. WT. LESS BOTTOM FRAME= 3674#

SHIPPING NUMBER	FIND OR MARK NO	DRAWING NUMBER	QUANTITY REQ'D	CODE IDENT.	DESCRIPTION	MATL/REMARKS	PAGE LINE SOURCE

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TOLERANCES
FRACTIONS ± 1 PLACE DECIMALS ±
ANGLES ± 2 PLACE DECIMALS ±

DO NOT SCALE DRAWING

MATERIAL SPECIFICATIONS UNLESS OTHERWISE INDICATED
SHAPES ASTM A36
HRS BAR MERCHANT QUALITY A S M 1020 1005 SOD
PLATE ASTM A36
SHEET OR STRIP

MO NO 420201-075
CONTRACT NO

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APPROVED	GM	
APPROVED		

APPROVAL

APPROVAL

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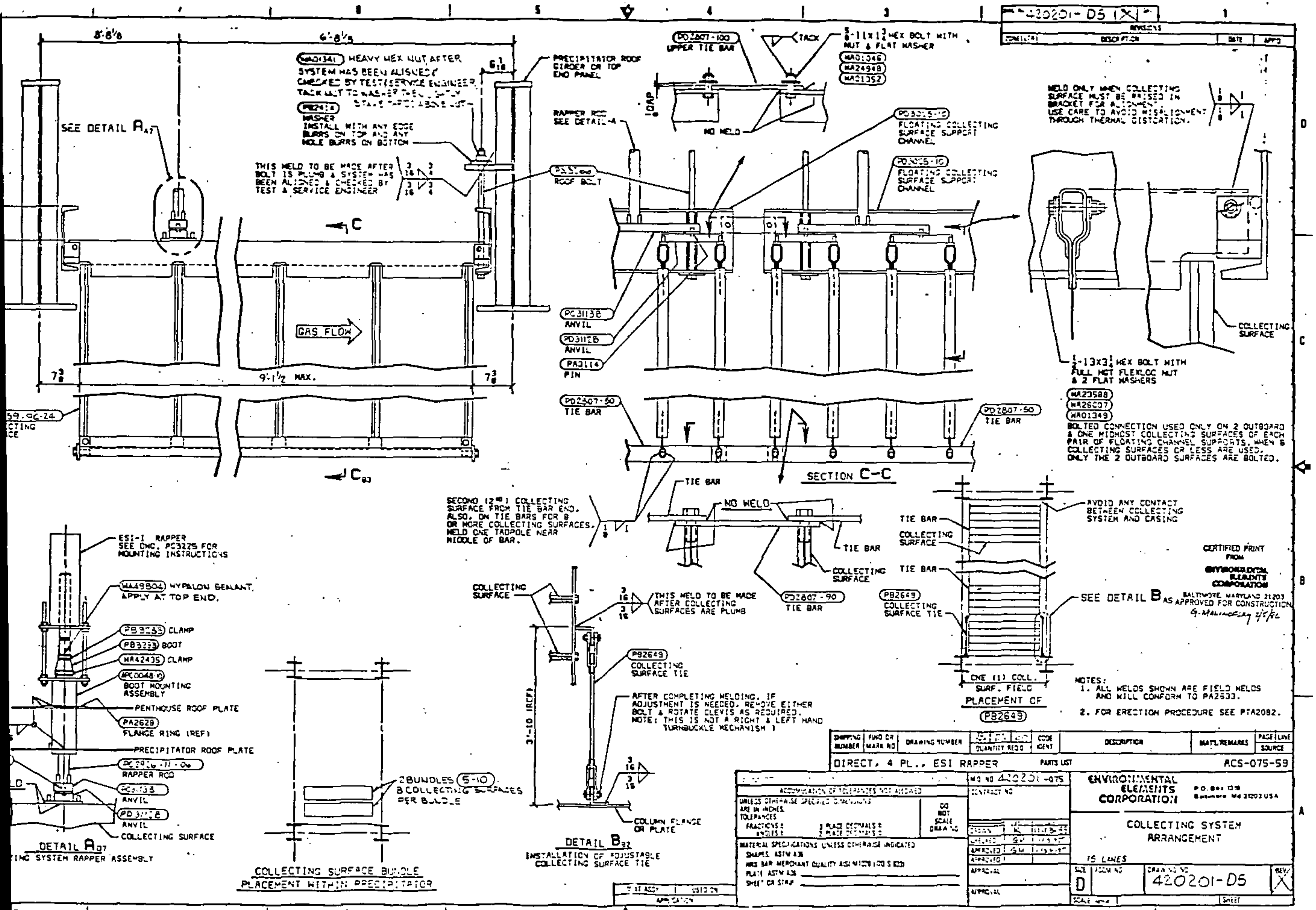
Baltimore, Md 21203 USA

