

March 7, 1997

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**BUREAU OF
AIR REGULATION**

Mr. David Knowles
Florida Department of Environmental Protection
2295 Victoria Avenue, Suite 364
Ft. Meyers, FL 33901

Subject: OMS of Lee, Inc.
Lee County Solid Waste Resource Recovery Facility
Air Emissions Source Test Plan

Dear Mr. Knowles:

Enclosed is the source test plan for the annual testing of the Lee County Solid Waste Resource Recovery Facility. This testing is designed to demonstrate compliance with the State of Florida, Department of Environmental Protection, Permit No. PSD-FL-151, Specific Condition 3.C. This testing is scheduled for June 9-18, 1997.

A relative accuracy test audit (RATA) will be performed on the continuous emission monitoring system (CEMS) as required by 40 CFR 60, Appendix F during the testing.

Please contact me (201) 882-7173 if you have any comments or questions.

Sincerely,

Michelle L. Genberg

Michelle L. Genberg
Sr. Environmental Engineer

MLH:rj
Enclosure

cc: L. Sampson - Lee Co. (w/Encl.)
C. Fancy - Tallahassee (w/Encl.)
G. J. Aldina
G. Crane
T. Eriksen (w/Encl.)
B. Bigari (w/Encl.)
L. Simpson (w/Encl.)
D. Fickling (w/Encl.)

SOURCE TEST PLAN

Source Information

Type Unit: Municipal Solid Waste-to-Energy Facility

Facility: Ogden Martin Systems of Lee, Inc.
10500 Buckingham Road
Ft. Myers, FL 33905

Purpose of Test: Demonstration of Compliance with Florida Department
of Environmental Protection Permit No. PSD-FL-151 and
with 40 CFR 60, Appendix F.

Person(s) to Contact: Mr. Tom Eriksen, Facility Manager
(813) 337-2200

Mr. G. J. Aldina
Sr. Vice President, Environmental Testing/CEM
(201) 882-4136

Mr. Derek A. Porter
Asst. Vice President - CEM Systems
(201) 882-7259

Testing Firm Information

Company: Contractor to be selected

Testing Information

Procedure: Testing two municipal solid waste-fired boilers for air
pollutant emissions. Perform relative accuracy test audit
(RATA) on the continuous emission monitoring system
(CEMS).

Test Dates: June 9-18, 1997

Prepared by: Michelle L. Genberg

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1.0 INTRODUCTION

A contractor for Ogden Martin Systems of Lee will test the emission rate of the parameters listed in Table 1-1 from the Lee County Solid Waste Energy Recovery Facility. This testing will be performed to determine compliance with the Florida Department of Environmental Protection, Permit No PSD-FL-151, Specific Condition 3.C. Incoming tire weights will be recorded at the scale. The percentage of tires in the refuse will comply with PSD-FL-151, Specific Condition 4a.

1.0 INTRODUCTION - CONT'D.

Table 1-1: Emission Test Procedures

Pollutant	Permit Condition	Sampling Method	Location/Unit No.	Replicates	Approximate Sampling Time (Minutes)
Particulate Matter (PM)	2a	U.S. EPA Method 5	Stack 1, 2	1, 2, 3	120
Particulate Matter (PM) ⁽¹⁾	3c	U.S. EPA Method 5	Stack 1, 2	1, 2, 3	120
Particulate Matter <10 (PM ₁₀)	2b	U.S. EPA Method 201	Stack 1, 2	1, 2, 3	120
Opacity ⁽¹⁾⁽²⁾	2c, q, r	U.S. EPA Method 9	Stack 1, 2	1, 2, 3	60
Sulfur Dioxide (SO ₂) ⁽³⁾	2d	U.S. EPA Method 6C	Inlet/Stack 1, 2	1, 2, 3	60
Nitrogen Oxides (NO _x)	2e	U.S. EPA Method 7E	Stack 1, 2	1, 2, 3	60
Carbon Monoxide (CO)	2f	U.S. EPA Method 10	Stack 1, 2	1, 2, 3	60
Hydrocarbons (VOC) ⁽⁴⁾	2g	U.S. EPA Method 25A	Stack 1, 2	1, 2, 3	60
Hydrogen Chloride (HCl) ⁽⁵⁾	2h	U.S. EPA Method 26	Inlet/Stack 1, 2	1, 2, 3	60
Sulfuric Acid Mist (H ₂ SO ₄)	2i	U.S. EPA Method 8	Stack 1, 2	1, 2, 3	60
Fluoride (F)	2j	U.S. EPA Method 13B	Stack 1, 2	1, 2, 3	60

⁽¹⁾ Three compliance test runs shall also be conducted under normal soot blowing conditions. A sampling duration of 120 minutes is used to ensure that the required volume of gas (60 ft³) is captured.

⁽²⁾ One hour visible emission observations shall be conducted simultaneously with all particulate testing. In addition, opacity will be observed during operation of the lime silo and from the ash building.

⁽³⁾ SO₂, HCl and Hg shall be sampled simultaneously at the inlet and stack locations.

⁽⁴⁾ A request to use alternative sampling procedure U.S. EPA Method 25A at 40 CFR 60, Appendix A for VOC testing or to have the testing requirements dropped has been submitted in accordance with Rule 62.29762(a), FAC. If the alternative procedure or removal of testing is not approved, the method stated in Permit No. PSD-FL-151, Specific Condition 3.a. will be used for the emission testing.

⁽⁵⁾ Multi-metals testing includes lead (Pb), arsenic (As) and beryllium (Be).

⁽⁶⁾ A separate sampling train will be used for ammonia testing. The hydrogen chloride sample train will be used for HCl only.

1.0 INTRODUCTION - CONT'D.

Table 1-1: Emission Test Procedures

Pollutant	Permit Condition	Sampling Method	Location/Unit No.	Replicates	Approximate Sampling Time (Minutes)
Multi-metals (MMTL) ⁽⁵⁾	2k, l, n	40 CFR 266, Appendix IX	Stack 1, 2	1, 2, 3	120
Mercury (Hg) ⁽³⁾	2m	U.S. EPA Method 101A	Inlet/Stack 1, 2	1, 2, 3	120
Dioxins/Furans (PCDD/PCDF)	2o	U.S. EPA Method 23	Stack 1, 2	1, 2, 3	240
Ammonia (NH ₃) ⁽⁶⁾	2p	U.S. EPA Method 26 Type	Stack 1, 2	1, 2, 3	60
Particulate Matter	2r	U.S. EPA Method 5	Ash Building	1, 2, 3	60

⁽¹⁾ Three compliance test runs shall also be conducted under normal soot blowing conditions. A sampling duration of 120 minutes is used to ensure that the required volume of gas (60 ft³) is captured.

⁽²⁾ One hour visible emission observations shall be conducted simultaneously with all particulate testing. In addition, opacity will be observed during operation of the lime silo and from the ash building.

⁽³⁾ SO₂, HCl and Hg shall be sampled simultaneously at the inlet and stack locations.

⁽⁴⁾ A request to use alternative sampling procedure U.S. EPA Method 25A at 40 CFR 60, Appendix A for VOC testing or to have the testing requirements dropped has been submitted in accordance with Rule 62.29762(a), FAC. If the alternative procedure or removal of testing is not approved, the method stated in Permit No. PSD-FL-151, Specific Condition 3.a. will be used for the emission testing.

⁽⁵⁾ Multi-metals testing includes lead (Pb), arsenic (As) and beryllium (Be).

⁽⁶⁾ A separate sampling train will be used for ammonia testing. The hydrogen chloride sample train will be used for HCl only.

1.0 INTRODUCTION - CONT'D.

A relative accuracy test audit (RATA) will be performed on the continuous emission monitoring system (CEMS) as required by 40 CFR 60, Appendix F. The CEM system consists of the following analyzers:

Table 1-2: RATA Test Procedures

Pollutant Monitor	Unit Number	Location	Emission Limit	Range	Monitor Manufacturer	Model Number	Serial Number
O ₂	1	Economizer Outlet	-----	0-25%	Servomex	1420	1420/B143
SO ₂	1	Economizer Outlet	-----	0-1000 ppm	Western Research	721M	93-721M-8056-7
CO ₂	1	Economizer Outlet	-----	0-20%	Milton Roy	ZRH1	N2L1474T
CO	1	Economizer Outlet	-----	0-500 ppm	TECO	48	48-45332-273
SO ₂	1	Stack	30 ppmdv @ 7% O ₂	0-200 ppm	Western Research	721M	93-721M-8056-8
O ₂	1	Stack	-----	0-25%	Servomex	1420	1420/B146
NO _x	1	Stack	180 ppmdv @ 7% O ₂	0-500 ppm	TECO	42H	42H-45546-274
CO ₂ /CO	1	Stack	CO: 100 ppmdv @ 7% O ₂	0-20%/0-500 ppm	Milton Roy	ZRH2	N2L1452T
O ₂	2	Economizer Outlet	-----	0-25%	Servomex	1420	1420/B141
SO ₂	2	Economizer Outlet	-----	0-1000 ppm	Western Research	721M	93-721M-8056-5
CO ₂	2	Economizer Outlet	-----	0-20%	Milton Roy	ZRH1	N2L1462T
CO	2	Economizer Outlet	-----	0-500 ppm	TECO	48	48-46041-275
SO ₂	2	Stack	30 ppmdv @ 7% O ₂	0-200 ppm	Western Research	721M	93-721M-8056-6
O ₂	2	Stack	-----	0-25%	Servomex	1420	1420/B142
NO _x	2	Stack	180 ppmdv @ 7% O ₂	0-500 ppm	TECO	42H	42H-45488-274
CO ₂ /CO	2	Stack	CO: 100 ppmdv @ 7% O ₂	0-20%/0-500 ppm	Milton Roy	ZRH2	N2L1451T

Dioxins and furan emissions will be reported in units of the standard and will include the isomers listed in Table 1-3:

Table 1-3: Dioxin/Furan Isomers

2378 TCDD

Other TCDD

12378 PeCDD

Other PeCDD

123478 HxCDD

123678 HxCDD

123789 HxCDD

Other HxCDD

1234678 HpCDD

Other HpCDD

OCDD

Total PCDD

2378 TCDF

Other TCDF

12378 PeCDF

23478 PeCDF

Other PeCDF

123478 HxCDF

123678 HxCDF

123789 HxCDF

234678 HxCDF

Other HxCDF

1234678 HpCDF

1234789 HpCDF

Other HpCDF

OCDF

Total PCDF

Total 2,3,7,8 TCDD Equivalent

2.0 SCHEDULE OF ACTIVITIES

2.0 TEST PROGRAM

Table 2-1: Schedule of Activities⁽¹⁾

Day	Parameter	Unit	Location	Test Method	Replicates
0	Setup	-----	-----	-----	-----
1	PCDD/PCDF	1, 2	Stack	EPA 23	1, 2
	PM	1	Stack	EPA 5	1, 2, 3
	Opacity	1	Stack	EPA 9	1, 2, 3
	NH ₃	2	Stack	EPA 26 Type	1, 2, 3
2	PCDD/PCDF	1, 2	Stack	EPA 23	3
	PM	2	Stack	EPA 5	1, 2, 3
	Opacity	2	Stack	EPA 9	1, 2, 3
	NH ₃	1	Stack	EPA 26 Type	1, 2, 3
3	MMTL	1, 2	Stack	Appendix IX	1, 2, 3
	PM ₁₀	1, 2	Stack	EPA 201	1, 2, 3
4	Hg ⁽²⁾	1, 2	Inlet/Stack	EPA 101A	1, 2, 3
	H ₂ SO ₄ Mist	1, 2	Stack	EPA 8	1, 2, 3
5	HCl ⁽²⁾	1	Inlet/Stack	EPA 26	1, 2, 3
	HF	1	Stack	EPA 13B	1, 2, 3
	SO ₂ ⁽²⁾	1	Inlet/Stack	EPA 6C	1, 2, 3
	NO _x , CO	1	Stack	EPA 7E, 10	1, 2, 3
	VOC	1	Stack	EPA 25A	1, 2, 3
	O ₂ , CO ₂ , NO _x , CO	1	Inlet/Stack	EPA 3A, 6C, 7E, 10	1-9
6	HCl ⁽²⁾	2	Inlet/Stack	EPA 26	1, 2, 3
	HF	2	Stack	EPA 13B	1, 2, 3
	SO ₂ ⁽²⁾	2	Inlet/Stack	EPA 6C	1, 2, 3
	NO _x , CO	2	Stack	EPA 7E, 10	1, 2, 3
	VOC	2	Stack	EPA 25A	1, 2, 3
	O ₂ , CO ₂ , SO ₂ , NO _x , CO ₂	2	Inlet/Stack	EPA 3A, 6C, 7E, 10	1-9
	PM		Ash Building	EPA 5	1, 2, 3
	Opacity		Ash Building	EPA 9	1, 2, 3
	Opacity		Lime Silo	EPA 9	1, 2, 3
7	PM ⁽³⁾	1, 2	Stack	EPA 5	1, 2, 3
	Opacity ⁽³⁾	1, 2	Stack	EPA 9	1, 2, 3

⁽¹⁾ Schedule may change during testing to accommodate site conditions.

⁽²⁾ Hg, HCl and SO₂ shall be sampled simultaneously at the inlet and stack.

⁽³⁾ Three test runs will be conducted under normal soot blowing conditions.

3.0 QUALITY ASSURANCE / QUALITY CONTROL

3.0 QUALITY ASSURANCE / QUALITY CONTROL

OPI has instituted a rigorous Quality Assurance/Quality Control (QA/QC) program for all of its pollution testing. This program ensures that the emission data reported for OPI facilities are as accurate and meaningful as possible.

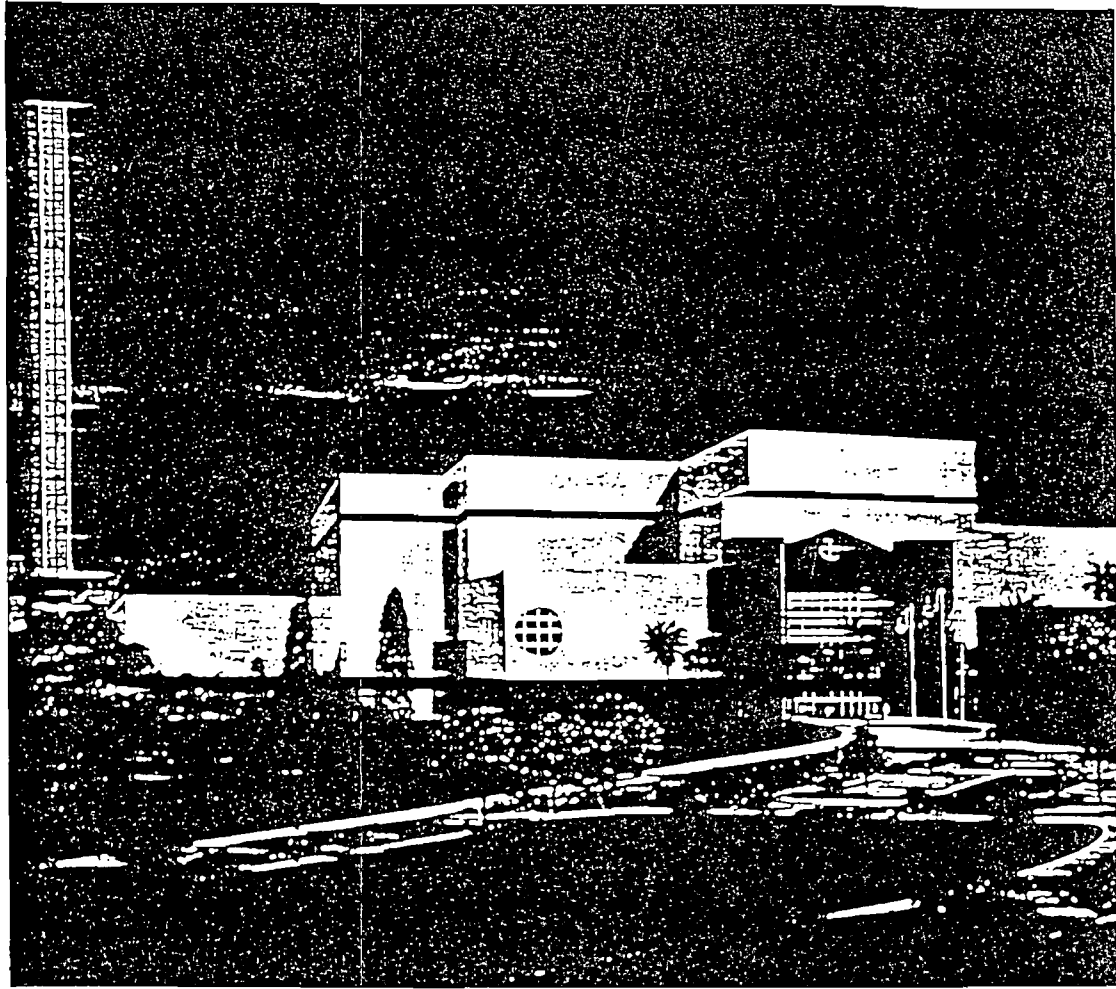
Glass or Teflon is employed in all of the sampling equipment in contact with the sample gas. This includes the nozzle, probe liner, filter housing, sample line and impingers. Calibration of all gas meters, thermocouples, and pitot tubes used in the test program will be performed using reference methods with calibration sheets included in the final report.

Transportation blanks, method blanks, inert sample container, field data and chain of custody forms from the U.S. EPA QA Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA-600/4-77-027b, are used during all phases of the test program and will be included in the final test report.

All test programs include a supervising engineer from OPI's Fairfield, New Jersey, office to ensure the integrity of the test program according to the Source Test Plan.

4.0 SOURCE TEST INFORMATION

4.1 DESCRIPTION OF OPERATIONS



Lee County
Solid Waste
Resource Recovery
Facility

OGDEN MARTIN SYSTEMS
OF LEE, INC.





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LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

The new Lee County Solid Waste Resource Recovery Facility will be owned by the County and operated by Ogden Martin Systems of Lee, Inc. (OMSL). It will convert approximately 1,200 tons per day of municipal solid waste from Lee and Hendry Counties into energy. Construction began in October 1992 and is scheduled for completion in January 1995.

Waste, a non-renewable resource, will be recycled into energy. As are most waste-to-energy facilities, the Lee facility will be self-sufficient and operate on a small portion of the power it generates. The remaining electricity will be sold to Florida Power and Light Company to power area homes and businesses.



FLORIDA

RECYCLING WASTE INTO ENERGY

The facility's mass burn combustion system will incorporate the technology of German-based Martin GmbH. Waste will be combusted at temperatures exceeding 1,800 degrees Fahrenheit and will be reduced to an inert ash residue that is

approximately 10% of the original volume. The ash residue will be disposed in a new lined landfill in Hendry County.

Combustion gases will pass through the most modern pollution control equipment available to date. The facility will house

dry flue gas scrubbers, cyclone baghouses and mercury and nitrogen oxide abatement systems. Facility emissions are continuously monitored and strictly regulated by state and federal agencies.

AN INTEGRATED SYSTEM

Lee County officials recognized that no single method of waste disposal will handle all the waste generated by area residents. Therefore, a completely integrated waste management system must be employed. Acting as the cornerstone of that system, OMSL will provide Lee and Hendry County residents with an environmentally sound method of

waste disposal and a reliable, cost efficient source of energy well into the 21st century.

Also included in the plan is a comprehensive curbside recycling program, household hazardous waste collection, horticultural waste composting and land-filling. A battery collection program helps remove mercury from the waste stream and ferrous

metals will be recovered at the facility which will significantly improve the County's rates.

The Lee County Solid Waste Resource Recovery Facility is located at 10500 Buckingham Road in Fort Myers. For information please call 2200.

FACILITY SPECIFICATIONS

Rated Refuse Capacity
1,200 tons per day

Unit Design
Two 600 ton per day waterwall furnaces

Guaranteed Throughput
372,300 tons per year

Guaranteed Waste Delivery
279,225 to 372,300 tons per year

Energy Generation at Rated Capacity
Up to 39.7 MW, a portion sold to Florida Power and Light Company

OGDEN MARTIN SYSTEMS OF LEE, INC.

10500 Buckingham Road
Fort Myers, FL 33905

5.0 OPERATIONAL PARAMETERS

5.0 OPERATIONAL PARAMETERS

During the air pollutant emissions testing, plant process data will be monitored and collected by OMS personnel to ensure representative operation of the facility. Steam flow rate will be documented to ensure representative heat input at design conditions. In addition, the following boiler parameters will be monitored throughout the testing period:

Turbine Steam Flow	Econ O ₂	Drum Level
Turbine Steam Press	Econ NO _x	Main Steam Flow
Turbine Steam Temp	Stack NO _x	Feedwater Flow
Turbine Exhaust Press	Stack O ₂	Total Air Flow
Feedwater Pressure	Stack SO ₂	OFA Flow
Feedwater Temp	Stack Opacity	Aux Fuel Flow
Feedpump "A" Suction Flow	Ambient Air Temp	Econ Outlet Water
Temp		
Feedpump "B" Suction Flow	UFA Temp	
Generator Power	Avg Top of Refractory Temp	
Generator Reactive Power	Avg Roof Temp	
Generator Power Totalizer	Econ Gas Outlet Temp	
Generator Voltage	Feedwater Press	
Sprayer Dryer Inlet Temp	Drum Pressure	
Sprayer Dryer Diff Press	Main Stream Pressure	
Baghouse Inlet Temp	OFA Pressure	
Baghouse Outlet Temp	Furnace Pressure	
Baghouse Inlet Pressure	Top of 3rd Pass Pressure	
Baghouse Outlet Pressure	Econ Inlet Gas Pressure	
Baghouse Differential	Econ Outlet Gas Pressure	
ID Fan Current	FD Fan Current	
Econ CO	OFA Fan Current	
Econ SO ₂	Flue Gas O ₂	



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Department of
Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia E. Wetherelli
Secretary

October 13, 1995

Certified Mail-Return Receipt Requested

Ms. Michelle L. Herman
Environmental Engineer
Ogden Martin Systems, Inc.
40 Lane Road
Fairfield, New Jersey 07007-2615

Dear Ms. Herman:

Enclosed is a copy of an administrative order concerning the request for approval to use the sampling method described in 40 CFR 266 Appendix IX, Section 3.1 for the simultaneous measurement of arsenic (As), beryllium (Be), and lead (Pb) emissions from Ogden Martin's Lee County Solid Waste Resource Recovery Facility, Permit No. PSD-FL-151.

If you have any questions about the above, please call Ramesh Menon at 904/488-6140, or write to me.

Sincerely,

Michael D. Harley, P.E., DEE
P.E. Administrator
Emissions Monitoring Section

Enclosure

cc: Pat Comer, FDEP
David Knowles, South District
Derrick Porter, Ogden Martin
Thomas Eriksen, Ogden Martin

PSD-FL-151B
allowed method 29 in lieu of
12,109 & 108. Per Mike Harley:
meth 29 is much better than 40 CFR
266 Section 3.1. ∴ ASP-95-A-01 is
now absolute.

J. Holton 7/13/00

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In the matter of:)	Permit No.	PSD-FL-151
)		
Ogden Martin Systems, Inc.)		
)	ASP No.	95-A-01
Petitioner.)		

ORDER ON REQUEST
FOR
ALTERNATE PROCEDURES AND REQUIREMENTS

Pursuant to Rule 62-297.620, Florida Administrative Code (F.A.C.), Ogden Martin Systems Inc. petitioned for approval to use: (1) the EPA Method described in 40 CFR 266, Appendix IX, Section 3.1 in lieu of EPA Method 108 for measuring arsenic (As); (2) the EPA Method described in 40 CFR 266, Appendix IX, Section 3.1 in lieu of EPA Method 104 for measuring beryllium (Be); and, (3) the EPA Method described in 40 CFR 266, Appendix IX, Section 3.1 in lieu of EPA Method 12 for measuring lead (Pb) emissions from Petitioner's Solid Waste Resource Recovery Facility, permit number PSD-FL-151, located in Lee County.

Having considered Petitioner's written request and all supporting documentation, the following Findings of Fact, Conclusions of Law, and Order are entered:

FINDINGS OF FACT

1. On June 9, 1995, Petitioner specifically requested approval to use the EPA method described in Section 3.1 of 40 CFR 266, Appendix IX, "Methodology for the Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes", as the compliance verification procedure for simultaneously determining emissions of arsenic (As), beryllium (Be), and lead (Pb) from the Lee County Solid Waste Resource Recovery Facility (PSD-FL-151) using a single sampling train. [Exhibit 1]

2. As justification for the use of the EPA Method described in Section 3.1 of 40 CFR 266, Appendix IX, Petitioner stated, "The method described in 40 CFR 266, Appendix IX, Section 3.1 is requested for the determination of lead, beryllium, and arsenic. This is an EPA approved Method that produces reliable and accurate results. This method allows for the determination of these metals in one sampling train. The method is more time efficient and cost effective without compromising the results." [Exhibit 1]

3. The applicability section of the method described in

section 3.1.1.1 in 40 CFR 266, Appendix IX states, "This method is being developed for the determination of total chromium (Cr), cadmium (Cd), arsenic (As), nickel (Ni), manganese (Mn), beryllium (Be), copper (Cu), Zinc (Zn), lead (Pb), selenium (Se), phosphorous (P), thallium (Tl), silver (Ag), antimony (Sb), barium (Ba), and mercury (Hg) stack emissions from hazardous waste incinerators and similar combustion processes."

CONCLUSIONS OF LAW

1. The Department has jurisdiction to consider Petitioner's request pursuant to Section 403.061, Florida Statutes (F.S.), and Rule 62-297.620, F.A.C.

2. Pursuant to Rule 62-297.340(2), F.A.C., the Department may require Petitioner to conduct compliance tests that identify the nature and quantity of pollutant emissions, if, after investigation, it is believed that any applicable emission standard or condition of a permit is being violated.

3. Petitioner has provided reasonable justification that the EPA Method described in Section 3.1 of 40 CFR 266, Appendix IX will be adequate to verify compliance with the arsenic (As), beryllium (Be), and lead (Pb) emission limiting standards.

ORDER

Having considered Petitioner's written request and supporting documentation, it is hereby ordered that:

1. Petitioner's request to use the EPA method described in Section 3.1 of 40 CFR 266, Appendix IX to measure emissions of arsenic (As), beryllium (Be), and lead (Pb) in a single train is granted; and,

2. The Department retains the right to require Petitioner to measure emissions using EPA Method 108 for arsenic (As), EPA Method 104 for beryllium (Be), and EPA Method 12 for lead (Pb) if, after investigation, it is believed that the use of any of these methods is necessary to accurately assess the compliance status of the emission unit.

PETITION FOR ADMINISTRATIVE REVIEW

1. A person whose substantial interests are affected by the Department's decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 21 days of receipt of this Order. The petitioner shall mail a copy of the petition to the applicant at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any

right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

2. The petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, and the Department File Number;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by each petitioner, if any;

(e) A statement of facts which each petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes each petitioner contends require reversal or modification of the Department's action or proposed action; and,

(g) A statement of the relief sought by each petitioner, stating precisely the action each petitioner wants the Department to take with respect to the Department's action or proposed action.

3. If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Order. Persons whose substantial interests will be affected by any decision of the Department with regard to the petition have the right to petition to become a party to the proceeding. The petition must conform with the requirements specified above and be filed (received) within 21 days of receipt of this notice in the Office of General Counsel at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

4. This Order constitutes final agency action unless a petition is filed in accordance with the above paragraphs or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 62-103.070, F.A.C. Upon timely filing of a petition or a request for an extension of time, this Order will not be effective until further Order of the Department.

RIGHT TO APPEAL

Any party to this Order has the right to seek judicial review of the Order pursuant to Section 120.68, F.S., by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and, by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date the Notice of Agency Action is filed with the Clerk of the Department.

DONE AND ORDERED this 6 day of October, 1995 in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION



HOWARD L. RHODES
Director
Division of Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

(904) 488-0114

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that a true copy of the foregoing was mailed to Ms. Michelle L. Herman, Environmental Engineer, Ogden Martin Systems, Inc., 40 Lane Road, Fairfield, New Jersey 07007-2615 on this 13th day of October 1995.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Charlotte Hayes 10/13/95
Clerk Date

95-A-01

OGDEN MARTIN SYSTEMS, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

2011 382-9000

RECEIVED

JUN 15 1995

Bureau of Air Monitoring
& Mobile Sources



June 9, 1995

Mr. Michael D. Harley, P.E., DEE
P.E. Administrator
Emissions Monitoring Section
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blairstone Road
Tallahassee, FL 32399-2400

Subject: OMS of Lee, Inc.
Permit No. PSD-FL-151
Request for Amendments to Specific Condition 3a (Test Methods)

Dear Mr. Harley:

Thank you for your response to our request to amend Permit Number PSD-FL-151. Based upon your direction in the letter dated May 12, 1995, we now request that sampling methods described at 40 CFR 266, Appendix IX, Section 3.1 be allowed for determination of lead, beryllium and arsenic instead of EPA Methods 12, 104 and 108.

Below please find the documentation necessary for approval of an alternate test method as stated in Rule 62-297.620(2)(a)-(d), F.A.C.

Rule 62-297.620(2) states the following:

(a) Specific emissions unit and permit number, if any, for which exception is requested.

The emission units for which an exception is requested are lead, beryllium and arsenic. These metals are required to be tested according to permit number PSD-FL-151 for the Lee County Solid Waste Resource Recovery Facility.

(b) The specific provision(s) of this chapter from which an exception is sought.

Specific condition 3(a) in permit number PSD-FL-151 requires that EPA Method 12 be used for determination of lead, EPA Method 104 be used for determination of beryllium and EPA Method 108 be used for determination of arsenic.

Letter to Mr. Michael D. Harley

Page 2

June 9, 1995

(c) The basis for the exception including but not limited to any hardship which would result from compliance with the provisions of this chapter.

Using EPA Methods 12, 104 and 108 for determination of lead, beryllium and arsenic respectively is redundant. These methods can be sampled in one train (40 CFR 60, Appendix IX, Section 3.1). Using a single train is more efficient and cost effective.

(d) The alternate procedure(s) or requirement(s) for which approval is sought and a demonstration that such alternate procedure(s) or requirement(s) shall be adequate to demonstrate compliance with applicable emission limiting standards contained in the rules of the Department of any permit issued pursuant to those rules.

The method described in 40 CFR 60, Appendix IX, Section 3.1 is requested for the determination of lead, beryllium and arsenic. This is an EPA approved method that produces reliable and accurate results. This method allows for the determination of these metals in one sampling train. The method is more time efficient and cost effective without compromising the results.

If you have any questions or comments please call me at (201) 882-7173.

Sincerely,



Michelle L. Herman
Environmental Engineer

MLH:rj

cc: G. J. Aldina
G. Crane
J. Brown - FLDER
T. Eriksen
J. Gorrie
D. Porter



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

April 20, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David S. Dee, Esquire
Landers and Parsons
310 West College Avenue
Tallahassee, Florida 32301

Dear Mr. Dee:

Re: Amendments to PSD-FL-151(A)
Lee County Solid Waste Energy Recovery Project

The Department received your request dated September 28, 1994, for minor amendments to the subject construction permit. The permit is amended as shown:

Specific Condition No. 4.a.

FROM:

4.a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

TO:

4.a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a minimum furnace roof temperature and a minimum temperature of 1800 degrees F above the grate (at a height to be specified by the vendor) prior to ignition of MSW. The appropriate minimum furnace roof

temperature shall be established by the Department, based on the test data collected during the facility's initial start-up operations, and shall be correlated to the minimum temperature of 1800 degrees F above the grate.

During all shutdown procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800 degrees F and the furnace roof temperature is maintained above the correlated minimum furnace roof temperature while any MSW is burning.

Specific Condition No. 4.e.

FROM:

4.e. Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

TO:

4.e. Baghouse Operations

All baghouses, except for the lime silo dust collector and the baghouses for the silos containing hydrated lime, soda ash, and activated charcoal for the facility's water treatment system, shall be equipped with pressure drop monitoring equipment.

Specific Condition No. 5.b.

FROM:

5.b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppmvd at 7% O₂, 24 hour daily geometric average, whichever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).

Mr. David Dee
April 20, 1995
Page 3 of 3

TO:

- 5.b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80%, by weight, or to achieve an emission rate of 30 ppmvd at 7% O₂, 24 hour geometric average, whichever is less stringent. Except during a malfunction, the maximum flue gas temperature at the final particulate matter control device inlet, during the combustion of solid waste, shall not exceed the maximum temperature established by Rule 62-296.416(4)(a), F.A.C.

A copy of this letter shall be attached to Permit PSD-FL-151(A) and shall become a part of that permit.

Sincerely,



Howard L. Rhodes, Director
Division of Air Resources
Management

HLR/jr/t

cc: D. Knowles, SD
J. Harper, EPA
J. Bunyak, NPS
H. Oven, PPS

Final Determination
PSD-FL-151(A)
Lee County Solid Waste Energy Recovery Project

The proposed permit amendments for the subject facility located in Lee County, Florida, were distributed on March 21, 1995. The Notice of Intent to Issue was published in the Ft. Myers News-press on March 30, 1995. Copies of the amendments were available for public inspection at the Department offices in Ft. Myers and Tallahassee.

No comments were submitted by the National Park Service, the U.S. Environmental Protection Agency, the applicant, or the public.

The final action of the Department will be to issue the permit amendments as proposed.

Fold at the top of envelope to the

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
 David S. Dee, Esq.
 Landers & Parsons
 310 West College Ave
 Tallahassee, FL 32301

4a. Article Number:
 Z 311 902 920

4b. Service Type:
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

7. Date of Delivery:
 4-26-95

5. Signature (Addressee):

6. Signature (Agent):
 Amy E. Hendry

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1991 U.S. G.P.O. 1993-352-714

Thank you for using Return Receipt Service

Z 311 902 920



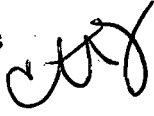
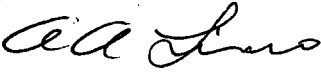
Receipt for Certified Mail
 No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, March 1993

Sent to	David S. Dee
Street and No.	Landers & Parsons
City, State and ZIP Code	Tall. FL
Postage	
Certified Fee	\$
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	PSD-FI-151KA) 4-25-95 Lee Cty Solid Waste

Memorandum

Florida Department of
Environmental Protection

TO: Howard L. Rhodes 
THROUGH: Clair H. Fancy
FROM: A. A. Linero 
DATE: April 20, 1995
SUBJECT: Lee County Solid Waste Energy Recovery Project
PSD-FL-151(A)

Attached for your approval and signature is a permit amendment prepared by the New Source Review Section to revise roof temperature and other requirements for the Lee County Solid Waste Energy Recovery facility in Ft. Myers, Florida. This amendment is not controversial.

I recommend that this permit amendment be approved.

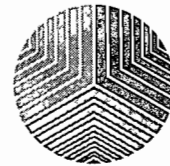
HLR/al/t

Attachments

OGDEN MARTIN SYSTEMS, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

(201) 882-9000



AN OGDEN PROJECTS
COMPANY

April 11, 1995

Mr. John Brown
State of Florida
Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED

APR 13 1995

Bureau of
Air Regulation

RE: OMS of Lee, Inc.
Permit No. PSD-FL-151
Request for Amendments to Specific Condition 3a (Test Methods)

Dear Mr. Brown:

The OMS Lee County Permit includes 40 CFR 60, Appendix A, EPA Methods 12, 104 and 108 for determination of lead, beryllium, and arsenic emissions respectively. We request this condition be amended to include the use of the SW846/BIF Methods for multi-metals testing instead of EPA Method 29 as originally requested in a letter dated April 4, 1995.

Sincerely,

OGDEN MARTIN SYSTEMS, INC.

Michelle L. Herman

Michelle L. Herman
Environmental Engineer

MLH:rj

cc: G. J. Aldina
G. Crane
M. Harley - FLDER

OGDEN MARTIN SYSTEMS, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

(201) 882-9000



AN OGDEN PROJECTS
COMPANY

RECEIVED
APR 11 1995

Bureau of
Air Regulation

April 4, 1995

Mr. John Brown
State of Florida
Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: OMS of Lee, Inc.
Permit No. PSD-FL-151.
Request for Amendments to Specific Condition 3a (Test Methods)

Dear Mr. Brown:

The OMS Lee County Permit includes 40 CFR 60, Appendix A, EPA Methods 12, 104 and 108 for determination of lead, beryllium, and arsenic emissions respectively. We request this condition be amended to include the use of Method 29 for multi-metals testing. This request was initially made in the Source Test Plan (OPI Report No. 757R) submitted October 11, 1994.

Sincerely,

OGDEN MARTIN SYSTEMS, INC.

Michelle L. Herman
Environmental Engineer

MLH:rj

cc: G. J. Aldina
G. Crane
M. Harley - FLDER

Department of Environmental Regulation
Routing and Transmittal Slip

To: (Name, Office, Location)

1. ~~Clair Nancy~~
2. ~~(Dir) Magrath Center~~
3. ~~MS 5500~~
4. ~~MS 5500~~

Remarks:

4/4
Patty
I believe we need to
modify PSD permit
as of. CLR

4/6
AL,
aren't we processing this?
We have 30 days to
issue the permit (modify)
This is John R's K-

Should be issued after April 14
if no hearing is requested

From

Richard Wozell

Date

4/3/25

Phone

921-9642

Copy
JR

RECEIVED
APR 03 1995
Bureau of
Air Regulation

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

IN RE: LEE COUNTY RESOURCE RECOVERY)	
MODIFICATION OF CONDITIONS OF)	
CERTIFICATION PA 90-30)	DEP CASE NO. PA 90-30A
LEE COUNTY, FLORIDA)	OGC CASE NO. 90-1163

FINAL ORDER MODIFYING CONDITIONS
OF CERTIFICATION

On June 16, 1992, the Governor and Cabinet, acting as the Siting Board, issued a final order approving certification for the Lee County Resource Recovery Facility (LCRRF). The certification order approved the construction and operation of a 40 MW (net), municipal waste fired, resource recovery facility and associated facilities to be located in Lee County, Florida.

On September 28, 1994, Lee County filed a request to modify the conditions of certification pursuant to section 403.516(1)(b), Florida Statutes (F.S). The County requested that the conditions be modified to approve changes to conditions regulating emissions and boiler monitoring; stormwater pond control elevation; the number of water supply wells; and increases in per well pumping rates.

Copies of Lee County's request were distributed to all parties to the certification proceeding and made available for public review. On January 20, 1995, a Notice of Intent to Issue Proposed Modification of Power Plant Certification regarding the proposed modifications was published in the Florida Administrative Weekly. As of January 31, 1995 all of

the parties to the original proceeding had received copies of the intent to modify. The notice specified that a hearing would be held if a party to the original certification hearing objects within 45 days from receipt of the proposed modification or if a person whose substantial interests will be affected by the proposed modification objects in writing within 30 days after issuance of the public notice. No written objection to the proposed modifications was received by the Department.

Accordingly, in the absence of any timely objection,
IT IS ORDERED:

The proposed changes to the LCRRF, described in the September 28, 1994, request for modification, are APPROVED. Pursuant to section 403.516(1)(b), Florida Statutes, the conditions of certification for the LCRRF are MODIFIED by the Department as follows:

Condition XIV.A.

3. Miscellaneous Requirements

a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a minimum furnace roof temperature of ~~1270°~~ and a minimum temperature of 1800° above the grate (at a height to be specified by the vendor) prior to ignition of MSW. The appropriate minimum furnace roof temperature shall be established by the Department, based on the test data collected during the facility's initial start-up operations, and shall be

correlated to the minimum temperature of 1800 degrees F above the grate.

During all shutdown procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800° and the furnace roof temperature is maintained above ~~1270°~~ the correlated minimum furnace roof temperature while any MSW is burning.

e. Baghouse Operations

All baghouses (except for the lime silo dust collector and the baghouses for the silos containing hydrated lime, soda ash, and activated charcoal for the facility's water treatment system) shall be equipped with pressure drop monitoring equipment. ~~Baghouses shall have a maximum air-to-cloth ratio of 4:1.~~

4. Emission Control Equipment

b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80%, by weight, or to achieve an emission rate of 30 ppmvd at 7% O₂, 24 hour geometric average, whichever is less stringent ~~and to cool the flue gases to an average temperature not to exceed 300° (3-hour rolling average)~~. Except during a malfunction, the maximum flue gas temperature at the final particulate matter control device inlet, during the combustion of solid waste, shall not exceed the maximum temperature established by Rule 62-296.416(4)(a), F.A.C.

Condition XV.B.2. Site Specific Standards Design Requirements

c. Authorized Withdrawal Facilities

A maximum of six (6) - 8" x 150' wells cased to 80' withdrawing from the Sandstone aquifer with a total combined pumping capacity of ~~±75~~ 1000 gpm ~~per-well~~.

Condition XV.C.2. Site Specific Design Requirements

d. Authorized Control Elevation

~~20.5~~ 21.4 Feet NGVD

NOTICE OF RIGHTS

Any party to this Order has the right to seek judicial review of the Order pursuant to section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the clerk of the Department of Environmental Protection in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Order is filed with the clerk of the Department.

DONE AND ENTERED this 31st day of March, 1995 in Tallahassee, Florida.

**STATE OF FLORIDA, DEPARTMENT
OF ENVIRONMENTAL PROTECTION**

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to S120.52
Florida Statutes, with the designated
Department Clerk, receipt of which
is hereby acknowledged.