RIGITRODE SYSTEM ASSEMBLY
9'-0 COLLECTING SURFACE

15 LANES

SIZE D | FSCM NO | DRAWING NO 420201-D6 | REV X

SCALE NONE | SHEET



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NOTES:
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2. FOR ERECTION PROCEDURE SEE PTA2082.

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DIRECT, 4 PL., ESI RAPPER					PARTS LIST		ACS-075-59

MO NO 420201-075

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ACCUMULATION OF TOLERANCES NOT ALLOWED

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TOLERANCES
FRACTIONS ± 3 PLACE DECIMALS ±
ANGLES ± 2 PLACE DECIMALS ±

DO NOT SCALE DRAWING

MATERIAL SPECIFICATIONS UNLESS OTHERWISE INDICATED
SHAPES ASTM A36
HRS BAR MERCHANT QUALITY AISI M1020 (ΟΟ S ΕΟ)
PLATE ASTM A36
SHEET OR STRIP

DRAWN K
CHECKED GM
APPROVED GM
APPROVED
APPROVAL
APPROVAL

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Baltimore Md 21203 USA

COLLECTING SYSTEM ARRANGEMENT

15 LINES

SIZE D
FSCM NO
DRAWING NO 420201-D5
REV X
SCALE NONE
SHEET

NEXT ASSY
USED ON
APPLICATION

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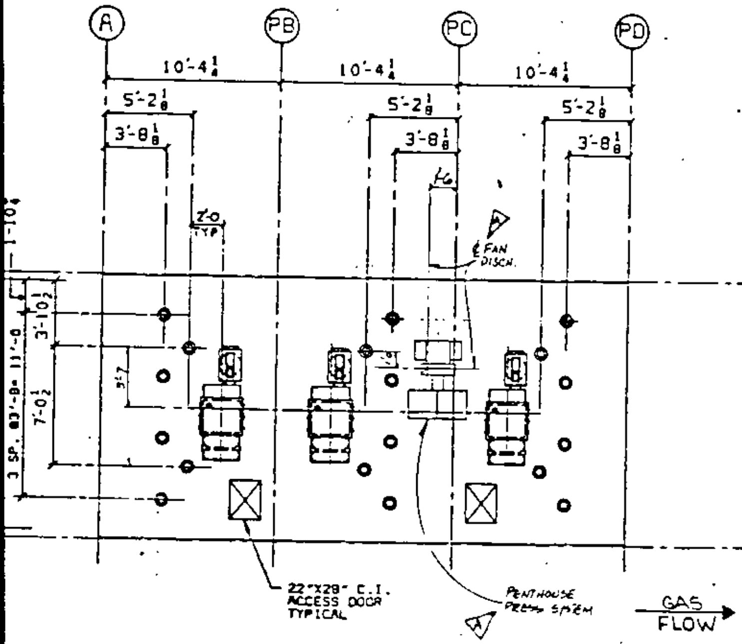
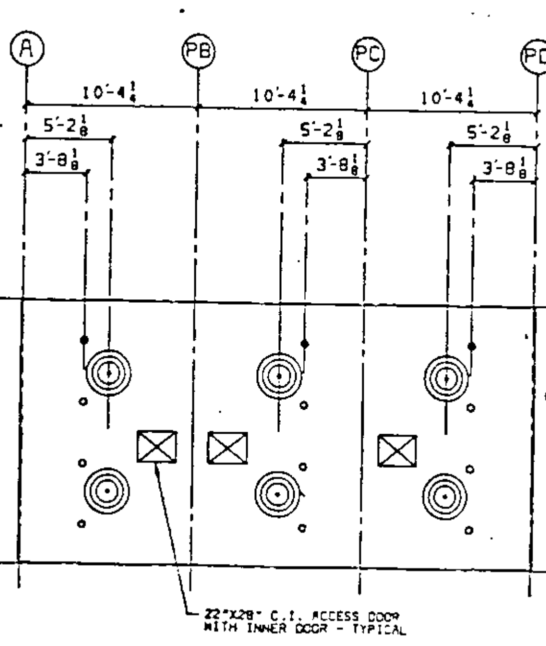
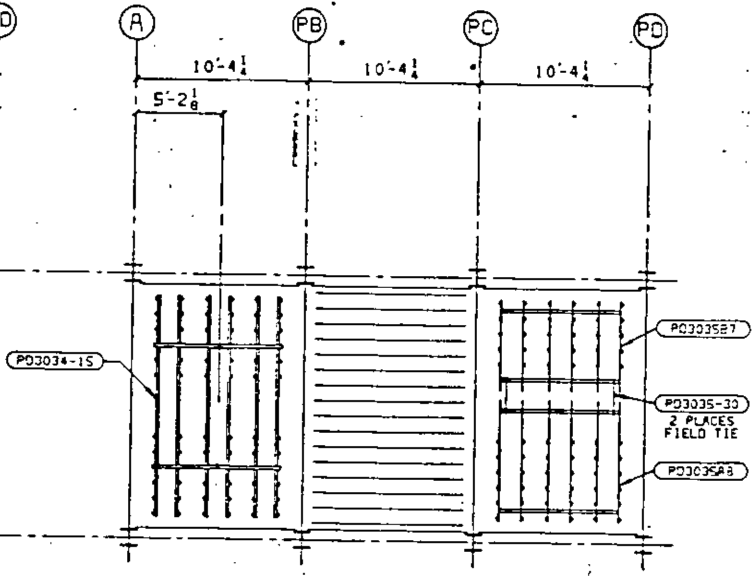