[Signature]
Clerk 4/3/95
Date

[Signature] for
Virginia B. Wetherell
Secretary

3900 Commonwealth Boulevard
Tallahassee, FL 32399-3000
(904) 488-4805

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing Final Order has been furnished by U.S. Mail to:

Jim Yaeger
Office of County Attorney
Post Office Box 398
Fort Myers, FL 32902

David Dee
Landers & Parsons
310 W. College
Tallahassee, FL 32302

Larry Johnson
Lindsey Sampson
Lee County Department of
Solid Waste Management
Post Office Box 398
Fort Myers, FL 33902

Dexter Bellamy
SFCARE Inc.
10301 Tarrah Lane
Bonita Springs, FL 33923

Dan Stengle
Department of Community Affairs
2740 Centerview Drive
Tallahassee, FL 32399-2100

Vernon Whittier
Department of Transportation
605 Suwannee Street
Tallahassee, FL 32399

Wayne Daltry
SWFRPC
4980 Bayline Drive, 4th Floor
Post Office Box 3455
North Ft. Myers, FL 33918

Jim Antista
FG&FWFC
620 South Meridian Street
Tallahassee, FL 32399-1600

Susan Coughanour
John Fumero
SFWMD
Post Office 24680
West Palm Beach, FL 33416-4680


Matthew P. Farmer
Attorney for SFCARE
Farmer & Fitzgerald
708 East Jackson Street
Tampa, FL 33602

Rob Vandiver
General Counsel
Florida Public Service
Commission
101 E. Gaines Street
Tallahassee, FL 32301

Joe Treshler
Ogden Projects, Inc.
350 N. Falkenburg Road
Tampa, FL 33619

this 3rd day of April, 1995.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION



RICHARD T. DONELAN, JR.
Assistant General Counsel

2600 Blair Stone Road
Tallahassee, FL 32399-2400
(904) 488-9314



BOARD OF COUNTY COMMISSIONERS

P.O. Box 398
Fort Myers, Florida 33902-0398
(813) 335-2111

Writer's Direct Dial Number
(813) 338-3101

RECEIVED

APR 05 1995

Bureau of
Air Regulation

- John E. Manning
District One
- Douglas R. St. Cerny
District Two
- Ray Judah
District Three
- Andrew W. Coy
District Four

March 31, 1995
SL-95-453

- John E. Albion
District Five
- Donald D. Stilwell
County Manager
- James G. Yaeger
County Attorney
- Diana M. Parker
County Hearing Examiner

Mr. C. H. Fancy, P.E.
Bureau of Air Regulations,
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: LEE COUNTY SOLID WASTE ENERGY FACILITY
AFFIDAVIT OF PUBLIC NOTICE OF INTENT
TO ISSUE PERMIT AMENDED PSD-FL-151(A)

Dear Mr. Fancy:

Transmitted herewith is Affidavit of Publication of the Notice of Intent to issue permit amendment for the subject facility from:

- The Fort Myers News-Press

Contact me should you have any questions.

Sincerely,

DEPARTMENT OF SOLID WASTE MANAGEMENT

Lindsey J. Sampson
Lindsey J. Sampson, P.E.
Deputy Director

LJS/clr

Attachments

- cc: D. Owen
- D. Dee
- T. Eriksen
- D. Knowles (Local D.E.P.)
- II A102

(4231) *G. Reynolds*
B. Owen
G. Harper, EPA
G. Benyah

NEWS-PRESS

Published every morning — Daily and Sunday
Fort Myers, Florida

Affidavit of Publication

STATE OF FLORIDA
COUNTY OF LEE

Before the undersigned authority, personally appeared

Brenda Leighton

who on oath says that he/she is the

Legal Coordinator of the News-Press, a

daily newspaper, published at Fort Myers, in Lee County, Florida; that the

attached copy of advertisement, being a Notice of Intent to Issue Permit Amended

in the matter of Lee County Solid Waste Energy Recovery Facility

in the Court

was published in said newspaper in the issues of March 30, 1995

Affiant further says that the said News-Press is a paper of general circulation daily in Lee, Charlotte, Collier, Glades and Hendry Counties and published at Fort Myers, in said Lee County, Florida and that said newspaper has heretofore been continuously published in said Lee County, Florida, each day, and has been entered as a second class mail matter at the post office in Fort Myers in said Lee County, Florida, for a period of one year next preceding the first publication of the attached copy of the advertisement; and affiant further says that he/she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Brenda Leighton (signature)

Sworn to and subscribed before me this thirtieth day of March

19 95 by

Brenda Leighton

who is personally known to me

as identification, and who did or did not take an oath.

Notary Public (signature)

Print Name

My Commission Expires:

CLASS-16



STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION NOTICE OF INTENT TO ISSUE PERMIT AMENDMENT PSD-FL-151(A)

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment to Lee County Solid Waste Energy Recovery Facility, Buckingham Road and State Road 82, Fort Myers, Florida. This facility consists of two mass burn units with a total capacity of 3320 tons per day (550 MMBtu/hr) capable of generating a total of 40 megawatts of power. The amendments include the following: removing the requirement that the furnace roof temperature be maintained at 1270°F requiring instead that the appropriate minimum furnace roof temperature be established by the Department based on initial startup test data; removing pressure drop monitoring requirements for certain baghouses on non-major sources; and removing the requirement that the flue gases be cooled to an average temperature not to exceed 300°F. These amendments will not cause or contribute to a violation of any air pollution standard or adversely affect the environment.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399, 2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner; the applicant's name and address; the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g)

relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

The application/request is available for public inspection during normal business hours: 8:00 a.m. to 5:00 p.m., Monday through Friday, except holidays, at Department of Environmental Protection, Bureau of Air Regulation, 111 S. Magnolia Drive, Suite 14, Tallahassee, Florida 32301, Department of Environmental Protection, South District, 2295 Victoria Avenue, Suite 364, Fort Myers, Florida 33901.

Any person may send written comments on the proposed action to Mr. Al Linero at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered in the Department's final determination. P.O. 500615, Mar 30 No. 9739



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

March 21, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David S. Dee, Esquire
Landers & Parsons
310 West College Avenue
Tallahassee, Florida 32301

Dear Mr. Dee:

Enclosed is a proposed amendment letter and Public Notice for modifications to Lee County's Solid Waste Energy Recovery facility. The Department requires a public notice for this modification. All comments during the public notice period should be addressed to Mr. Al Linero at the Department's Tallahassee address.

If there are additional questions on the above, please call John Reynolds at (904) 488-1344.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/jr/b

Enclosures

cc: D. Knowles, SD
J. Harper, EPA
J. Bunyak, NPS
H. Oven, PPS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CERTIFIED MAIL

In the Matter of an
Application for Permit Amendment

DEP File No. PSD-FL-151(A)
Lee Co.

Mr. David S. Dee, Esquire
Landers & Parsons
310 West College Avenue
Tallahassee, Florida 32301

INTENT TO ISSUE

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment for a modification (copy attached) for the proposed project as detailed in the application/request specified, above, for the reasons stated in the application/request.

The applicant, Lee County Solid Waste Energy Recovery Facility, applied on September 28, 1994 to the Department for an amendment of their PSD permit's specific conditions regarding startup and shutdown procedures, baghouse operation and maximum flue gas temperature. The facility is located in Lee County.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-212 and 62-4, Florida Administrative Code (F.A.C.). The project is not exempt from permitting procedures. The Department has determined that a permit amendment is required for the proposed work.

Pursuant to Section 403.815, F.S., and Rule 62-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit Amendment. The notice shall be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit amendment.

The Department will issue the permit amendment with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information;

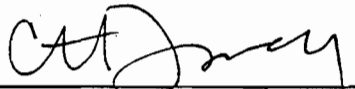
- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to

request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION



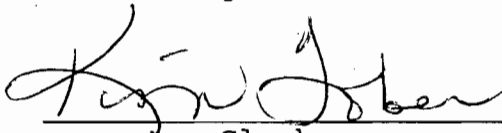
C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this INTENT TO ISSUE PERMIT AMENDMENT all copies were mailed by certified mail before the close of business on 3-22-95 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to
§120.52(11), Florida Statutes,
with the designated Department
Clerk, receipt of which is hereby
acknowledged.



clerk

3-22-95

Date

Copies furnished to:

D. Knowles, SD
J. Harper, EPA
J. Bunyak, NPS
H. Oven, PPS

SENDER:

- Complete Items 1 and/or 2 for additional services.
- Complete Items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed
*David S. Dee, Esq.
 Landers & Parsons
 310 W. College Ave
 Tallahassee, FL
 32301*

4a. Article Number
Z 311 902 948

4b. Service Type
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

7. Date of Delivery
3-23-95

5. Signature (Addressee)

6. Signature (Agent)
David S. Dee

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1991 U.S. GPO: 1993-352-714 **DOMESTIC RETURN RECEIPT**

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

Z 311 902 948



Receipt for Certified Mail

No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, March 1993

Sent to	<i>D. Dee</i>
Street and No.	<i>Landers & Parsons</i>
P.O., State and ZIP Code	<i>Tall. FL</i>
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	<i>3-22-95</i>
	<i>Lee Cty PSO-FI-151(A)</i>

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOTICE OF INTENT TO ISSUE PERMIT AMENDMENT

PSD-FL-151(A)

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment to Lee County Solid Waste Energy Recovery Facility, Buckingham Road and State Road 82, Fort Myers, Florida. This facility consists of two mass burn units with a total capacity of 1320 tons per day (550 MMBtu/hr) capable of generating a total of 40 megawatts of power. The amendments include the following: removing the requirement that the furnace roof temperature be maintained at 1270°F, requiring instead that the appropriate minimum furnace roof temperature be established by the Department based on initial startup test data; removing pressure drop monitoring requirements for certain baghouses on non-major sources; and removing the requirement that the flue gases be cooled to an average temperature not to exceed 300°F. These amendments will not cause or contribute to a violation of any air pollution standard or adversely affect the environment.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's

action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

The application/request is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Protection
Bureau of Air Regulation
111 S. Magnolia Drive, Suite 4
Tallahassee, Florida 32301

Department of Environmental Protection
South District
2295 Victoria Avenue, Suite 364
Fort Myers, Florida 33901

Any person may send written comments on the proposed action to Mr. Al Linero at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered in the Department's final determination.



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

April XX, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David S. Dee, Esquire
Landers and Parsons
310 West College Avenue
Tallahassee, Florida 32301

Dear Mr. Dee:

RE: Amendments to PSD-FL-151(A)
Lee County Solid Waste Recovery Project

The Department received your request dated September 28, 1994, for minor amendments to the subject construction permit. The permit is amended as shown:

Specific Condition No. 4.a.

FROM:

4.a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

TO:

4.a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a minimum furnace roof temperature and a minimum temperature of 1800 degrees F above the grate (at a height to be specified by the vendor) prior to ignition of MSW. The appropriate minimum furnace roof

DRAFT

temperature shall be established by the Department, based on the test data collected during the facility's initial start-up operations, and shall be correlated to the minimum temperature of 1800 degrees F above the grate.

During all shutdown procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800 degrees F and the furnace roof temperature is maintained above the correlated minimum furnace roof temperature while any MSW is burning.

Specific Condition No. 4.e.

FROM:

4.e. Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

TO:

4.e. Baghouse Operations

All baghouses, except for the lime silo dust collector and the baghouses for the silos containing hydrated lime, soda ash, and activated charcoal for the facility's water treatment system, shall be equipped with pressure drop monitoring equipment.

Specific Condition No. 5.b.

FROM:

5.b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppmvd at 7% O₂, 24 hour daily geometric average, whichever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).

DRAFT

Mr. David Dee
April XX, 1995
Page 3 of 3

TO:

- 5.b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80%, by weight, or to achieve an emission rate of 30 ppmvd at 7% O₂, 24 hour geometric average, whichever is less stringent. Except during a malfunction, the maximum flue gas temperature at the final particulate matter control device inlet, during the combustion of solid waste, shall not exceed the maximum temperature established by Rule 62-296.416(4)(a), F.A.C.

A copy of this letter shall be attached to Permit PSD-FL-151(A) and shall become a part of that permit.

Sincerely,

Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/jr/b

cc: D. Knowles, SD
J. Harper, EPA
J. Bunyak, NPS
H. Oven, PPS

Memorandum

Florida Department of
Environmental Protection

TO: Clair H. Fancy
FROM: Al Linero *Al Linero*
DATE: March 21, 1995
SUBJECT: Amendment of Permit No. PSD-FL-151A

Lee County has requested that the referenced permit for their Solid Waste Energy Recovery Project be amended to remove certain restrictions on furnace roof temperature, baghouse pressure drop monitoring, and minimum flue gas temperature. The amendment will not result in an increase in actual emissions. The public notice requirement is consistent with the last such amendment done in February for a power plant siting facility.

AL/jr/b

*Kim - Clerk x
send out. Show
in log book that
we got it back
from Clair. 3/22
Al
(don't send out cover sheets)*

~~12/23 D.H. file~~

~~ARREN~~

Lee County



AN OGDEN PROJECTS COMPANY

OGDEN MARTIN SYSTEMS, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

(201) 882-9000

RECEIVED

DEC 16 1994

Bureau of
Air Regulation

December 15, 1994

Mr. Clair H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

**Subject: OMS of Lee, Inc.
Performance Specification Test
OPI Report No. 884**

Dear Mr. Fancy:

Enclosed is the performance specification test (PST) report for the continuous emission monitoring system at the Lee County Solid Waste Resource Recovery Facility. Testing was conducted by Clean Air Engineering October 21-26, 1994. The performance specification test results demonstrate compliance with 40 CFR 60, Appendix B.

Please contact me at (201) 882-2769 if you have any questions or comments.

Sincerely,

OGDEN MARTIN SYSTEMS, INC.

John D. Agogliati
Environmental Engineer

JDA:rj

Enclosure

- cc: D. Knowles - FLDER (w/Encl.)
- M. Harley - FLDEP
- R. Menon - FLDEP
- J. Fernandez (w/Encl.)
- T. Ericksen
- G. J. Aldina
- D. Porter
- G. Crane
- S. Bass
- R. Tulli
- P. Young

RECEIVED

DEC 27 1994

Bureau of Air Monitoring
& Mobile Sources

MESSAGE CONFIRMATION

OCT-17-'94 MON 11:32

TERM ID:

P-9999

TEL NO:

NO.	DATE	ST. TIME	TOTAL TIME	ID	DEPT CODE	OK	NG
846	10-17	11:29	00:02:37	813 337 2510		04	00

TO Bruce
 DATE 10-17 TIME 10:00
 WHILE YOU WERE OUT
 M JOE AIDINA
 of Ogden Projects (see County)
 PHONE 813 337 2200
AREA CODE NUMBER EXTENSION

To: Joe Aidina
 Ogden Projects, Inc.
 813-337-2510

TELEPHONED	PLEASE CALL	WILL CALL AGAIN	
RETURNED YOUR CALL	CALL IMMEDIATELY		
CAME TO SEE YOU	WANTS TO SEE YOU		

MESSAGE Re: Would like to
have permit amendment
faxed to him.
Fax # - ~~813~~ 337 2510
 813 BY Pat M.



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

October 11, 1994

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. G. J. Aldina, Sr. Vice President
Environmental Testing/CEM
Ogden Projects, Inc.
40 Lane Road
CN 2615
Fairfield, N.J. 07007-2615

Dear Mr. Aldina:

Re: Amendment of Permit No. PSD-FL-151(A)
Lee County Solid Waste Energy Recovery Facility

The Department is in receipt of your September 29, 1994 letter (enclosure) requesting permission to use another EPA stack test method to measure the emissions from the referenced facility that is located at Buckingham Road and State Road 82 in Ft. Myers, Lee County, Florida.

Your request is acceptable and this letter amends Specific Condition No. 3.a. of Permit No. PSD-FL-151(A) to authorize the use of EPA Method 7E, as described in 40 CFR 60, Appendix A, to measure the nitrogen oxides emissions from Units 1 and 2 of the Lee County Solid Waste Energy Recovery facility.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the applicant of the amendment request/application and the parties listed below must be filed within 14 days of receipt of this amendment. Petitions filed by other persons must be filed within 14 days of the amendment issuance or within 14 days of their receipt of this amendment, whichever occurs first. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

Mr. G. J. Aldina, Sr.
PSD-FL-151(A)
Permit Amendment
October 11, 1994
Page 2 of 3

The Petition shall contain the following information:

- (a) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
- (g) A statement of the relief sought by petitioner, stating precisely the action the petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this amendment. Persons whose substantial interests will be affected by any decision of the Department with regard to the request/application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this amendment in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

Mr. G. J. Aldina, Sr.
PSD-FL-151(A)
Permit Amendment
October 11, 1994
Page 3 of 3

A copy of this letter amendment must be attached to the referenced permit, No. PSD-FL-151(A), and shall become a part of that permit.

Sincerely,



Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/WH/bjb

Enclosure

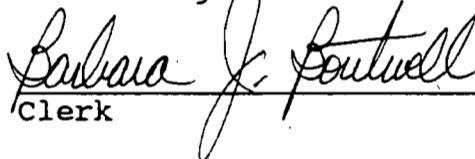
cc: David Knowles, SD
Jewell Harper, EPA
John Bunyak, NPS
Buck Oven, PPC

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this AMENDMENT and all copies were mailed by certified mail before the close of business on 10/17/94 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to 120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.


Clerk

10/17/94
Date

DO NOT WRITE IN THESE SPACES

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3 and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number. The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1 Addressee's Address

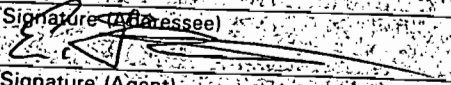
2 Restricted Delivery

Consult postmaster for fee.

3 Article Addressed to:
 Mr. G. J. Aldina, Sr. Vice Pres.
 Environmental Testing/CEM
 Ogden Projects, Inc.
 40 Lane Road
 CN 2615
 Fairfield, N.J. 07007-2615

4a Article Number
 Z 751 859 994

4b Service Type
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

5 Signature (Addressee)


6 Signature (Agent)

7 Date of Delivery
 OCT 20 1994

8 Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1991 U.S. GPO: 1992-323-402

DOMESTIC RETURN RECEIPT

Is your RETURN ADDRESS completed on the reverse side

Thank you for using Return Receipt Service

Z 751 859 994



Receipt for Certified Mail
 No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, March 1993

Sent to Mr. G. J. Aldina	
Street and No. 40 Lane Road	
P. O., State and ZIP Code Fairfield, N.J. 07007-2615	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 10/17/94 PSD-FL-151(A)	

Florida Department of
Environmental Protection

Memorandum

To: *Howard* Rhodes
From: *Benny* Clair Fancy
Date: *John* October 11, 1994
Subject: Amendment of Permit
PSD-FL-151(A)

Attached for your approval and signature is a letter that will amend the construction permit for the Lee County Solid Waste Energy Recovery Facility that is located in Ft. Myers, Florida. The amendment will authorize the use of another EPA test method to measure nitrogen oxides emissions.

I recommend your approval and signature.

CF/WH/wh

Attachment

Florida Department of
Environmental Protection

Memorandum

10/2 John, Bruce, Patty
Pls. assign's track. Let me know
who is doing this as I get calls from
David Deel, their attorney. *Clair*

TO: Power Plant Siting Review Committee
FROM: Buck Oven *HJO*
DATE: September 29, 1994
SUBJECT: Lee County RRF PA 90-30, Module 8040

RECEIVED

SEP 30 1994

Bureau of
Air Regulation

We have received a request for modification of the Lee County Resource Recovery Facility. Please review the enclosed material for completeness/sufficiency and advise me of your findings by October 28, 1994.

cc: Al Rushanan
Clair Fancy
Mary Jean Yon
Trudie Bell
Richard Donelan
David Knowles

~~John Brown~~

Bruce
Please
assign;
see CF
note on
PKA. B.O. due
date 10/24
JB

TO: Power Plant Siting Review Committee
FROM: Buck Oven
DATE: September 29, 1994
SUBJECT: Lee County RRF PA 90-30, Module 8040

We have received a request for modification of the Lee County Resource Recovery Facility. Please review the enclosed material for completeness/sufficiency and advise me of your findings by October 28, 1994.

cc: Al Rushanan
Clair Fancy
Mary Jean Yon
Trudie Bell
Richard Donelan
David Knowles

OGDEN PROJECTS, INC.
40 LANE ROAD, CN 2615
FAIRFIELD, N.J. 07007-2615

0006266

G. J. ALDINA
SENIOR VICE PRESIDENT
ENVIRONMENTAL TESTING/CEM

TEL: (201) 882-4136
FAX: (201) 882-4156

September 29, 1994

Mr. John Brown
State of Florida
Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

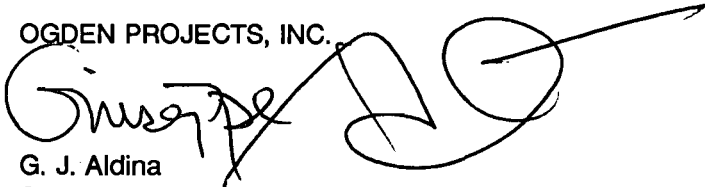
**Subject: OMS of Lee, Inc.
Permit No. PSD-FL-151
Request for Amendment to Specific Condition 3a (Test Methods)**

Dear Mr. Brown:

The OMS Lee County Permit includes 40 CFR 60, Appendix A, EPA Methods 7, 7C, or 19 for determination of nitrogen oxides emissions. We request this condition be amended to include the use of 40 CFR 60, Appendix A, EPA Method 7E. Method 7E is included in FAC Rule 17-2.700(3). The use of Method 7E for nitrogen oxides emission testing was discussed with M. Harley and R. Menon during our meeting September 28, 1994.