PENTHOUSE ROOF PLAN



PRECIPITATOR ROOF PLAN



INTERNAL PLAN

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MODEL 15-11-3x9

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DATE
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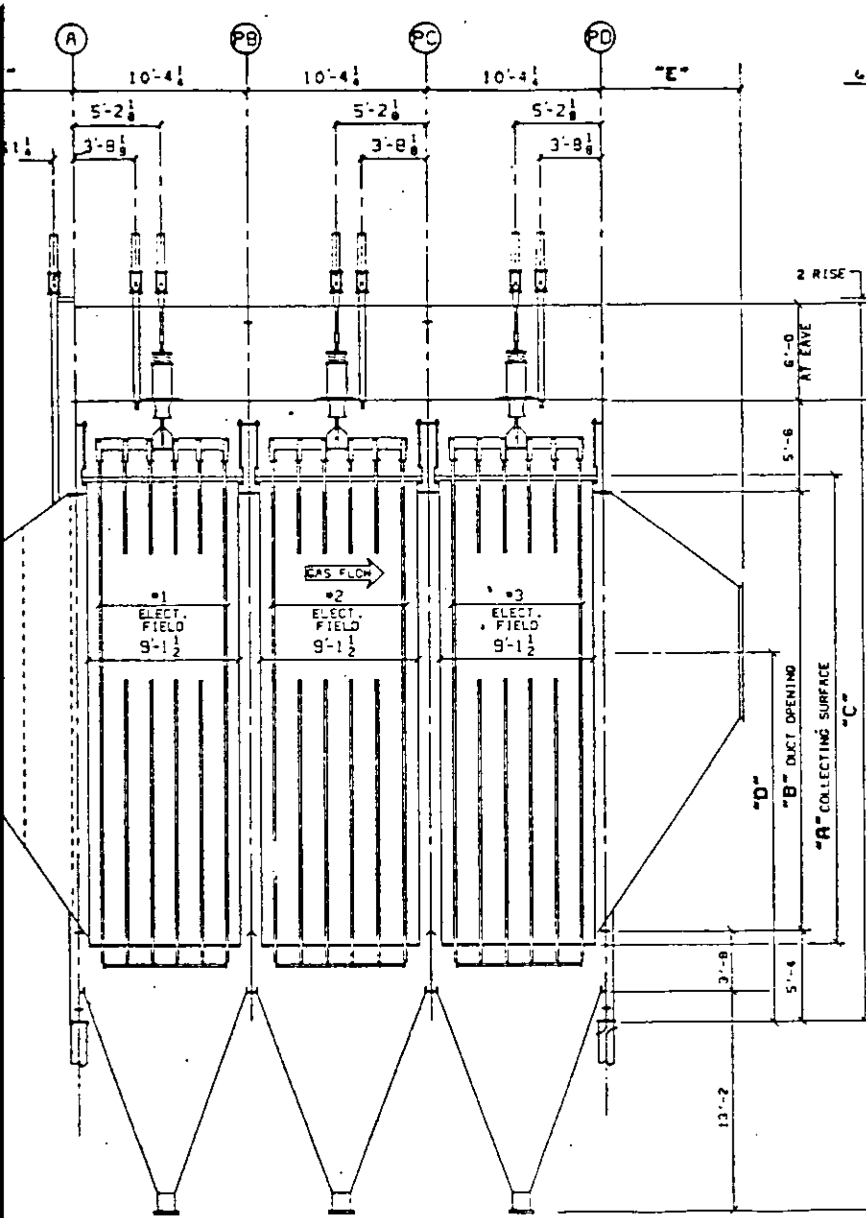
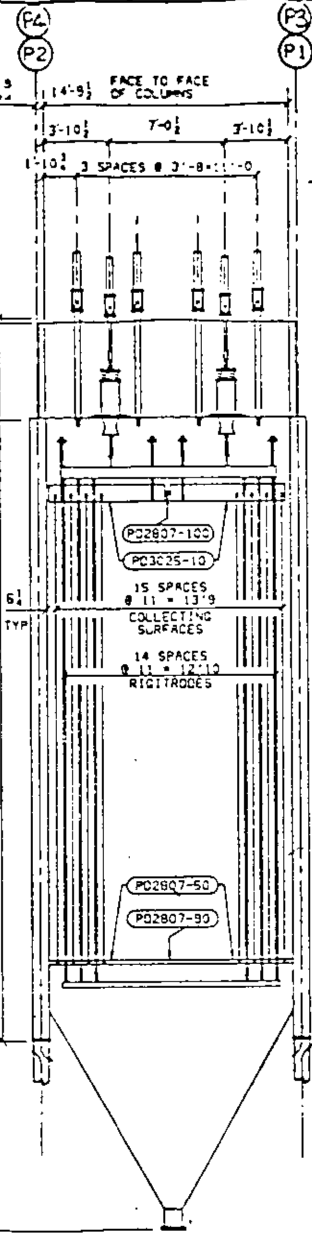
FSCM NO.
DRAWING NO. 40020-08
REV
SCALE
SHEET