Sincerely,

OGDEN PROJECTS, INC.



G. J. Aldina
Sr. Vice President
Environmental Testing/CEM

GJA:rj

cc: P. Young
J. Treshler
G. Crane

Attached is fee for Amendment - \$250.00

RECEIVED
DLR - MAIL ROOM
1994 SEP 30 PM 3:23

OGDEN MARTIN SYSTEMS OF LEE, INC.
40 LANE ROAD
FAIRFIELD, NJ 07007-2615

0006266
Check No. 000018 Check Date 9/29/94

50-937
213

The sum of \$250 and 00 cts

Pay This Amount

*****\$250.00*****

Pay to
The Order
Of: FLORIDA DEPT. OF ENV. PROTECTION

THE CHASE MANHATTAN BANK, N.A.
SYRACUSE, NEW YORK

[Handwritten Signature]



DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF FINANCE AND ACCOUNTING
RECEIPTS SECTION
DAILY CASH LISTING

DOC # AMOUNT NAME REV DATE COMMENTS

** DIVISION: F2

* OBJECT CODE: 002275
006265 79.00 ALEXANDER WH 09/30/94
006266 250.00 OGDEN MARTIN 09/30/94 →
006267 1010.38 FL STEEL COR 09/30/94

* Subsubtotal *
1339.38

* OBJECT CODE: 002276
006265 42.02 ALESANDER WH 09/30/94
006267 537.37 FL STEEL COR 09/30/94

* Subsubtotal *
579.39

** Subtotal **
1918.77

*Money sheet
date
9/30*

OGDEN MARTIN SYSTEMS OF LEE, INC.		Vendor	Check No. 000018	Check Date 9/29/94	
Invoice Number	Invoice Date	Invoice Description	Gross Amount	Retention	Net Amount
092994	9/29/94	FDEP PROCESSING FEE	\$250.00		\$250.00

040017

To Marty Costello
Date _____ Time _____

WHILE YOU WERE OUT

M JR Aldina
of _____
Phone 201/889-4136
Area Code Number Extension

TELEPHONED	PLEASE CALL
CALLED TO SEE YOU	WILL CALL AGAIN
WANTS TO SEE YOU	URGENT
RETURNED YOUR CALL	

Message _____

JR Aldina
10/1/94

10/2 John Brown
He did's F
sent to you.
Clair

I N T E R O F F I C E M E M O R A N D U M

Date: 28-Sep-1994 03:50pm EST
From: Hamilton Buck Oven TAL
OVEN H
Dept: Office of Secretary
Tel No: 904/487-0472
SUNCOM: Room 953-A

TO: See Below

Subject: Modification for Lee County RRF

I will be mailing the attachments describing Lee County's requested modifications to you on 9/29.

Distribution:

TO: Clair Fancy	TAL	(FANCY C)
TO: Bruce Mitchell	TAL	(MITCHELL B)
TO: Al Rushanan	TAL	(RUSHANAN A)
TO: Mary Jean Yon	TAL	(YON MJ)
TO: Trudie Bell	TAL	(BELL T)
TO: David Knowles	FTM	(KNOWLES_D @ A1 @ FTM1)

CARLTON, FIELDS, WARD, EMMANUEL, SMITH & CUTLER, P. A.

ATTORNEYS AT LAW

ONE HARBOUR PLACE P.O. BOX 3239 TAMPA, FLORIDA 33601 (813) 223-7000 FAX (813) 229-4133	FIRSTSTATE TOWER P.O. BOX 1171 ORLANDO, FLORIDA 32802 (407) 849-0300 FAX (407) 648-9099	HARBOURVIEW BUILDING P.O. BOX 12426 PENSACOLA, FLORIDA 32582 (904) 434-0142 FAX (904) 434-5366	FIRST FLORIDA BANK BUILDING P.O. DRAWER 190 TALLAHASSEE, FLORIDA 32302 (904) 224-1585 FAX (904) 222-0398	ESPERANTE P.O. BOX 150 WEST PALM BEACH, FLORIDA 33402 (407) 659-7070 FAX (407) 659-7386	BARNETT TOWER P.O. BOX 2861 ST. PETERSBURG, FLORIDA 33731 (813) 821-7000 FAX (813) 822-3788
--	---	--	--	---	---

PLEASE REPLY TO :

September 28, 1994

Tallahassee

Hamilton Oven, Jr.
Power Plant Siting Coordinator
Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

DEPARTMENT OF
ENVIRONMENTAL PROTECTION

SEP 28 1994

SITING COORDINATION

Re: Lee County Resource Recovery Facility

Dear Mr. Oven:

This law firm represented Lee County, Florida, in the administrative hearings that were conducted under the Florida Electrical Power Plant Siting Act ("PPSA") concerning the County's Resource Recovery Facility ("Facility"). On behalf of Lee County, we respectfully respect the Florida Department of Environmental Protection ("DEP") to modify the PPSA Conditions of Certification for the Facility, pursuant to Section 403.516(1)(b), Florida Statutes, and Rule 62-17.211(4), F.A.C., in the manner described in paragraphs 1-5, below. These modifications are very minor in nature; they will not result in any significant or meaningful environmental impact.

1. Control Elevations for Stormwater Ponds.

At the request of the South Florida Water Management District ("SFWMD"), the Conditions of Certification set the "control elevation" for the Facility's stormwater ponds at 20.5 feet NGVD. The control elevation is the lowest elevation at which stormwater can be released through the control devices in the Facility's stormwater ponds. The County has obtained site specific information which demonstrates that the Facility's stormwater management system would operate better if the control elevation were raised to 21.4 feet NGVD. The County's consultant, Malcolm Pirnie, believes a control elevation of 21.4' NGVD "provides an enhancement to both the Facility site and surrounding eco-system" because it "is appropriate to provide the necessary site drainage and retention of stormwater onsite, while

reducing potential impacts to the hydrologic balance of the adjacent sites." See Exhibit A. It is our understanding that the SFWMD also believes the control elevation should be raised. Consequently, the Conditions of Certification should be modified to state that the control elevation for the Facility's stormwater system is 21.4' NGVD, rather than 20.4' NGVD, based upon the improved design for the Facility's stormwater system. See Exhibit E.¹

2. Alternate Water Supply Wells.

The Facility will use reclaimed water (i.e., treated effluent) from the City of Ft. Myers' wastewater treatment plant as its primary source of water for normal operations. The Facility also will have a back-up or alternate water supply system that could be used in the unlikely event that the primary water supply system is unavailable. The Conditions of Certification provide that the Facility's alternate water supply system will consist of six wells, each capable of pumping 175 gpm. This system would have a total pumping capacity of 1050 gpm.

The County has installed two wells on-site and conducted tests which indicate that the system would work better if it were built with four wells, each capable of pumping 250 gpm. See Exhibit B. This proposed system would have a total capacity of 1000 gpm. It would be nominally smaller than the system that already has been approved.

The South Florida Water Management District has reviewed the County's site specific data and confirmed that the County's proposal to use four wells is consistent with the District's regulations. The SFWMD "concurs that the proposed two additional wells, with a maximum withdrawal capacity of 250 gpm for each well, will not have a greater impact than the previously permitted six well system." See Exhibit B.

¹ Exhibit E contains the precise language that should be added to and deleted from the Conditions of Certification for each of the proposed modifications described in paragraphs 1-5.

However, the SFWMD and County recognize that the actual capacity of the two new wells will not be known until they are installed and tested. Consequently, it is possible that the County may need to install a fifth or sixth well to satisfy its needs. If so, the County will submit appropriate technical data to the SFWMD and obtain SFWMD's prior written approval before it installs the additional well(s). The County also will restrict the operation of the alternate water supply system to ensure that, regardless of the number of wells, the system will not withdraw more than 1000 gpm.

Accordingly, the Conditions of Certification should be modified to authorize the use of the County's improved design for its alternate water supply system, subject to a maximum withdrawal rate of 1000 gpm. See Exhibit E.

3. Baghouse for Ash Handling Building.

The County will use a baghouse (fabric filter) to remove any airborne dust in the Facility's ash handling building. The Facility's Conditions of Certification provide that the emissions from the baghouse cannot exceed 0.010 grains/dscf. The County has concluded that it can comply with the Department's emission limit of 0.010 grains/dscf by using a baghouse at the ash handling building with a maximum air-to-cloth ratio of 10:1.

The Department of Environmental Protection already has amended the Facility's Prevention of Significant Deterioration (PSD) permit to allow the use of a baghouse with a maximum air-to-cloth ratio of 10:1. See Exhibit C. Although the Conditions of Certification provide that the various baghouses at the Facility should have a maximum air-to-cloth ratio of 4:1, the Department has determined that a maximum air-to-cloth ratio of 10:1 "is acceptable [in the baghouse for the ash handling building] and will not result in an increase in permitted annual emissions of any pollutant subject to the PSD regulations." Id. Since the Department previously approved the County's proposal to use a maximum air-to-cloth ratio of 10:1 in the baghouse for the ash handling building, the Conditions of Certification should be modified to make them consistent with the PSD permit. See Exhibit E.

4. Storage Silos for Water Treatment System.

The Conditions of Certification indicate that pressure drop monitoring equipment is not required for the baghouse that filters the air from the Facility's lime silo. The lime silo holds the lime that is used in the Facility's dry scrubber, which is part of the air pollution control system for the combustion units. The baghouse for the lime silo is not subject to the requirement for pressure drop monitoring because the lime silo is an extremely small source of particulate emissions. Continuous pressure drop monitoring also is unnecessary because there is little or no potential for emissions from the lime silo, except when trucks unload lime into the silo, which only occurs on an infrequent and intermittent basis.

Since the Department has concluded that pressure drop monitors are not necessary for the baghouse in the lime silo, pressure drop monitors should not be required for three other relatively small silos where the County will store solid reagents (e.g., hydrated lime, soda ash, and activated carbon) that will be used in the Facility's water treatment system. Similar to the lime silo, the storage silos for these reagents will have a baghouse to control particulate emissions that may occur during truck unloading activities. However, the potential emissions from these silos will be even less than the potential emissions from the lime silo because the volume of reagent used in the Facility's water treatment system will be far less than the volume of lime used in the Facility's air pollution control system. Consequently, fewer trucks will be unloaded into these silos, and there will be much less potential for airborne emissions.

The maximum annual particulate emissions from the lime silo for the air pollution control system will be 54 pounds. See Lee County's application for PPSA certification, Volume III, page 7-18. The County has calculated that the maximum particulate emissions from the three silos serving the water treatment system will be approximately 22 pounds per year--i.e., five pounds per year from the silo for activated carbon, seven pounds per year from the silo for hydrated lime, and ten pounds per year from the silo for soda ash. See Exhibit D. Thus, the combined maximum emissions from all three silos will be less than one-half of the emissions from the lime silo, which were deemed insignificant by DEP and EPA.

Hamilton Oven
Page Five
September 28, 1994

The Conditions of Certification should be modified to ensure that these three silos are treated in the same manner as the lime silo. See Exhibit E.

5. Furnace Roof Temperature.

The Conditions of Certification require the County to attain a temperature of 1800° F above the grate and a temperature of 1270° F at the furnace roof when burning municipal solid waste. It appears, however, that the Department's selection of the 1270° F temperature limitation was based erroneously on data from a resource recovery facility that is not comparable to Lee County's Facility. The 1270° F temperature is not related to the actual operating conditions that will be found at the Facility.

To address this issue, the County will measure the grate temperature and the furnace roof temperature at the Facility during initial start-up operations. Thereafter, the Department and the County can use the actual test data for the Facility to establish an appropriate requirement for the furnace roof temperature, and establish the correlation between the temperatures at the grate and furnace roof. The Conditions of Certification concerning the furnace roof temperature should be modified to reflect the actual conditions at Lee County's Facility, based on the tests performed by the County during the Facility's initial start-up operations. See Exhibit E.

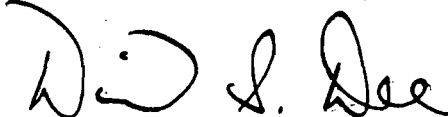
Conclusion.

Lee County believes the Conditions of Certification for the Facility should be modified in the manner described in paragraphs 1-5, above. The County today sent copies of this letter and the attached exhibits by certified mail, return receipt requested, to all of the parties to the Facility's PPSA certification hearing. Pursuant to Section 403.518(1)(c), Florida Statutes, and Rule 62-17.293, F.A.C., the County has enclosed a check (Warrant No. 232008), made payable to the Department, to pay the Department's fee for this request for a modification to the PPSA certification.

Hamilton Oven
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September 28, 1994

If you have any questions about the County's request, please call me at (904) 224-1585 or the Director of the County's Department of Solid Waste Management, Mr. Larry Johnson, at (813) 338-3100.

Sincerely,

A handwritten signature in black ink, appearing to read "D. S. Dee". The signature is written in a cursive style with a large initial "D" and a distinct "S" and "Dee".

David S. Dee

cc: See attached distribution list

Distribution List

Jim Yaeger
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Office of County Attorney
Post Office Box 398
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Lindsey Sampson
Lee County Department of
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ATTORNEYS AT LAW

ONE HARBOUR PLACE P.O. BOX 3239 TAMPA, FLORIDA 33601 (813) 223-7000 FAX (813) 229-4133	FIRSTSTATE TOWER P.O. BOX 1171 ORLANDO, FLORIDA 32802 (407) 849-0300 FAX (407) 848-9099	HARBOURVIEW BUILDING P.O. BOX 12426 PENSACOLA, FLORIDA 32582 (904) 434-0142 FAX (904) 434-5388	FIRST FLORIDA BANK BUILDING P.O. DRAWER 190 TALLAHASSEE, FLORIDA 32302 (904) 224-1585 FAX (904) 222-0398	ESPERANTE P.O. BOX 150 WEST PALM BEACH, FLORIDA 33402 (407) 659-7070 FAX (407) 659-7368	BARNETT TOWER P.O. BOX 2861 ST. PETERSBURG, FLORIDA 33731 (813) 821-7000 FAX (813) 822-3768
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PLEASE REPLY TO :

September 28, 1994

Tallahassee

Clair H. Fancy
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399

Re: Lee County Resource Recovery Facility
(PSD-FL-151)

Dear Mr. Fancy:

This law firm assisted Lee County in its efforts to obtain environmental permits for the Lee County Resource Recovery Facility ("Facility"), including the Prevention of Significant Deterioration ("PSD") permit. Lee County has identified three provisions of the PSD permit that need to be amended to make the PSD permit consistent with the modifications the County is seeking with respect to the Facility's Conditions of Certification. All of these amendments to the PSD permit are minor, and will have no significant environmental impact.

Accordingly, on behalf of the County, we are submitting this letter to the Department as the County's formal request for the following amendments to the County's PSD permit:

1. 300° F. Temperature Limitation.

The Conditions of Certification and PSD permit establish a 300° Fahrenheit (F) limitation on the temperature of the flue gases in the Facility's air pollution control system. This temperature limitation appears to have been superseded by the temperature limitation in the Department's mercury rule. See Rule 62-296.416, F.A.C. Since the Department's mercury rule establishes more stringent requirements for the operation of the Facility, the rule serves as an automatic modification to the Conditions of Certification. See § 403.511(5)(a), Fla. Stat. However, the Facility's PSD permit needs to be amended to make it consistent with the Conditions of Certification and the mercury rule. The specific changes to the PSD permit are shown in Exhibit A, which is attached hereto.

2. Storage Silos for Water Treatment System.

The PSD permit indicates that pressure drop monitoring equipment is not required for the baghouse that filters the air from the Facility's lime silo. The lime silo holds the lime that is used in the Facility's dry scrubber, which is part of the air pollution control system for the combustion units. The baghouse for the lime silo is not subject to the requirement for pressure drop monitoring because the lime silo is an extremely small source of particulate emissions. Continuous pressure drop monitoring also is unnecessary because there is little or no potential for emissions from the lime silo, except when trucks unload lime into the silo, which only occurs on an infrequent and intermittent basis.

Since the Department has concluded that pressure drop monitors are not necessary for the baghouse in the lime silo, pressure drop monitors should not be required for three other relatively small silos where the County will store solid reagents (e.g., hydrated lime, soda ash, and activated carbon) that will be used in the Facility's water treatment system. Similar to the lime silo, the storage silos for these reagents will have a baghouse to control particulate emissions that may occur during truck unloading activities. However, the potential emissions from these silos will be even less than the potential emissions from the lime silo because the volume of reagent used in the Facility's water treatment system will be far less than the volume of lime used in the Facility's air pollution control system. Consequently, fewer trucks will be unloaded into these silos, and there will be much less potential for airborne emissions.

The maximum annual particulate emissions from the lime silo for the air pollution control system will be 54 pounds. See Lee County's application for PPSA certification, Volume III, page 7-18. The County calculates that the maximum annual particulate emissions from the three silos serving the water treatment system will be approximately 22 pounds--i.e., a maximum of five pounds per year from the silo for activated carbon, seven pounds per year from the silo for hydrated lime, and ten pounds per year from the silo for soda ash. Thus, the maximum combined annual emissions from all three silos will be less than one-half of the emissions from the lime silo, which DEP and EPA previously determined were insignificant.

Given these facts, the PSD permit should be amended to ensure that these three silos are treated in the same manner as the lime silo.

3. Furnace Roof Temperature.

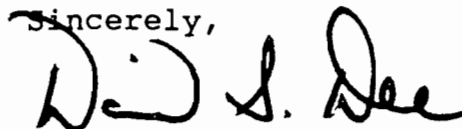
The PSD permit requires the County to attain a temperature of 1800° F above the grate and a temperature of 1270° F at the furnace roof when burning municipal solid waste. It appears, however, that the Department's selection of the 1270° F temperature limitation was based erroneously on data from a resource recovery facility that is not comparable to Lee County's Facility. The 1270° F temperature is not related to the actual operating conditions that will be found at the Facility.

To address this issue, the County will measure the grate temperature and the furnace roof temperature at the Facility during initial start-up operations. Thereafter, the Department and the County can use the actual test data for the Facility to establish an appropriate requirement for the furnace roof temperature, and establish the correlation between the temperatures at the grate and furnace roof. The PSD permit should be amended to reflect the actual conditions at Lee County's Facility, based on the tests performed by the County during the Facility's initial start-up operations.

Conclusion

Lee County respectfully requests the Department to amend the Facility's PSD permit in the manner shown in Exhibit A. If you have any questions about the County's requests, please call Larry Johnson, Director of the Lee County Department of Solid Waste Management at 813/338-3100 or me at 224-1585.

Sincerely,



David S. Dee

cc: Jim Yaeger
David Owen

Clair Fancy
September 28, 1994
Page 4

Larry Johnson
Lindsey Sampson
Joe Treshler
Hamilton Oven, Jr.
Richard Donelan

EXHIBIT A

LEE COUNTY'S PROPOSED AMENDMENTS
TO PSD PERMIT (PSD-FL-151)¹

SPECIFIC CONDITIONS:

4. Miscellaneous Requirements

a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a minimum furnace roof temperature ~~of 1270° F~~ and a minimum temperature of 1800° F above the grate (at a height to be specified by the vendor) prior to ignition of MSW. The appropriate minimum furnace roof temperature shall be established by the Department, based on the test data collected during the facility's initial start-up operations, and shall be correlated to the minimum temperature of 1800° F above the grate.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800° F and the furnace roof temperature is maintained above ~~1270°~~ the minimum furnace roof temperature, as specified above, while any MSW is still burning.

* * * * *

e. Baghouse Operations

All baghouses (except for the lime silo dust collector and the baghouses for the silos containing hydrated lime, soda ash, and activated charcoal for the facility's water treatment system) shall be equipped with pressure drop monitoring equipment. Baghouses for the facility's combustion units shall have a maximum air-to-cloth ratio of 4:1. The baghouse for the ash handling building's dust collection system shall have a maximum air-to-cloth ratio of 10:1.

* * * * *

5. Emission Control Equipment

* * * * *

¹Language added to the existing text of the Conditions of Certification is underscored. Language deleted from the existing text of the Conditions of Certification is ~~struck through~~.

b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppm_{dv} at 7% O₂, 24 hour geometric average, which ever is less stringent, ~~and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).~~ Except during a malfunction, the maximum flue gas temperature at the final particulate matter control device inlet, during the combustion of solid waste, shall not exceed the maximum temperature established by Rule 62-296.416(4)(a), F.A.C.

CARLTON, FIELDS, WARD, EMMANUEL, SMITH & CUTLER, P. A.

ATTORNEYS AT LAW

ONE HARBOUR PLACE P.O. BOX 3239 TAMPA, FLORIDA 33601 (813) 223-7000 FAX (813) 229-4133	FIRSTSTATE TOWER P.O. BOX 1171 ORLANDO, FLORIDA 32802 (407) 849-0300 FAX (407) 648-9099	HARBOURVIEW BUILDING P.O. BOX 12426 PENSACOLA, FLORIDA 32562 (904) 434-0142 FAX (904) 434-5366	FIRST FLORIDA BANK BUILDING P.O. DRAWER 190 TALLAHASSEE, FLORIDA 32302 (904) 224-1585 FAX (904) 222-0398	ESPERANTE P.O. BOX 150 WEST PALM BEACH, FLORIDA 33402 (407) 659-7070 FAX (407) 659-7368	BARNETT TOWER P.O. BOX 2861 ST. PETERSBURG, FLORIDA 33731 (813) 821-7000 FAX (813) 822-3788
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PLEASE REPLY TO :

September 28, 1994

Tallahassee

Hamilton Oven, Jr.
Power Plant Siting Coordinator
Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

DEPARTMENT OF
ENVIRONMENTAL PROTECTION

SEP 28 1994

SITING COORDINATION

Re: Amendments For Lee County
Resource Recovery Facility
(Case No. PA 90-30)

Dear Mr. Oven:

As you know, this law firm assisted Lee County with its efforts to obtain the environmental permits for the Lee County Resource Recovery Facility ("Facility"), including the certification under the Florida Electrical Power Plant Siting Act ("PPSA").

On behalf of Lee County, we are sending this letter to the Department because the County now wishes to amend two provisions in its application for certification, as described below. Both of the amendments are minor, and will have no significant environmental impact. We hereby formally notify the Department of the following amendments to Lee County's application for site certification. It is our understanding that the submittal of this letter is sufficient to accomplish these amendments.

1. Easement for FPL Transmission Line
to Serve Buckingham Park.

The County would like to construct an electric distribution line from Buckingham Road to serve the needs of the County's Buckingham Park. The County has determined that there would be fewer environmental impacts (i.e., fewer trees would be cut down) if the transmission line were placed on the Facility's site in a 10 foot easement located adjacent to the site's southeastern boundary. The distribution line and easement will run north from

Hamilton Oven, Jr.
September 28, 1994
Page 2

Buckingham Road for approximately 2,000 feet and then it will turn to the east and enter the Buckingham Park. The construction of the transmission line would only require the placement of a few telephone poles and would not involve any impacts to wetlands or other sensitive environmental areas.

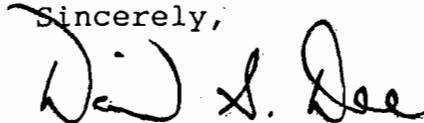
2. Filter Cake From The Water Treatment System

The Facility's water treatment system will produce solids, which will be concentrated and placed in a filter press. The cake from the filter press will be placed in the ash handling building and taken to the landfill for disposal.

Conclusion

If the Department has any questions about these two amendments, please call Mr. Larry Johnson, the Director of Lee County's Department of Solid Waste Management, at 813/338-3100 or me at 904/224-1585.

Sincerely,



David S. Dee

cc: Richard Donelan
Jim Yaeger
David Owen
Larry Johnson
Lindsey Sampson
Joe Treshler

CARLTON, FIELDS, WARD, EMMANUEL, SMITH & CUTLER, P. A.

ATTORNEYS AT LAW

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PLEASE REPLY TO :

September 28, 1994

Tallahassee

Hamilton Oven, Jr.
Power Plant Siting Coordinator
Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Re: Administrative Modification for
Lee County Resource Recovery Facility
(Case No. 90-30)

Dear Mr. Oven:

Pursuant to Section 403.511(5)(a), Florida Statutes, Lee County ("County") respectfully requests the Department of Environmental Protection ("Department") to administratively modify the Conditions of Certification for its Resource Recovery Facility ("Facility").

Section XIV.A.4.b. of the Conditions of Certification establishes a 300° Fahrenheit (F) limitation on the temperature of the flue gases in the Facility's air pollution control system. This temperature limitation appears to have been superseded by the temperature limitation in the Department's mercury rule. See Rule 62-296.416(4), F.A.C. Since the Department's mercury rule establishes more stringent requirements for the operation of the Facility, the rule serves as an automatic modification to the Conditions of Certification. See § 403.511(5)(a), Florida Statutes. Based on Rule 62-296.416(4), F.A.C., the Conditions of Certification should be modified as follows:

XIV. OPERATION

A. Air

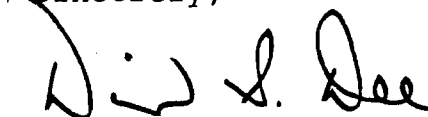
4. Emission Control Equipment

b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppm_{dv} at 7% O₂, which ever is less stringent, ~~and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).~~ Except during a malfunction, the maximum flue gas temperature at the final particulate matter control device inlet, during the combustion of solid waste, shall not exceed the maximum temperature established by Rule 62-296.416(4)(a), F.A.C.¹

Conclusion

If the Department has any questions about this proposed modification, please call me at 224-1585.

Sincerely,



David S. Dee

cc: Richard Donelan
Clair Fancy
Jim Yaeger
David Owen
Larry Johnson
Lindsey Sampson
Joe Treshler

¹Language added to the existing text of the Conditions of Certification is underscored. Language deleted from the existing text of the Conditions of Certification is ~~struck through~~.

August 17, 1994

Larry Johnson, P.E.
Director
Lee County Department of Solid Waste
2013 Altamont Avenue
Ft. Myers, FL 33901

**RE: Surface Water Management Plan
Control Elevation for the Facility Site**

Dear Mr. Johnson:

The control elevation for the Facility site is defined by South Florida Water Management District (SFWMD) as the lowest elevation at which water can be released through a control device. The control elevation for the Facility site was originally established at 20.5' in the Power Plant Site Certification (PPSC). The control elevation has been since modified based upon site specific information. Detailed Facility and surrounding site analyses was undertaken by Malcolm Pirnie as required for submission of the *Review Package for Surface Water Management Permit* (Review Package) under the Power Plant Site Certification (PPSC). As a result, the control elevation was established at 21.4' and provides an enhancement to both the Facility site and surrounding eco-system. Malcolm Pirnie believes that the revised control elevation of 21.4' NGVD is appropriate to provide for:

- effective site drainage,
- necessary retention of stormwater onsite, and
- reducing potential impacts to the hydrologic balance of adjacent sites.

The following provides a brief description of the activities undertaken by Malcolm Pirnie to establish a control elevation of 21.4':

As required by the SFWMD, an application for a Surface Water Management Permit must contain supporting discussion describing the methods by which the average wet season water table elevations were determined. The methods most acceptable to the SFWMD were stated to be: (first), on site information which is both obtained during the latter part of the wet season and representative of the average wet season water table; or (second), technically defensible near-site similar information. As a result, Malcolm Pirnie utilized both applications by using survey crews, on-site information, and information on the control elevation used for other facilities located near the project (Buckingham Park and Buckingham Road). Specifically, the following provides a description of the activities undertaken in an effort to establish the control elevation in accordance with the SFWMD guidelines.

EXHIBIT A

- August 3, 1992 Malcolm Pirnie's subconsultant, Kevin L. Erwin Ecologists (KLECE) performed a field investigation of the Facility site and erected stakes to mark off the high water levels.
- August 4, 1994 Malcolm Pirnie's subconsultant INK Engineering surveyed the stakes erected by KLECE to determine the water level elevations for use in determination of the control elevation. In addition, INK Engineering researched available information on the control elevation used for other facilities located near the project (Buckingham Park and Buckingham Road).
- August 18, 1992 Malcolm Pirnie provided formal notice to Ogden Martin Systems of Lee, Inc. (OMSL) that 21.4' NGVD would be utilized as the control elevation for all calculations and drawings to be submitted to the SFWMD as part of the Review Package for the Surface Water Management Permit (Review Package).
- August 25, 1992 OMSL submitted the Surface Water Management System Construction Plans and Dewatering Plans to the SFWMD based on the 21.4' NGVD control elevation. Two sealed sets of the submitted plans and calculations were resubmitted to the SFWMD on December 31, 1992.
- September 2, 1992 Review Package was submitted to the SFWMD by Malcolm Pirnie. All drawings and calculations were based on the 21.4' NGVD control elevation.

As stated in the PPSC, Section XVC3a "...(2) If control elevations are revised for any portion of the proposed surface water management system, revised calculations which demonstrate compliance with the SFWMD's retention/detention criteria for both quantity and quality purposes (are required); (3) If control elevations are revised for any portion of the proposed surface water management system, revise soil storage calculations (are required)...". Malcolm Pirnie and OMSL provided this documentation as part of the original submittals to SFWMD.

On October 20, 1992, SFWMD issued an authorization to commence construction and/or initiation of the following:

- storm water management system and dewatering operations for the area within the facility site boundary,
- ground and surface water monitoring plans, and
- surface water management system, wetland mitigation, monitoring, maintenance plan, and dewatering operations outside the facility site boundary.

Larry Johnson, P.E.
Lee County Department of Solid Waste

August 17, 1994
Page 3

For your information we have enclosed a copy of the following documents:

- A copy of the December 31, 1992 OMSL submittal to the SFWMD which was the resubmittal of the calculations and plans originally presented on August 25, 1992.
- A copy of the cover letter transmitted with the September 2, 1992 submittal of the Review Package by Malcolm Pirnie.
- A copy of Item I-5 of the Review Package "Wetland Control Elevation Table" which provides a completed SFWMD form No. 0545-G07, field survey information, and a wetland control elevation survey.
- October 20, 1992 SFWMD authorization to commence construction.

In summary, Malcolm Pirnie believes that the revised control elevation of 21.4' NGVD is appropriate to provide the necessary site drainage and retention of stormwater onsite, while reducing potential impacts to the hydrologic balance of adjacent sites.

If you have any questions regarding this matter or any of the enclosures, please do not hesitate to contact us.

Very truly yours,

MALCOLM PIRNIE, INC.


David S. Ferrato
Senior Project Manager

- c: D. Dee, Esq., Carlton, Fields et al. (w/ encl.)
D. Owen, Esq., Lee County Attorney's Office (w/o encl.)
L. Sampson, Lee County Department of Solid Waste (w/o encl.)



South Florida Water Management District

5501 Gun Club Road • P.O. Box 24680 • West Palm Beach, FL 33416-4680 • (407) 686-8800 • FL WATS 1-800-452-2045

LAN 04-06

July 22, 1994

Mr. Hamilton S. Oven, Jr., P.E.
Administrator, Office of Siting Coordination
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Dear Mr. Oven:

**Subject: Lee County Solid Waste Resource Recovery Facility (Phase I)
Well Construction and Relocation**

South Florida Water Management District (SFWMD) staff has reviewed the information submitted on July 20, 1994 by Ogden Martin Systems of Lee, Inc., included the accompanying May 5, 1994 water supply withdrawal evaluation from Ardaman and Associates, Inc. and the February, 1994 Production Well Completion Report from Southwest Water Wells, for the proposed construction of up to four additional wells at the above-referenced project site, pursuant to Certification Condition XV.B.3.d. Based on the flows available from the existing two wells previously authorized, the applicant has indicated that the construction of two to four additional wells is necessary to obtain the total combined flow of 1,000 gpm authorized under Certification Condition XV.B.2.c

The proposed well construction and relocation is consistent with SFWMD criteria and the scope of activities permitted under the approved Site Certification Order for the Lee County Solid Waste Resource Recovery Facility. Based on staff's review of the documentation submitted, the SFWMD concurs that the proposed two additional wells, with a maximum withdrawal capacity of 250 gpm for each well, will not have a greater impact than the previously permitted six well system. Consequently, the proposed well construction and relocation is acceptable to the SFWMD, subject to compliance with the applicable Certification Conditions, including those conditions that address activities during and after construction. We also recommend that Certification Condition XV.B.2.c. be amended to read:

~~6 - 8' x 150' wells cased to 80' withdrawing from the Sandstone aquifer with a pumping capacity of 175 gpm per well.~~

A maximum of 6 - 8" x 150' wells cased to 80' withdrawing from the Sandstone aquifer with a total combined pumping capacity of 1,000 gpm.

EXHIBIT B

Governing Board:
Valerie Boyd, Chairman
Frank Williamson, Jr., Vice Chairman
Annie Betancourt

William Hammond
Betsy Krant
Allan Milledge

Eugene K. Pettis
Nathaniel P. Reed
Leah G. Schad

Tilford C. Creel, Executive Director
Thomas K. MacVicar, Deputy Executive Director

Mr. Hamilton S. Oven, Jr., P.E.
July 22, 1994
Page 2

In the event the two additional wells do not produce sufficient flow to achieve the 1000 gpm needed as a backup water supply source, the applicant shall provide an evaluation similar to that provided with this request for review and approval by the SFWMD prior to constructing Wells 5 and/or 6:

In addition, please have the well contractor complete and return the enclosed Well Completion Report form so that we may keep our files on this project current.

If any of the above requires additional clarification, please do not hesitate to contact Susan Coughanour at (407) 687-6920.

Sincerely,



Steve Lamb, Director
Regulation Department
South Florida Water Management District

SL/jjg

- c: Richard P. Donelan, DEP-Tallahassee
- Philip Barbaccia, DEP-Fort Myers
- Linda McCarthy, DEP-West Palm Beach
- R. Lane Ware, Raytheon, Inc.
- Don Markley, Malcolm Pirnie, Inc.
- L. Peter Young, Ogden Martin Systems of Lee, Inc.
- Lindsey Sampson, Lee County Solid Waste Division
- Jim Yaegar, Lee County Attorney
- David Owen, Assistant Lee County Attorney
- Walter Stephens, Lee County Division of Water Resources
- George Crawford, Lee County DOT
- David Dee, Carlton, Fields, Ward, et al.
- Wayne Daltry, Southwest Florida Regional Planning Council
- James V. Antista, Florida Game & Freshwater Fish Commission
- Steve Pfeifer, Department of Community Affairs

Mike
Jim
John
Phillip permit file

OGDEN MARTIN SYSTEMS OF LEE, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

TEL: (201) 882-9000
FAX: (201) 882-4199

July 29, 1994



RECEIVED

AUG 1 1994
Bureau of
Air Regulation

Florida Department of Environmental Protection
South District Office
2295 Victoria Venue
Suite 364
Ft. Myers, FL 33901

Attention: Phillip Barbaccia

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE1308L

Subject: NOTICE OF ANTICIPATED START-UP

Gentlemen,

On behalf of Lee County, the permittee of the above reference PPSC and PSD, Ogden Martin Systems of Lee, Inc. is pleased to advise the South District Office of the Florida Department of Environmental Protection that the Lee County Solid Waste Resource Recovery Facility is anticipated to start-up with its initial firing of refuse on, or about, August 12, 1994. The second waste combustor boiler is anticipated to start-up within three (3) days after the firing of the first boiler.

The Specific Condition in the PPSC that specifically requires submittal of this information is as follow:

PPSC: Section XIV.A.5

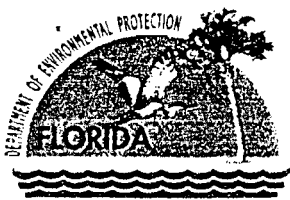
Do not hesitate to call at (201) 882-7246 if you have any questions or further needs.

Very truly yours,

L. Peter Young
Assistant Vice President -
Project Management

- cc: D. Cerrato - Malcolm Pirnie
- D. Markley - Malcolm Pirnie
- L. Sampson
- C. H. Fancy - FDEP/Bureau of Air Reg.
- T. Eriksen - OMSL
- L. Brasowski - OMSL
- J. Kowal - OMSL
- R. Rizzi - Raytheon
- pf 5.1 FDEP

pja/3614



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

August 5, 1994

Certified Mail - Return Receipt Requested

Mr. Peter Young
Assistant Vice President -
Project Management
Ogden Martin Systems of Lee, Inc.
40 Lane Road, CN 2615
Fairfield, NJ 07007-2615

RE: Compliance Test-Lee County Solid Waste Resource Recovery
Facility

Dear Mr. Young:

We reviewed the proposed test schedule for the above referenced source which was received on August 2. The proposed schedule includes test methods which are either different from those required by the permit or which have not been adopted in Chapter 17-297, F.A.C. These specific test methods include: 1) EPA Method 25A for volatile organic compounds (VOCs) and 2) EPA Method 29 for the metals for lead (Pb), beryllium (Be), and arsenic (As). The use of these proposed methods would require advance approval as alternate sampling procedures pursuant to Rule 17-297.620, F.A.C. A copy of the rule is attached for your information.

Since EPA Method 29 is still a conditional test method which has not been adopted by EPA, it is unlikely that its use will be approved for the measurement of lead (Pb), beryllium (Be), and arsenic (As). However, the Department may consider approving a request to use the RCRA multi-metals method in 40 CFR 266 Appendix IX for the metals lead (Pb), beryllium (Be), and arsenic (As). EPA Method 26 is for the measurement of hydrogen chloride (HCl) and the incorporation of any deviations for the measurement of ammonia (NH₃) will also require prior approval as an alternate sampling procedure. Please provide: 1) A detailed description of the sampling and analytical procedures for ammonia (NH₃); and, 2) A demonstration that the ammonia measurement technique will not compromise the measurement of hydrogen chloride (HCl).

The use of EPA Method 7E for the measurement of nitrogen oxides (NO_x) will require a permit amendment. The request for permit amendment should be submitted to the Bureau of Air Regulation in Tallahassee.

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.

The purpose of the 120 minute of sampling duration for EPA Method 5 is not clear. An acceptable compliance test for EPA Method 5 consists of 3 valid runs with a minimum sampling duration 60 minutes each. Table 2-1 of the proposed protocol shows that on day number 2, the test method for the measurement of polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDFs/PCDDs) is EPA Method 9. Please be advised that the appropriate test method for polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDFs/PCDDs) is EPA Method 23 and not EPA Method 9.

Requests for approval of alternate standards and procedures are processed by the Division of Air Resources Management in Tallahassee (specifically the Emissions Monitoring Section). In order to satisfy the demonstration requirements of Rule 17-297.620(2)(d), F.A.C., the Department routinely requires the petitioner to test the source simultaneously using both the adopted procedure and the proposed procedure. The processing of a request for approval of an alternate standard or procedure generally requires a minimum of about 90 days from the date that all of the required information is received. Until an Order approving an alternate sampling procedure is signed, compliance with the applicable limitations shall be determined using the methods specified in the permit.

If you have any questions, please call Ramesh Menon at (904) 488-1344 or write to Michael Harley.

Sincerely,



C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

Enclosure

cc: J. Brown
J. Pennington
B. Oven
D. Knowles, S. District
D. McNeal, EPA Region IV
D. Dees



Lawton Chiles
Governor

Florida Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

May 2, 1994

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Joseph R. Treshler
Vice President
Ogden Martin Systems, Inc.
P. O. Box 709
Brandon, Florida 23509-0709

RE: Lee County Solid Waste Energy Recovery Facility
PSD-FL-151

Dear Mr. Treshler:

The review of your September 17, 1993, letter requesting an administrative change to the conditions of the Prevention of Significant Deterioration permit (PSD-FL-151) issued to Lee County Utilities on July 20, 1992, for the waste to energy recovery facility has been completed. You requested that Specific Conditions 4e. of the permit be revised to authorize a higher air-to-cloth ratio for the ash handling building dust collection and ventilation system.

The basis of your request is that the 0.010 grains/dscf is achievable using a standard industrial HVAC baghouse having an air-to-cloth ratio within the range of 8:1 to 10:1.

Based on the foregoing, it is determined that the proposed revision to the Specific Conditions 4e. of PSD-FL-151 is acceptable and will not result in an increase in permitted annual emissions of any pollutant subject to the PSD regulations.

Authority to construct a stationary source was granted for the Lee County Solid Waste Energy Recovery Facility project, subject to the conditions in the permit to construct on July 20, 1992. This administrative change to PSD-FL-151 does not alter the commence construction deadline for this facility. This authority to construct is based solely on the requirements of 40 CFR 52.21, the federal regulations governing significant deterioration of air quality, and in no way affects the approvals under other federal or State regulatory authorities. Please be advised that a violation of any condition issued as part of this approval, as well as any construction which proceeds in material variance with information submitted in your application, may subject Lee County Solid Waste Energy Recovery Facility project to an enforcement action.

Mr. Joseph Treshler
May 2, 1994
Page Two

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the applicant of the amendment request/application and the parties listed below must be filed within 14 days of receipt of this amendment. Petitions filed by other persons must be filed within 14 days of the amendment issuance or within 14 days of their receipt of this amendment, whichever occurs first. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

- (a) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action;
- (g) A statement of the relief sought by petitioner, stating precisely the action the petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this amendment. Persons whose substantial interests will be affected by any decision of the Department with regard to the request/application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this amendment in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed

Mr. Joseph Treshler
May 2, 1994
Page Three

time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

A copy of this letter shall be attached to the above mentioned permit and shall become a part of this permit.