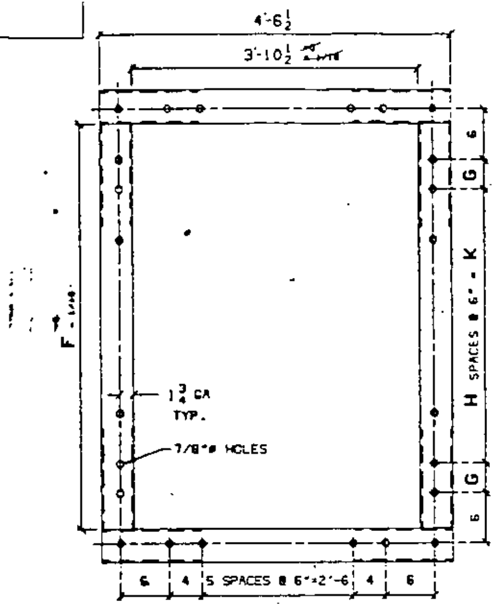
SIDE ELEVATION



END ELEVATION

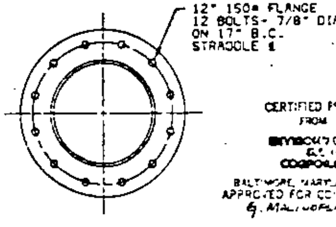
INDUSTRIAL DRY DUST PRECIPITATOR SERIES 11-3x9P

MODEL NUMBER	DIMENSIONS				
	A	B	C	D	E
15-11-3x9x24	24	22	38'-10	19'-5	7-3½
~~15-11-3x9x26~~	~~26~~	~~24~~	[illegible]	[illegible]	[illegible]
~~15-11-3x9x28~~	~~28~~	~~26~~	[illegible]	[illegible]	[illegible]



INLET AND OUTLET NOZZLE DRILLING

HEIGHT CODE A	F	G	H	K	WEIGHT EA. LBS.
24	6'-9	3¼	11	5'-6	122
~~26~~	[illegible]	~~3¼~~	~~12~~	[illegible]	~~128~~
~~28~~	~~7'-10~~	~~3¼~~	~~13~~	[illegible]	[illegible]



HOPPER FLANGE DRILLING

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TOLERANCES
FRACTIONS ±
ANGLES ±
1 PLACE DECIMALS ±
2 PLACE DECIMALS ±

DO NOT SCALE DRAWING

MATERIAL SPECIFICATIONS UNLESS OTHERWISE INDICATED
SHAPES ASTM-A36
HRS BAR MERCHANT QUALITY ...
PLATE ASTM A36
SHEET OR STRIP

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SECTIONS AND PLANS
MODEL 15-11-3x9P