Sincerely,



Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/TH/bjb

cc: David Knowles, SD
Buck Oven
Richard Donelan

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this AMENDMENT and all copies were mailed by certified mail before the close of business on 5/5/94 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to
120.52(11), Florida Statutes,
with the designated Department
Clerk, receipt of which is
hereby acknowledged.

Barbara J. Portwell 5/5/94
Clerk Date

Is your RETURN ADDRESS completed on the reverse side?

SENDER

1. Complete Items 1 and/or 2 for address.
 2. Complete Items 3, 4, 5, 6, 7, and 8.
 3. Print your name and address on the reverse of this form so that we can return this card to you.
 4. Attach this form to the front of the mailpiece.
 5. Write "Return Receipt Requested" on the mailpiece below the article number.
 6. The Return Receipt will show to whom the article was delivered and the date delivered.

RECEIVED

1. Also wish to receive the following services (for an extra fee):
 Addressee's Address
 Restricted Delivery
 Consult postmaster for fee.

2. Article Addressed to:
 Mr. Joseph R. Treshler
 Vice President
 Ogden Martin Systems, Inc.
 350 N. Falkenburg Drive
 Tampa, Florida 33619

3. Article Number: P 872 563 615

4a. Service Type:
 Registered
 Certified
 Express Mail
 Insured
 COD
 Return Receipt for Merchandise

5. Signature (Addressee)
S. Carr

6. Signature (Agent)
S. Carr

7. Date of Delivery
5/16

8. Addressee's Address (Only if requested and fee is paid)
5/16

PS Form 3811, December 1991 U.S. GPO: 1992-323-402

DOMESTIC RETURN RECEIPT

Thank you for using Return Receipt Service

*RE Mailbox
 5/11/94
 note address
 element*

P 872 563 619



Receipt for Certified Mail
 No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

Sent to Mr. Joseph R. Treshler	
Street and No. P. O. Box 709	
P.O. State and ZIP Code Brandon, Florida 23509-0709	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 5/5/94 PSD-FL-151	

PS Form 3800, JUNE 1991

P 872 563 615



Receipt for Certified Mail
 No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

Sent to Mr. Joseph R. Treshler	
Street and No. 350 N. Falkenburg Drive	
P.O. State and ZIP Code Tampa, Florida 33619	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 5/11/94 PSD-FL-151	

PS Form 3800, JUNE 1991

The Specific Conditions of federal permit PSD-FL-151 shall be modified as follows:

Specific Condition No. 4e

FROM:

4.e Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

TO:

4.e Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Extra bags shall be maintained at the site for emergency purposes. Baghouse (combustion units) shall have a maximum to cloth ratio of 4:1. Baghouse (ash handling building dust collection system) shall have a maximum air-to-cloth ratio of 10:1.

LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

EMISSIONS FROM STORAGE SILOS FOR WATER TREATMENT SYSTEM

Carbon Silo:

Delivery Quantity	24 tons
Delivery Frequency	10 per year
Unloading Duration	240 minutes/delivery
Flow Rate During Unloading	700 acfm
Annual Emissions	5 pounds per year

Lime Silo:

Delivery Quantity	18 tons
Delivery Frequency	13 per year
Unloading Duration	240 minutes/delivery
Flow Rate During Unloading	700 acfm
Annual Emissions	7 pounds per year

Soda Ash Silo:

Delivery Quantity	25 tons
Delivery Frequency	19 per year
Unloading Duration	240 minutes/delivery
Flow Rate During Unloading	700 acfm
Annual Emissions	10 pounds per year

EXHIBIT D

EXHIBIT E

LEE COUNTY'S PROPOSED MODIFICATIONS TO THE CONDITIONS OF CERTIFICATION¹

Proposed Modification No. 1

Condition of Certification XV.C.2.d. should state: "~~20.5~~
21.4 Feet NGVD.

Proposed Modification No. 2

Specific Condition XV.B.2.c. should state: "A maximum of 6 -
8" x 150' wells cased to 80' withdrawing from the Sandstone
aquifer with a total combined pumping capacity of ~~175~~ 1,000 gpm
per well."

Proposed Modification No. 3

Condition of Certification XIV.A.3.e. should state: ". . .
Baghouses for the facility's combustion units shall have a
maximum air-to-cloth ratio of 4:1. The baghouse for the ash
handling building's dust collection system shall a maximum air-
to-cloth ratio of 10:1.

Proposed Modification No. 4

Condition of Certification XIV.A.3.e. should state: "All
baghouses (except for the lime solo dust collector and the
baghouses for the silos containing hydrated lime, soda ash, and
activated charcoal for the facility's water treatment system)
shall be equipped with pressure drop monitoring equipment.


Proposed Modification No. 5

Condition of Certification XIV.A.3.a. should state: "During
start-up procedures, propane gas shall be used to preheat the

¹ Language to be added to the existing text of the
Conditions of Certification is underscored. Language to be
deleted from the existing text of the Conditions of Certification
is ~~struck through~~.

combustion zone to achieve a minimum furnace roof temperature of ~~1270°F~~ and a minimum temperature of 1800° F above the grate (at a height to be specified by the vendor) prior to ignition of MSW. The appropriate minimum furnace roof temperature shall be established by the Department, based on the test data collected during the facility's initial start-up operations, and shall be correlated to the minimum temperature of 1800 F. above the grate.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800° F and the furnace roof temperature is maintained above ~~1270° F~~ the minimum furnace roof temperature, as specified above, while any MSW is still burning.

TO: Howard L. Rhodes
FROM: Clair H. Fancy 
DATE: May 2, 1994
SUBJECT: Amendment of Permit No. PSD-FL-151

Ogden Martin Systems, Inc. has requested that the referenced permit for the Lee County Solid Waste Energy Recovery Project be amended to authorize a higher air-to-cloth ratio for the ash handling building dust collection and ventilation system. The amendment will not allow an increase in permitted annual emissions of any air pollutant.

The Bureau finds their proposal acceptable and has drafted the enclosed amendment to permit No. PSD-FL-151. Because this facility is subject to Florida's Power Plant Certification regulations, we originally requested EPA's review and approval of the enclosed draft amendment.

CHF/TH/bjb

Enclosure

Best Available Copy

**OGDEN MARTIN SYSTEMS
OF LEE, INC.**

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

TEL: (201) 882-9000
FAX: (201) 882-4199



AN OGDEN PROJECTS
COMPANY

RECEIVED
FEB 09 1994
Bureau of
Air Regulation

VIA FIRST CLASS MAIL

February 4, 1994

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C. H. Fancy, P.E.

Florida Department of
Environmental Regulation
South District Office
2295 Victoria Avenue
Suite 364
Ft. Myers, FL 33901

Attention: Philip Barbaccia

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE0896L

Subject: INFORMATION OF THE CONTINUOUS EMISSION MONITORING SYSTEM
POWER PLANT SITE CERTIFICATION NO. 90-3942 EPP (PPSC)
PSD PERMIT NO. PSD-FL-151 (PSD)

Gentlemen,

On behalf of Lee County, the permittee of the above reference PPSC and PSD, Ogden Martin Systems of Lee, Inc. has prepared and herewith submits to the Bureau of Air Regulation and to the South District Office of the Florida Department of Environmental Regulation four (4) copies of information covering the opacity monitors for the continuous emissions monitoring (CEM) system for the Lee County Solid Waste Resource Recovery Facility in accordance with the subject PPSC and PSD. This submittal supplements our July 7, 1993 submission of the required information for the balance of CEM system devices.

The Specific Conditions in the PPSC and the PSD that specifically require the submittal of the information provided herein are as follows:

PPSC: Sections XIV.A, and XIV.A.2(b)

PSD: Sections 3.b

pja/3097

The information and plans provided herein are consistent with approved design concepts, regulations, and the Conditions of Certification.

This completes the submittals required to satisfy the above listed Sections of the PPSC and PSD.

Do not hesitate to call at (201) 882-7246 if you have any questions or further needs.

Very truly yours,



L. Peter Young
Assistant Vice President -
Project Management

cc: D. Cerrato - MP (w/1 set)
D. Markley - MP (w/1 set)
L. Sampson - Lee County (w/1 set)
J. Kowal - OMSL (w/1 set)
R. Rizzi - RE&C (w/1 set)

pf 5.1 FDER

G. Harper, EPA

M. Harley

D. Owen



MILTON ROY

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PROCESS & ENVIRONMENTAL INSTRUMENTS DIVISION

Instruction Manual
Best Available Copy

Process and Environmental
Instruments Division
1238 W. Grove Avenue
Orange, CA 92665-4134
Telephone: 714/974-5560
Telefax: 714/921-2531

INFRARED GAS ANALYZERS

MODEL : ZRH

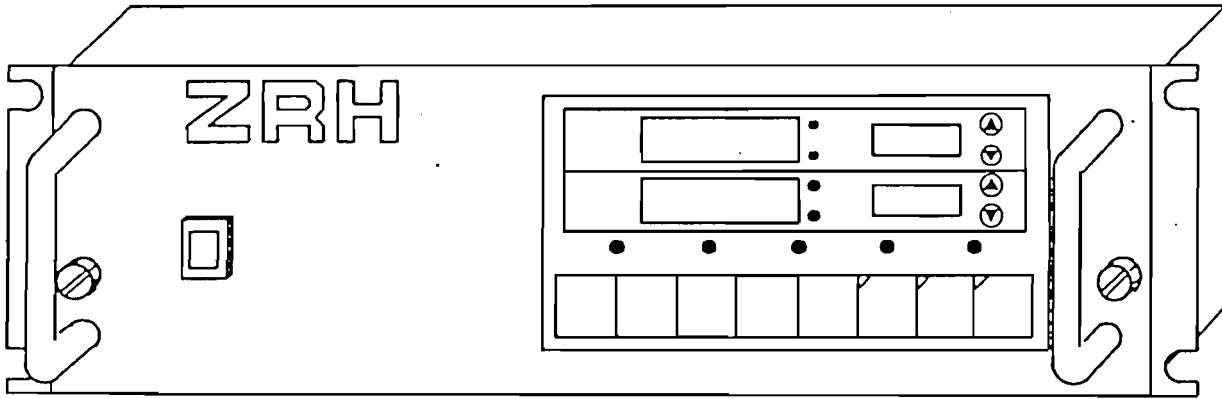


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Best Available Copy

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1. GENERAL DESCRIPTION

FUJI Model ZRH Infrared Gas Analyzer is a multi-functional and easy-handling non-dispersive type infrared gas analyzer, employing a highly sensitive and reliable mass-flow sensor and microprocessor to measure concentrations of gaseous components like CH₄, CO₂, CO etc.

FEATURES

- (1) Both zero calibration and span calibration can be performed by simple key operation.
- (2) Function of self-diagnosis is provided.
- (3) Function of automatic calibration can be added. (Option)
- (4) Function of remote selection of measuring ranges can be added. (Option)

NOTE

Prior to operation of this analyzer, it is recommendable to the user to read through this Instruction Manual in order to ensure efficient operation and accurate measuring results

2. SPECIFICATIONS

- Repeatability : The 1st range(low range) $\pm 0.5\%$ of full scale
The 2nd range(high range) $\pm 1.0\%$ of full scale
- Zero drift : $\pm 2\%$ of full scale/week
- Span drift : $\pm 2\%$ of full scale/week
- Response time : Electronic system response time (90%): 2 sec.
Response time including gas replacing time of
sample cell (90%): within 15 sec.
(depending on cell length)
- Power source : AC 100V, 115V or 220V $\pm 10\%$, 50/60 Hz
(Note: Refer to designation of TYPE NO.)
- Power consumption: 37VA max.
- Ambient temperature: $-5 \sim +45^{\circ}\text{C}$
- Ambient humidity: Less than 90% RH
- Enclosure : Steel plate case, indoor use.
- Measurable gas : <Single gas component, dual ranges measuring>
components and CO₂, CO, CH₄ (Low range/High range) ;
measuring 0~0.05/0.1% (unavailable for CH₄),
ranges 0~0.1/0.2%, 0~0.2/0.5%, 0~0.5/1%
0~1/2%, 0~2/5%, 0~5/10%, 0~10/20%
0~20/50%, 0~50/100%,

<Dual gas components, single range measuring>
CO₂/CO ;
0~20%/0~0.05%, 0~20%/0~0.1%
- Measuring principle: Infrared ray absorption, non-dispersive type
deflection method, single IR source single
beam system.

- Output signal : Output 1; DC 0 ~ 1V
Output 2; DC 4 ~ 20mA (allowable load resistances less than 550Ω).
To-order production of either DC 0 ~ 100mV or DC 0 ~ 10mV (output resistance less than 100 Ω to be available as non-standard.
- Contact output : 1'a'contact at analyzer fault
Rating: AC250V, 2A (resistance load)
- Overall dimensions : Rack mounted type 133 x 483 x 448 mm
(H x W x D) Panel flush mounted type 133 x 443 x 448 mm
Desk top type 145 x 443 x 448 mm
- Weight : Approx. 12 kg
- Color of finish : MUNSELL 5Y8/1
- Indication : Concentration indication(main display screen)
4-digit LED display
Parameter indication (sub-display screen)
4-digit LED display
- Hold of output signal : Output signal just prior to calibration are held during either manual or automatic calibration.
Hold or non-hold both selectable.
- Sample gas temperature : 0 ~ 50 °C
- Warm-up time : Approx. 4 hours after power switch on
- Materials of gas contacting parts : Measuring cell: stainless steel type 304
NEOPRENE® rubber
Window for infrared ray: CaF₂ or Sapphire
Internal piping TEFLON® tube
TOALON® tube

- Inlet & outlet dia.: RC 1/4 (PT 1/4) female threads or
of sample gas and NPT 1/4 female threads.
purging gas inlet
- Measuring gas flow : 1ℓ /min. ±0.5ℓ /min.
rate
- Purging gas flow : Approx. 1ℓ /min. (by occasional demands)
rate

ADDITIONAL SPECIFICATIONS

- Remote selection : Selection of measuring range by external
of measuring range signal available.
1st range selection signal:voltage input DC5V
- Contact output of : 1'a'contact output for 1st(low) range
range rating: AC250V, 2A (resistance load)
identification
signal
- Automatic : Automatic zero & span calibration at preset
calibration cycle time and due to external start signal.
Calibration gases flow orderly by sequential
driving of external solenoid valves.
- Nos. of components : Simultaneous calibration of max.2 gas
for calibration components available.
- Zero calibration : Fixed at 0%.
point
- Span calibration : Setting available in range of 0~ 100%
point of full scale
- Calibration start : To be started by either built-in timer or
remote start signal.

- Flowing mode of calibration gas at calibration : (1) Zero gas
(2) Zero gas - span gas 1
(3) Zero gas - span gas 2
(4) Zero gas - span gas 1 - span gas 2
- Calibration gas flowing time at calibration : Setting range from 100 to 599 sec.
- Cycle time of auto-matic calibration : Setting range from 1 to 199 hours (pitch by 1 hour)
- Automatic calibration error alarm : Output signal at error during automatic calibration.
- Contact outputs : 1'a'contact during calibration
Rating : AC250V, 2A (resistance load)
1'a'contact at calibration error
Rating : AC250V, 2A (resistance load)
1'a'contact for each solenoid valve drive
Rating : AC250V, 2A (resistance load)
- Remote starting of automatic calibration : Remote starting signal: voltage input DC5V

3. MEASURING PRINCIPLE

The principle of composition of the FUJI Model ZRH Infrared Gas Analyzer is shown in Fig.3.1.

Infrared light emitting from an Infrared Source① is intermitted by a Chopper② driven by a Chopper Motor③ in a certain frequency, then led into a Measuring Cell④. The infrared light beam is partially absorbed into the measured component in the Measuring Cell and the unabsorbed portion reaches a Detector⑤, which is provided with a Front Chamber and a Rear Chamber, both normally being filled with the same gas component as the gas to be measured.

When infrared light is led into the detector, the gases filling in both chambers absorb the light and expand.

Since the Detector is so designed as to produce an expansion difference between the Front and Rear Chambers, a slight gas flow is produced in a Mass-flow Sensor⑥ and this slight flow generates output voltage in the sensor as shown in Fig.3.2.

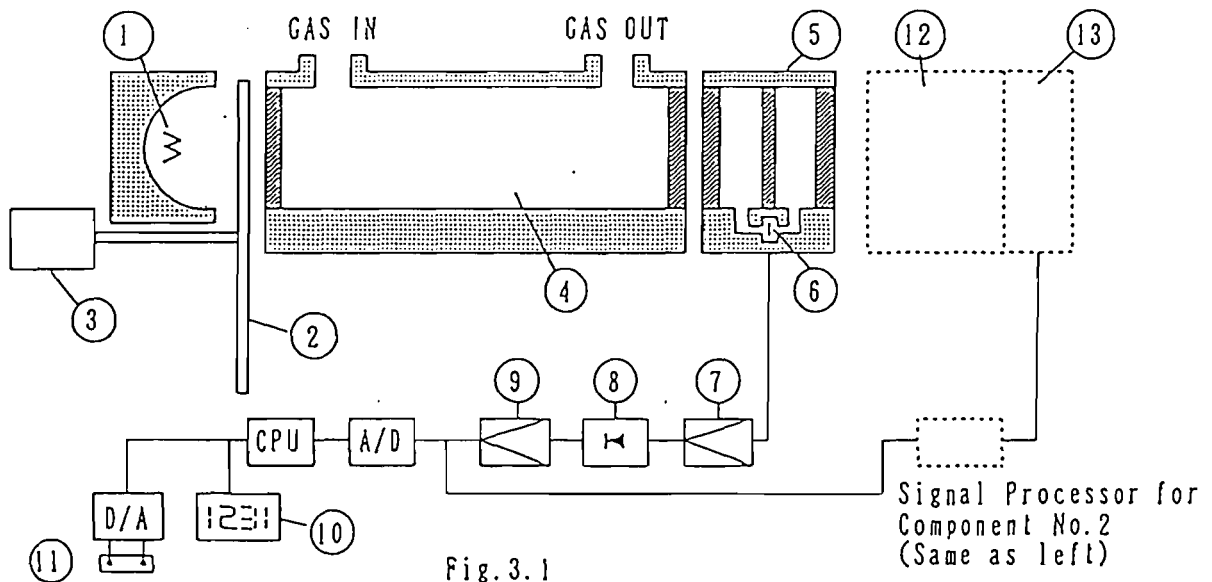


Fig.3.1

- | | |
|--------------------|--------------------|
| ①:Infrared Source | ⑨:DC Amplifier |
| ②:Light Chopper | ⑩:Display Panel |
| ③:Chopper motor | ⑪:Output Terminal |
| ④:Measuring Cell | ⑫:Measuring cell |
| ⑤:Detector | for No.2 component |
| ⑥:Mass-flow Sensor | ⑬:Detector for |
| ⑦:AC Amplifier | No.2 Component |
| ⑧:Rectifier | |

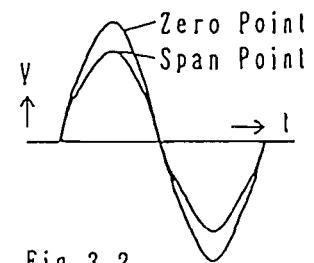


Fig.3.2

Output signal generated in the sensor is amplified by an AC Amplifier ⑦, then converted to DC voltage by a Rectifier ⑧.

The converted DC signal is amplified by a DC Amplifier ⑨, then converted by an A/D Converter and after being processed through concentration computing, temperature compensation and linearizing in a micro-processor, the concentration of measured component is displayed in 4-digit on a Display panel ⑩ in digital form and simultaneously a D/A converted signal is transmitted from an Output Terminal ⑪ as an analog output signal.

When sample gas contains such interfering gas components as absorption range partially overlapping with the gas component to be measured, the same expansion as mentioned above is produced in both chambers of the detector, however, since both expansions are designed for almost the same volume, mutual influence owing to interfering gas component can be minimized.

A dual components analyzer has additional Measuring Cell ⑫, Detector ⑬ and signal processing electronics the same as for the 1st component. As shown in Fig.3.1, they proceed with the same measuring process.

4. INSTALLATION

WARNINGS

- Dangerous voltages are present at power supply terminals and inside the instrument assembly.
- Be careful with gas leakage, especially in case of toxic gas and other hazardous gas to people.

CAUTIONS

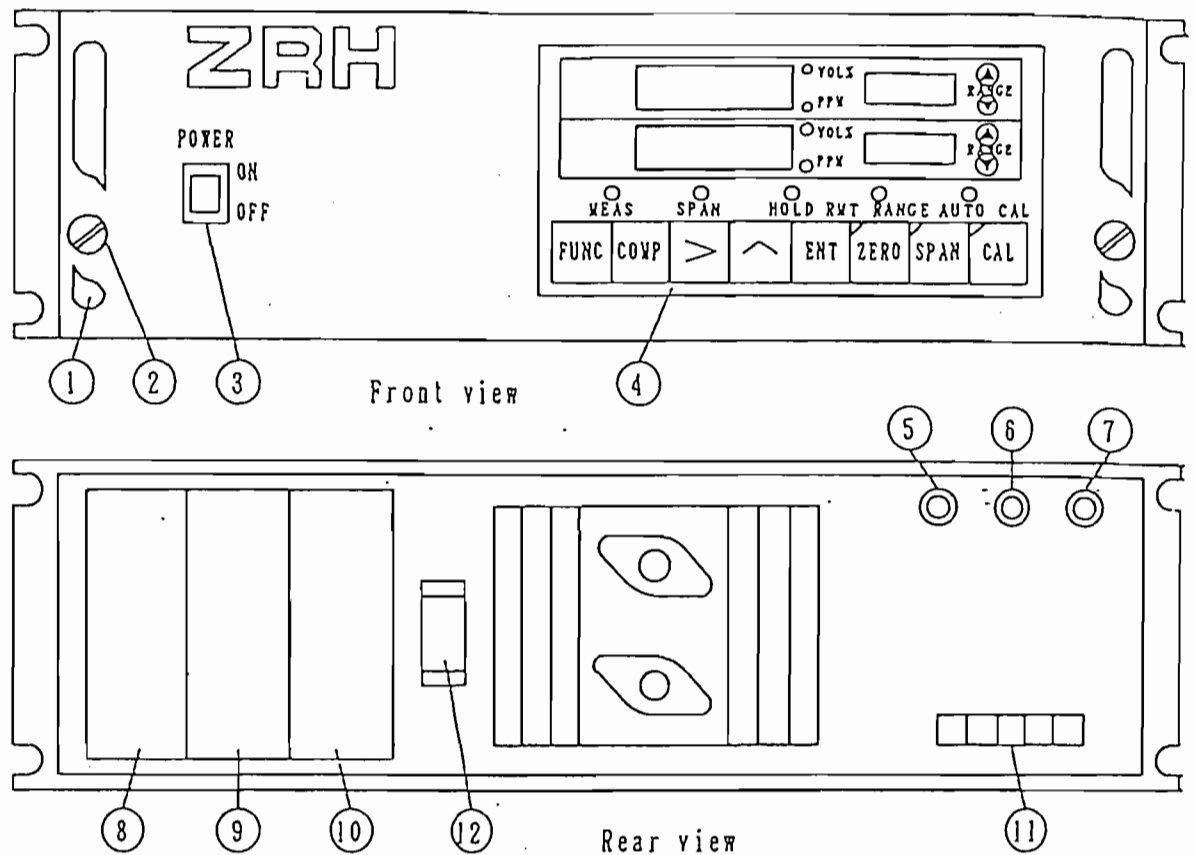
- Select an adequate installing location.
Install the analyzer so as not to be subjected to high and/or fluctuating temperature, strong heat radiation or direct sun light exposure.
In case when the instrument is installed outdoors, select weather protected area.
- Avoid the location with frequent and/or severe vibration.
- Avoid the location with corrosive and flammable gas in atmospheric air.

NOTES

- Check whether the followings are contained or not at time of unpacking.

Item	Quantities
◦ Instrument -----	1
◦ Power Source Fuse -----	2
◦ Test report -----	1
◦ Instruction Manual -----	1
◦ Mounting Screw -----	4 (in case of panel mounting type)

4.1 DESCRIPTIONS OF COMPONENTS



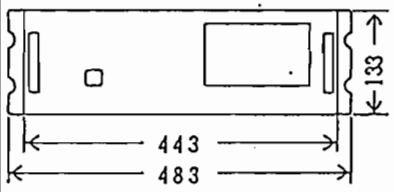
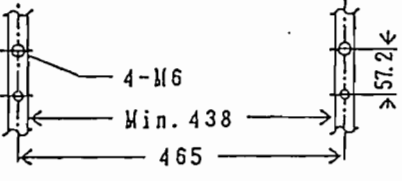
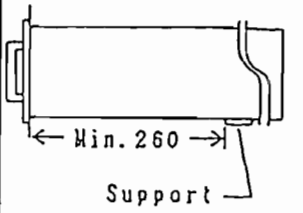
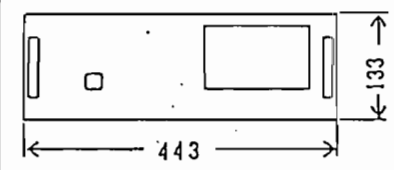
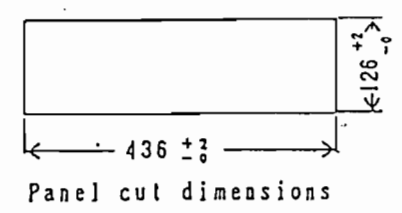
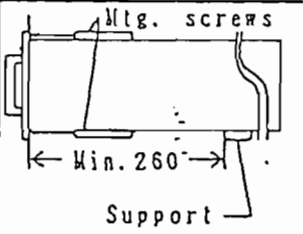
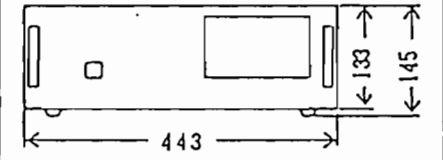
- | | |
|---------------------------|---|
| ① Handle | ⑨ COMP 2 Terminals |
| ② Set Screw | Attached to the dual components analyzer |
| ③ Power Switch | ⑩ AUTO CAL. Terminals |
| ④ Display & Control Panel | Attached to the analyzer with auto-calibration option |
| ⑤ Sample Gas Inlet | ⑪ Power Supply & Grounding Terminals |
| ⑥ Sample Gas Outlet | ⑫ Pin connector (for manufacturer's internal use) |
| ⑦ Purge Gas Inlet | |
| ⑧ COMP 1 Terminals | |

NOTE

The Pin connector ⑫ is intended to be used only in the manufacturing process. Do not remove the cover and do not make any electrical connections on it.

4.2 MOUNTING

3 ways of mounting (19" rack mount, panel flush mount and desk top) are available. Prepare for mounting referring to data listed in a table below (Dimensions in mm).

	Ext. Dimensions of Analyzer	Dimensions for Mounting	Mounting Method
19" Rack Mount			
Panel Mount			
Desk top			

CAUTIONS

- Mount front side of the analyzer so as to be vertically positioned.
- In case of both mounting on panel and 19" rack, hold the rear side with such support as to be able to hold 10kg or more weight.

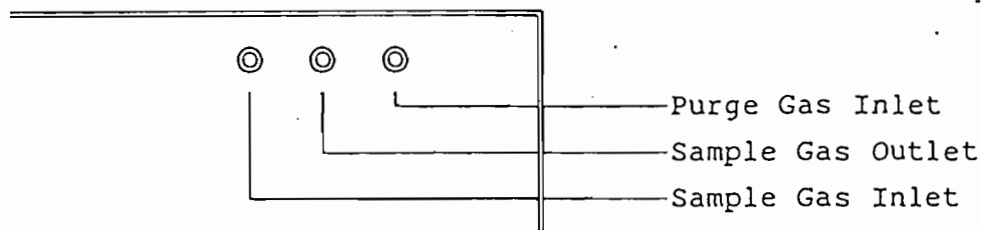
4.3 PIPING

Connect piping with gas inlet-outlet on the rear upper side of the analyzer. Connect the analyzer with a sampling system by means of corrosive-resistant tubing like TEFLON®, stainless steel or polyethylene etc. Do not use rubber or soft vinyl tubing even in any uncorrosive case to avoid incorrect indication due to adsorption of gas onto piping materials. Rc1/4 (PT1/4) or NPT1/4 female threads connectors are equipped for piping connection.

Be sure to minimize piping length as short as possible in order to ensure quicker response. Adequate tubing bore is 4 mm.

Use clean tubings and connections as dust inhaling may cause improper operation.

Location of pipe connectors on the rear panel of the analyzer is shown below.



4.4 SAMPLING

4.4.1 SAMPLE GAS CONDITIONING

- (1) Remove dust in sample gas completely through filters.
For final stage filtering, use a filter capable of removing particles of dust larger than 0.3μ .
- (2) Dew point of sample gas must be lower than ambient temperature in order to prevent moisture inside the analyzer.
In case that moisture is contained in sample gas, bring dew point of the sample gas down to about 0°C through a dehumidifier.
- (3) When SO_2 mist is contained in sample gas, remove it through a mist-filter and cooler etc. Remove other mist by similar procedures.
- (4) Note and take care, the life of the analyzer is to be shortened when such heavy corrosive gases as Cl_2 , F_2 & HCl etc. are much contained in sample gas.
- (5) Allowable temperature range of sample gas is $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$.
Be careful not to bring hot gas into the analyzer directly.

4.4.2 FLOW RATE OF SAMPLE GAS

Keep flow rate of sample gas at 1 ℓ /min. $\pm 0.5 \ell$ /min.

Prepare flowmeter so as to measure flow rate.

4.4.3 PREPARATION OF CALIBRATION GASES

Prepare calibration gases for zero and span calibration.

zero gas	N ₂ gas
span gas	Each component should have concentration more than 80% of full scale.

4.4.4 PURGING INTERIOR OF THE ANALYZER CASE

Purging inside the analyzer is generally unneeded, however, proceed purging with instrumentation air or N₂ gas for the following cases.

Purging flow rate is to be approximately one l/min.

When dust & mist are contained in purge gas, utilize it after their complete removal.

- (1) When corrosive gas exists in the environmental air of the installing location.
- (2) When the same or interfering gas component with the gas to be measured, exists in the environmental air of the installing location.

4.4.5 PRESSURE AT THE OUTLET OF SAMPLING GAS

Keep pressure at the outlet of sample gas so as for it to be atmospheric pressure.

4.5 WIRING

CAUTION

Do not locate analyzer near to the electric apparatus to generate electric noises. (Induction furnace & electric welder etc.).

When the analyzer is operated near to such electric apparatus be sure to separate the power source to avoid noise.

In case the noise from relay or solenoid valve etc. influences the analyzer through the power source, provide a ballistor(example: Fuji Electric Type No.ENA211-2) or a spark-killer(example: Okaya Type No.S1201) with the noise generating apparatus as shown in Fig.4.5.1

Be sure to mount the above as close as possible to such noise generating sources.

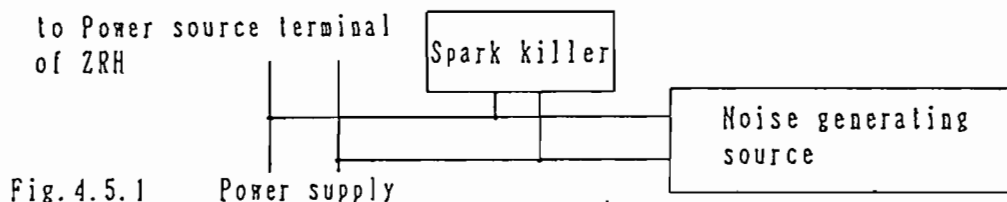


Fig. 4.5.1

All input & output terminals are on the rear panel of the analyzer. Proceed wiring of each terminal as shown in Fig.4.5.2.

Terminal screw is M3.5.(Power source terminal is M4.)

Use shield wire for wiring of output signal in order to reduce the influence of noise.

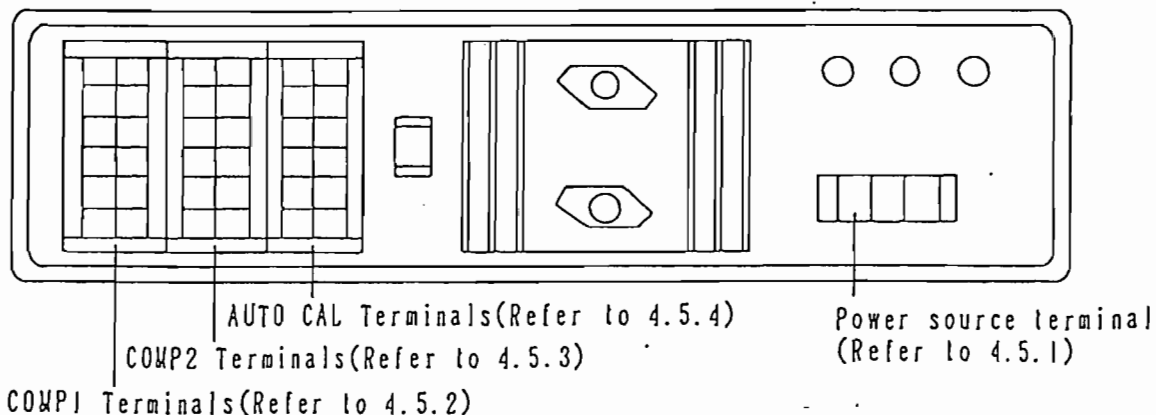


Fig.4.5.2 Rear panel

4.5.1 POWER SOURCE TERMINALS

CAUTION

Ensure to check voltage of power source to be identical with the one specified on the name plate of the analyzer, otherwise it may be broken.

Proceed ground earthing with earth terminal to eliminate electrical hazards.

Layout of power source terminals are shown in Fig. 4.5.3.

Proceed earthing of earth terminal and connect power source terminals to a power source.

Use crimp terminals (for M4 screw) for connecting.

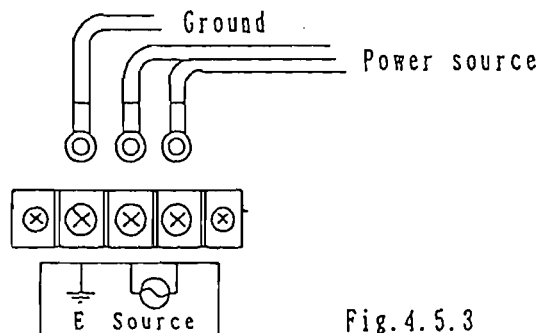


Fig.4.5.3

4.5.3 COMP2 TERMINALS

COMP 2 Terminals are input & output terminals for 2nd measuring component. Connection is to be referred to Fig. 4.5.5.

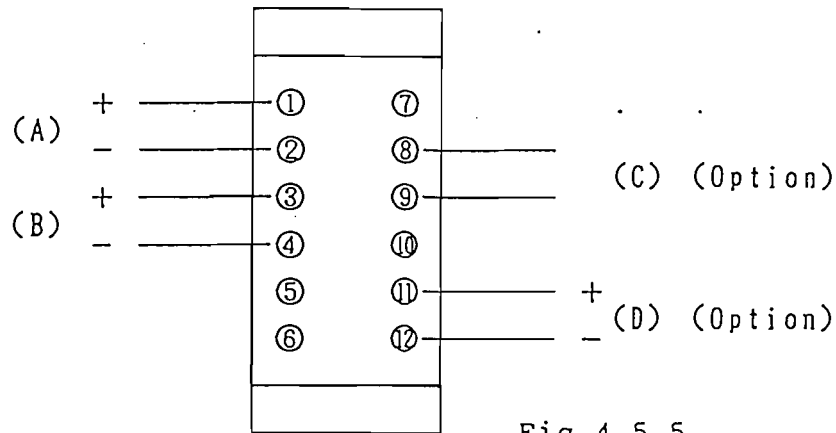


Fig.4.5.5

- (A) Voltage output : DC 0~ 1V
signal
- (B) Current output : DC 4~ 20mA
signal
- (C) Contact output of : 1'a'contact
measuring range Rating: AC 250V, 2A (resistance load)
identification At selection of the 1st range;
⑧ & ⑨ close
At selecting of the 2nd range;
⑧ & ⑨ open
- (D) Remote range : DC 5V
selection input During DC 5V is input to terminals
⑪ & ⑫, the 1st range is selected.
When terminals ⑪ & ⑫ are opened or given
0V, the 2nd range is selected.

4.5.4 AUTO CAL TERMINALS (OPTION)

AUTO CAL Terminals are input & output terminals for automatic calibration and the connection is shown in Fig. 4.5.6.

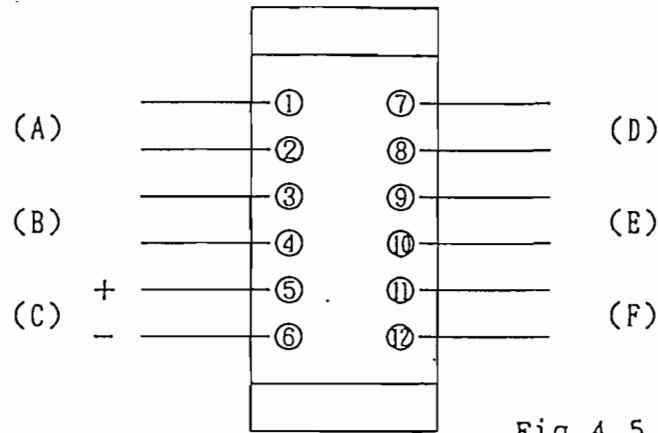
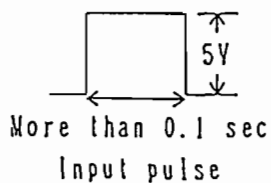


Fig.4.5.6

- | | |
|--|--|
| (A) Contact output during calibration | : 1'a'contact
Rating: AC 250V, 2A(resistance load)
Make-contact output to indicate automatic calibration taking place. |
| (B) Contact output of error in automatic calibration | : 1'a'contact
Rating: AC 250V, 2A(resistance load)
Make-contact output for error occurring in analyzer during automatic calibration, which works simultaneously with the contact output FAULT.
If error occurs, corresponding error code is displayed.
For details of error codes refer to 7.3 Error codes & how to recover. |
| (C) Remote start input | : DC 5V square signal longer than 100msec. in duration. |



Input to start automatic calibration by external signal. When the pulse shown left is input to terminals ⑤ & ⑥ automatic calibration is to start.

- (D) Contact output : 1'a'contact
for zero gas . Rating: AC 250V, 2A(resistance load)
Make-contact output to open solenoid
valve for zero gas flowing.
- (E) Contact output : 1'a'contact
for span gas 1 Rating: AC 250V, 2A (resistance load)
Make-contact output to open solenoid
valve for span gas of the 1st component
flowing.
- (F) Contact output : 1'a'contact
for span gas 2 Rating: AC 250V, 2A (resistance load)
Make-contact output to open solenoid
valve for span gas of the 2nd component
flowing.

CAUTION

Keep each unused terminal open so as not to make damage to
analyzer by short-circuit or misconnection etc.

5. OPERATION

5.1 OPERATION PROCEDURES

Proceed the followings for getting an analyzer into operation

(1) Check of piping



(2) Purging inside analyzer

Carry out purging if needed.



(3) Power switch on



(4) Warming up



(5) Set or review analog output signal holding

Refer to 5.5.2



(6) (Option) Set or review remote range setting

Refer to 5.5.3



(7) (Option) Set or review parameters for automatic calibration

Refer to 5.6.1, 5.6.2, 5.6.3
5.6.4 and 5.6.5



(8) Set or review span gas concentration & independent/dependent calibration

Refer to 5.5.1



(9) Initial calibration

Refer to 5.4.4, 5.4.2, 5.4.3 and 5.5.1

↓

(10)	Set or review key lock ON/OFF	Refer to 5.5.4
------	-------------------------------	----------------

↓

(11)	Introduction of sample gas
------	----------------------------

(Start of measuring)

↓

(End of measuring)

(12)	Stop sample gas and purge the analyzer
------	--

Supplemental explanations to above described items

(1) Check of piping

Check that piping is connected correctly.

(2) Purging inside analyzer

Check flow rate of purging gas when purging is needed.

(Refer to 4.4.4.)

(3) Power switch on

When power source is switched on, analyzer is operating in function mode "Measuring".

(4) Warming up

After power source is switched on, warm up the analyzer.

Approx. 4 hours are needed for warming up to obtain the specified performances in the specifications, but indication come to be stabilized approx. 2 hours after.

During warming up, reviewing all configuration parameters is recommended to get well acquainted with analyzer performance.

(9) Initial calibration

Proceed zero & span manual calibration according to 5.4.4.

If initial calibration has been surely completed in manufacturer or distributor, proceed ordinary zero & span calibration instead, either automatic or manual and either independent or dependent.

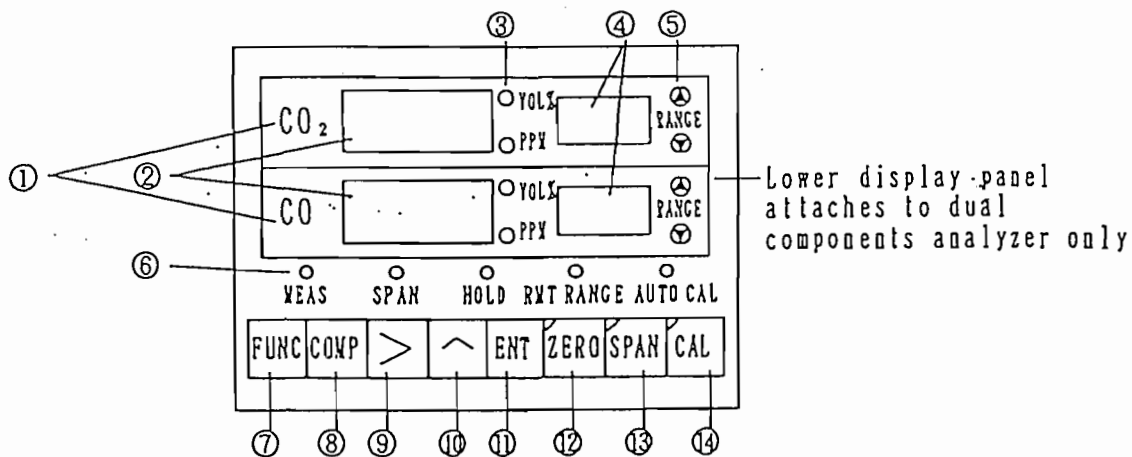
(12) Stop flowing-in of sample gas then proceed purging of measuring cell inside with dry nitrogen gas for 10 minutes.