SIZE D | FSCM NO. | DRAWING NO. 200001-D3 | REV. A
SCALE

420201-D11			
REVISIONS			
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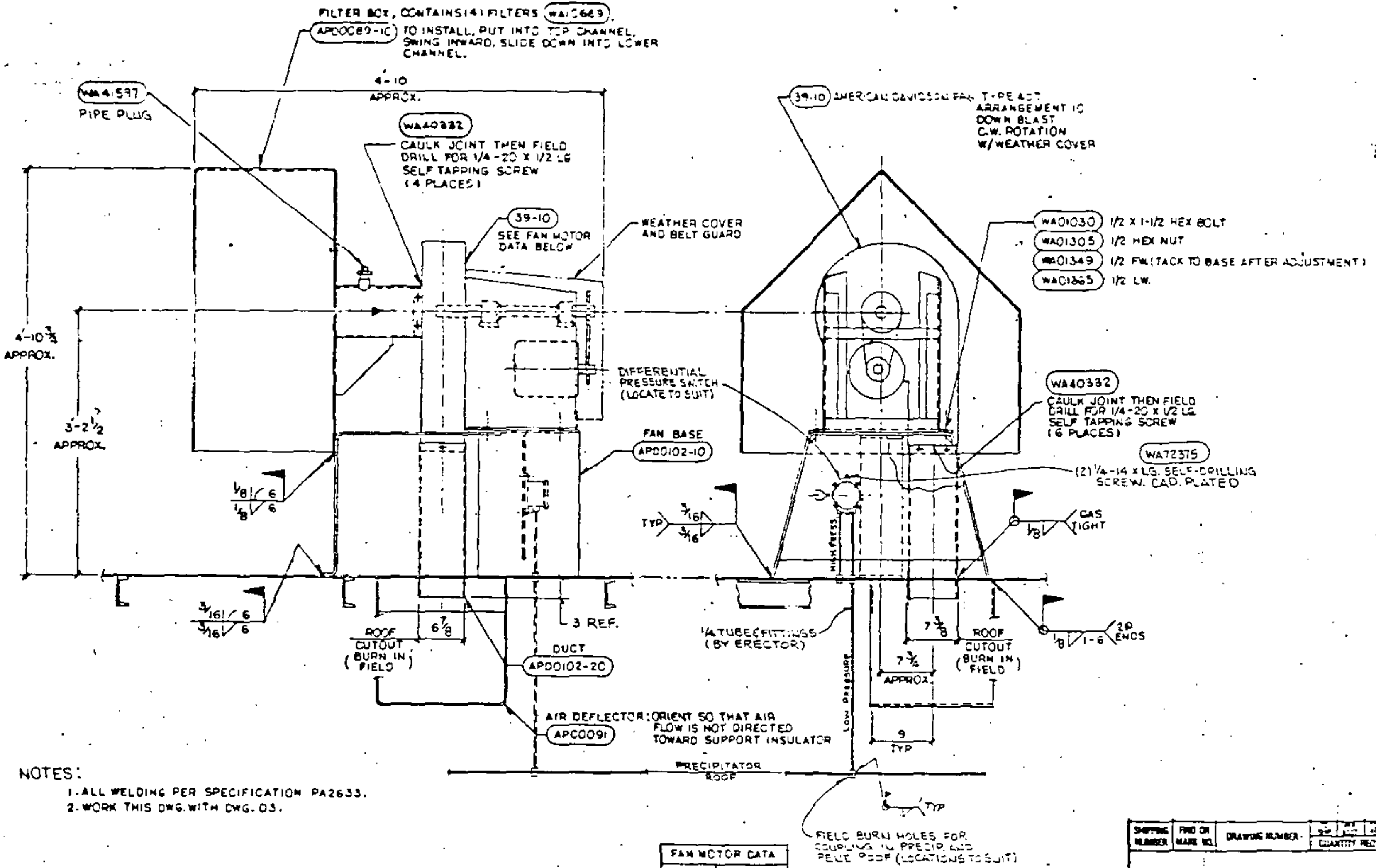

NOTES:

1. ALL WELDING PER SPECIFICATION PA2633.
2. WORK THIS DWG. WITH DWG. D3.

FAN MOTOR DATA	
HP	1 1/2
RPM	1750
VOLT	460
PHASE	3
HZ	60
FRAME SIZE T.E.F.C.	H145T

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TOLERANCES:
FRACTIONS ± ——— 3 PLACE DECIMALS ± ———
ANGLES ± ——— 2 PLACE DECIMALS ± ———

DO NOT SCALE DRAWING

MATERIAL SPECIFICATIONS, UNLESS OTHERWISE INDICATED:
SHAPES: ASTM-A36
HRS BAR: MERCHANT QUALITY ASTM-M1020 (00-3-020)
PLATE: ASTM-A36 ———
SHEET OR STRIP: ———

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CONTRACT NO.

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APPROVED	[illegible]	[illegible]
APPROVED		

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PENTHOUSE BLOWER
ASSEMBLY

SIZE	FSCM NO.	DRAWING NO.	REV
D		420201-D11	

SCALE NTS
SHEET ———