If switching off power source, refer notes on the next page.

NOTES

Even after switching off the power source, all preset parameters is stored and kept in non-volatile memory. However, time until the next automatic calibration stored in a timer expires after 4 hours from power source turned off. In this case, reset the timer again at re-starting.

5.2 DESCRIPTIONS OF DISPLAY AND CONTROL PANEL



NAME	DESCRIPTIONS
① Name of measured components	Indicating measured components
② Main display screens	Indicating measured concentration, and also indicating each parameter of automatic calibration etc. in set mode
③ Indicating light of measuring unit	Measuring unit of concentration display to be indicated.
④ Sub display screens	Besides displaying of measuring range, error code & parameters etc. also to be displayed.
⑤ Measuring range selection keys	To be utilized for range selection. ▲ : Selection button for high range ▼ : Selection button for low range

⑥ Function indicating lights

In case of single range, both do not work even if depressed.

Each light shows the following status.

MEAS : Lighting in measurement mode.
SPAN : Blinking in function mode of span gas concentration setting
HOLD : Blinking in hold setting mode, and remains lit while hold function enabled.

RMT RANGE: Blinking in remote range setting mode, remains lit while remote range function enabled.

AUTO CAL : blinking in automatic calibration setting mode, and remains lit while automatic calibration function enabled.

⑦ [FUNC] key

Setting mode to be changed-over at every key depression.

⑧ [COMP] key

Change-over of components for parameter setting in set mode.

⑨ [>] key

A changeable digit on the display shifts down by every key depression.

⑩ [^] key

Value of the chosen digit to be increased by every key depression.

⑪ [ENT] key

Set parameters to be stored and become effective by key depression.

⑫ [ZERO] key

To be used for zero calibration (zero key indicating light on up-left corner of key blinking during zero calibrating.)

⑬ [SPAN] key

To be used for span calibration (span key indicating light on up-left corner of the key blinking during span calibration.)

⑭ [CAL] key

To be used for starting of manual calibration.

While zero key indicating light blinking, CAL key depression leads to zero calibration, while span key indicating light blinking, it leads to span calibration.

5.3 OUTLINE OF OPERATION FLOW

As under-shown, function to be changed-over by FUNC key pressing down.

Key	Function (Reference pages)	Main/Sub display	Function display light
FUNC	[Measurement mode] Measuring (P.5-7)	Measuring value/ Measuring range	MEAS lighting on
↓ FUNC	[Set mode] Span gas concen- tration setting (P.5-13)	Span value/ Measuring range	Span blinking
↓ FUNC	Hold setting (P.5-15)	"HoLd"/ "ON"or"OFF"	HOLD blinking
↓ FUNC	Remote range setting(option) (P.5-17)	"r.rAG"/ "ON"or"OFF"	RMT RANGE blinking
	Automatic calibration (option)		
↓ FUNC	Calibration start timer (P.5-21)	"Strt"/Time	AUTO CAL blinking
↓ FUNC	Calibration Cycle time setting (P.5-22)	"CyCL"/Time	AUTO CAL blinking
↓ FUNC	Calibration gas flowing time setting (P.5-23)	"F.SEC"/Time	AUTO CAL blinking
↓			

	Calibration gas flow mode setting (P.5-24)	"FLno."/ Mode No.	AUTO CAL blinking
FUNC ↓	Automatic calibration on/off (enabling or not) (P.5-25)	"A.CAL"/ "ON"or"OFF"	AUTO CAL blinking
FUNC ↓	Key lock on/off (enabling or not) (P.5-18)	"LOC."/ "ON"or"OFF"	
FUNC ↓	(To function mode measuring)		
ZERO	[Measurement mode] Zero calibration	Measuring value/ Measuring range	Zero key indicating light blinking
SPAN	Span calibration	Measuring value/ Measuring range	Span key indi- cating light blinking

NOTES

- When the analyzer operating in set mode, the analog output signal is held at the value just prior the mode change.
- In case of no addition of optional function, the relating parameters of un-added optional function are not displayed.

5.4 MEASUREMENT MODE

The measurement mode consists of three function modes of "Measuring", "Zero calibration", and "Span calibration".

When the analyzer operates in the measurement mode, the indicating light MEAS is lit.

The analyzer operates in the function mode "Measuring" when power switch is turned on.

When the indicating light RMT RANGE is not lit in the measurement mode, high and low measuring ranges are selectable by depressing range selection keys.

The selected range value (max. value of the selected measuring range) is displayed on the sub-display screen.

5.4.1 MEASURING

Concentration reading of the measured component is displayed on the main display screen.

The selected measuring range value is displayed on the sub-display screen.

The measuring unit of concentration display is indicated by the unit indicating lights. (Fig.5.4.1)

When the measuring range is selectable by an external signal, the indicating light RMT RANGE is lit.

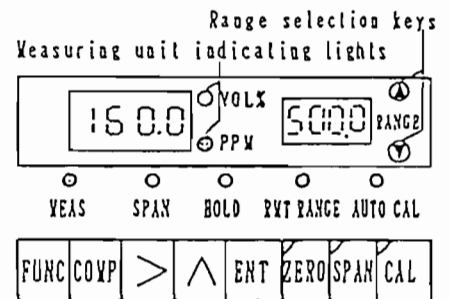


Fig.5.4.1

5.4.2 ZERO CALIBRATION

Depress [ZERO] key.

The ZERO key indicating light at the up-left corner of [ZERO] key blinks and it indicates that the analyzer is ready for zero calibration.

The indicating light HOLD is lit when the holding function is set as ON and the analog output signal is kept constant at the value immediately before [ZERO] key is depressed. (Fig. 5.4.2 a)

If the analyzer with automatic calibration option is used, the output signal for energizing a solenoid valve is turned on and zero gas is introduced into the analyzer.

The zero gas should be introduced into the analyzer manually if the analyzer without automatic calibration option is used.

If the dual ranges analyzer is used, select the range for zero calibration. When displayed concentration reading on the main display screen reaches its final value, depress [CAL] key.

The CAL key indicating light at the up-left corner of [CAL] key is lit and it indicates that the calibration is taking place.

The ZERO key indicating light changes simultaneously from blink to continuous lighting. (Fig. 5.4.2 b)

In the dual components analyzer, zero calibration is performed for both measured components simultaneously.

Lighting interval of the CAL key indicating light is normally very short, but if displayed concentration does not reach it's final value the analyzer waits for a maximum 30 seconds for stabilization of measured value.

If displayed concentration is not stabilized in 30 seconds,

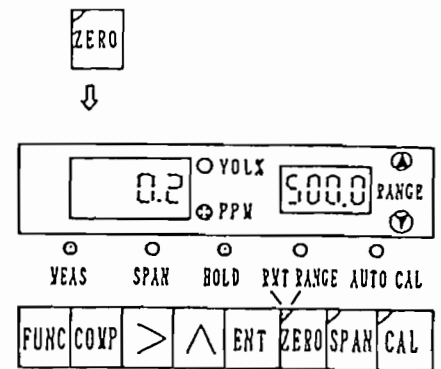


Fig. 5.4.2a

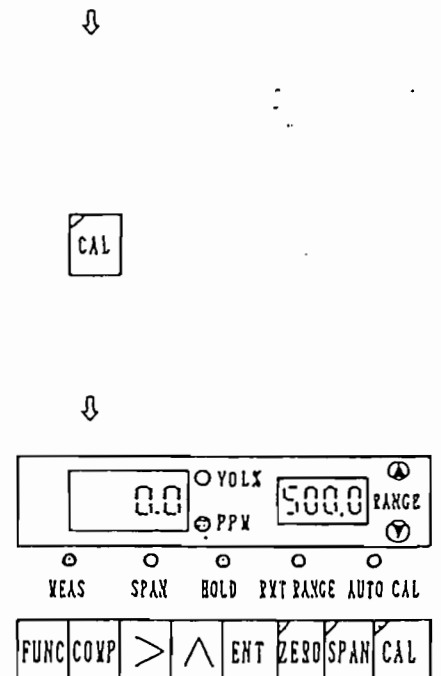


Fig. 5.4.2b

the calibration is cancelled.

After finishing zero calibration, the ZERO key indicating light and the CAL key indicating light are turned off and if the indicating light HOLD was lit, it is also turned off and then return to the function mode "Measuring".

NOTE

If zero calibration should be discontinued after starting, press [ZERO] key again.

The ZERO key indicating light is turned off and the analyzer returns to the function mode "Measuring" without performing zero calibration.

When [ZERO] key is depressed, and the holding function is set as ON, the analog output signal is kept constant at the value immediately before [ZERO] key is depressed.

When the zero calibration ends, the holding function is released. Therefore, before the sample gas is fully introduced into the analyzer, the analyzer transmits an analog signal different from measured component concentration for a short duration.

5.4.3 SPAN CALIBRATION

Concentration of span gas(span value) should be set before getting the analyzer into operation.

If not, span value should be set before calibration.

For this purpose, function mode "Span gas concentration(span value) setting and independent/dependent calibration selection" in set mode, should be selected by depressing [FUNC] key, and span value should be set beforehand. (Refer to 5.5.1, P.5-13)

Depress [SPAN] key.

The SPAN key indicating light at the up-left corner of [SPAN] key blinks and it indicates that the analyzer is ready for span calibration.

The indicating light HOLD is lit when the holding function is set as ON and the analog output signal is kept constant at the value immediately before [SPAN] key is depressed. (Fig. 5.4.3 a)

If the analyzer with automatic calibration option is used, the output signal for energizing a solenoid valve is turned on and span gas is introduced into the analyzer.

Span gas should be introduced into the analyzer manually if the analyzer without automatic calibration option is used.

If the dual components analyzer is used, the main display screen of one component to be calibrated blinks.

The component to be calibrated can be changed by depressing [COMP] key.

Select the correct component.

If the dual ranges analyzer is used, the range for calibration must be selected.

When displayed concentration on the main display screen reaches its final value, depress [CAL] key.

The CAL key indicating light at the up-left corner of [CAL] key is lit and it indicates that the calibration is taking place.

The SPAN key indicating light changes simultaneously from blink to continuous lighting. (Fig. 5.4.3 b)

Lighting interval of the CAL key indicating light is normally very short, but if displayed concentration does not reach it's final value the analyzer waits for a maximum 30 seconds for stabilization of measurement.

If displayed concentration is not stabilized in 30 seconds, the calibration is cancelled.

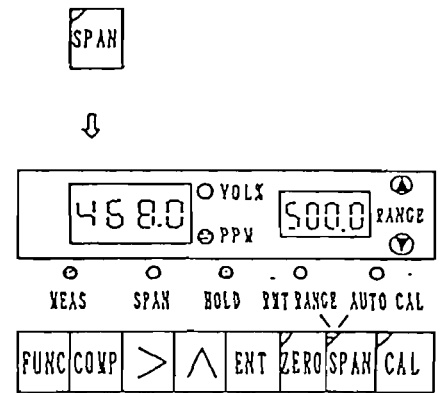


Fig. 5.4.3a

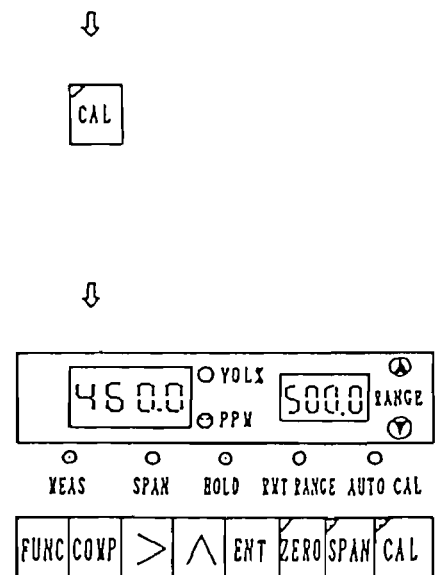


Fig. 5.4.3b

After finishing span calibration, the SPAN key indicating light and the CAL key indicating light are turned off and if the indicating light HOLD was lit, it is also turned off and then return to the function mode "Measuring".

NOTE

If span calibration should be discontinued after starting, press [SPAN] key again. The SPAN key indicating light is turned off and the analyzer returns to the function mode "Measuring" without performing span calibration.

When [SPAN] key is depressed, and the holding function being set as ON, the analog output signal is kept constant at the value immediately before [SPAN] key is depressed.

When span calibration ends, the holding function is released.

Therefore, before the sample gas is fully introduced into the analyzer, the analyzer transmits an analog signal different from measured component concentration for a short duration.

5.4.4 INITIAL CALIBRATION

Before getting the analyzer into operation, zero/span calibration should be completed in each range and for each measured component. Calibration for this purpose is called the initial calibration. Select function mode "Span gas concentration setting and independent/dependent calibration selection".

Set correct span gas concentration and select independent calibration for the dual ranges analyzer. (Refer to 5.5.1, P.5-13)

After finishing up the above-mentioned preparation, return to the function mode "Measuring" by depressing [FUNC] key repeatedly, and perform manual zero and span calibration.

For the dual ranges analyzer, zero and span calibration should be performed in each range independently.

For the dual components analyzer, perform zero calibration and span calibration of each component.

Move to set mode after completion of the initial calibration, and set or review various configuration parameters except span gas concentration setting.

5.5 SET MODE

Set mode is operating mode in which configuration parameters & data of the analyzer is reviewed or set.

This mode consists of following 3 basic function modes;

5.5.1 span gas concentration setting and independent/dependent calibration selection

5.5.2 Hold(Freeze) of analog output signal setting

5.5.4 Key lock ON/OFF setting

For the analyzer with remote range option,

5.5.3 Remote range setting

and further, for the analyzer with automatic calibration option,

5.6.1 Setting of automatic calibration start timer

5.6.2 Setting of automatic calibration cycle time

5.6.3 Setting of calibration gas flowing time duration

5.6.4 Setting of calibration gas flowing mode

5.6.5 Setting of automatic calibration ON/OFF are added.

In set mode the indicating light MEAS is turned off and the analog output signal is kept constant at the value immediately before moving to set mode.

Though many optional functions are included in set mode, parameters and data concerning them are not displayed for the analyzer without a corresponding option.

In the dual components analyzer, there are data and parameters to be set for each measured component.

In the function mode to set or review data and parameters for each component respectively, the main display of the currently selected component blinks.

Depressing [COMP] key, another component is selected and the display on the main display screen of the corresponding component starts blinking. (Fig. 5.5)

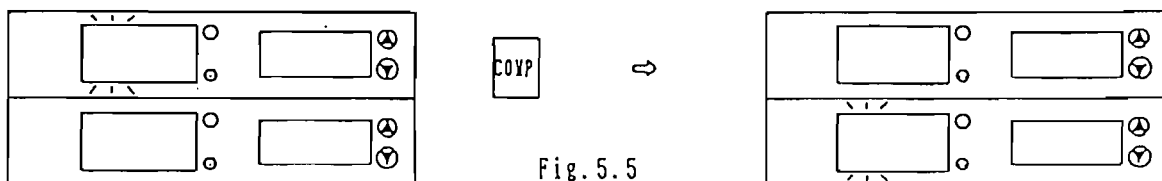


Fig. 5.5

NOTE

Configuration parameters and data are stored in a non-volatile memory in the analyzer and kept while the power is off.

5.5.1 SPAN GAS CONCENTRATION (SPAN VALUE) SETTING AND INDEPENDENT/DEPENDENT CALIBRATION SELECTION

In this function mode, concentration value of span gas and the calibration method for the dual ranges analyzer are set or reviewed. The setting or reviewing procedure of span gas concentration is as follows.

Depress [FUNC] key (repeatedly if necessary) until indicating light SPAN starts blinking.

Blink of the indicating light indicates that the analyzer is functioning in this mode.

Span value currently used is displayed on the main display screen. (Fig. 5.5.1 a)

If the dual ranges analyzer is used, depress range selection keys, the span value for selected range appears on the main display screen.

If the current setting is applicable, move to other function by depressing [FUNC] key or select independent or dependent calibration. (Refer next page)

Follow the procedure described below when span value setting should be changed.

Depress [>] or [^] or [COMP] key. The number of the digit which can be changed blinks on the main display screen. (Fig. 5.5.1b)

Select the measuring range or the component to be changed.

Depress [COMP] key to select the component.

The digit which can be changed shifts according to every depress of [>] key.

In every depression of [^] key, the digit on the screen increases one by one (1, 2 9 → 0).

After setting a new span value for each

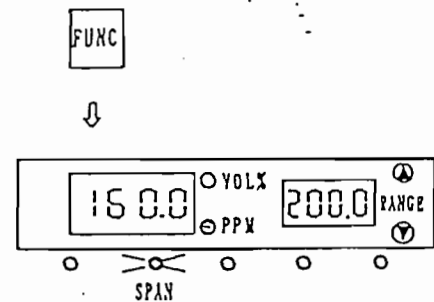


Fig. 5.5.1a

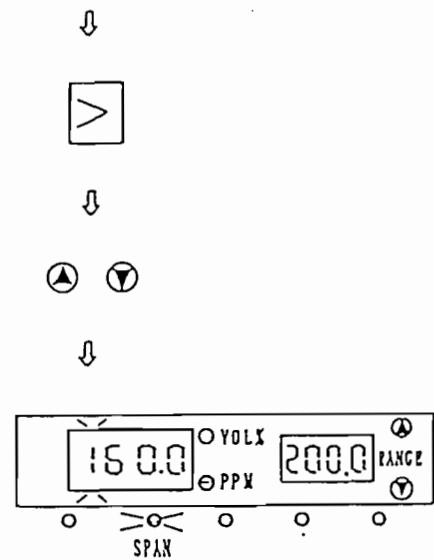


Fig. 5.5.1b

component or for each range, depress [ENT] key to write the new values into the memory.

Blink of the main display screen stops when the new value is stored.

There are two methods of performing calibration for high and low measuring ranges of the dual ranges analyzer.

One is performing calibration independently in each range and the other is performing calibration in one range with dependent calibration calculation for the other range.

In dependent calibration, calibration only in one range is necessary.

The other range is calibrated automatically by calculation.

The dependent calibration is mostly used, but in the initial calibration independent calibration must be chosen.

(Refer to 5.4.4, P.5-11)

Change setting according to the following procedure.

Depress [>] or [^] or [COMP] key.

Displayed value on the main display screen blinks. (Fig. 5.5.1 c)

Depress [CAL] key. Message "S.CAL" appears on the main display screen, and "on" or "off" is displayed on the sub-display screen. "on" denotes dependent calibration and "off" denotes independent calibration. (Fig. 5.5.1d)

When [^] key is depressed, displayed number "on" changes to "off" or vice versa. Depress [ENT] key to store the new parameter into the memory.

Blink of the sub-display screen stops after storing.

High or low range selection does not affect this setting.

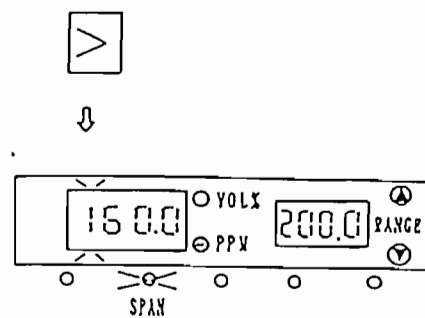


Fig. 5.5.1c

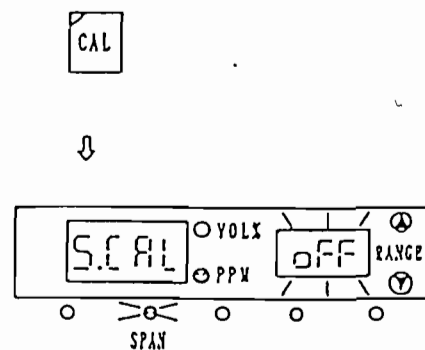


Fig. 5.5.1d

5.5.2 SETTING OF ANALOG OUTPUT SIGNAL HOLDING

This function is to hold the analog output signal at the value immediately before beginning of the calibration.

On the other hand, the displayed value on the main display screen is not held.

Holding can be set for each component respectively in the dual components analyzer.

Depress [FUNC] key repeatedly until message "HoLd" is displayed on the main display screen.

The indicating light HOLD blinks and it indicates that the analyzer is operating in the function mode "Setting of analog output signal holding". Message "on" or "oFF" is displayed on the sub-display screen. (Fig. 5.5.2'a)

"on" denotes that the holding function is effective.

"oFF" denotes that the holding function is ineffective.

Depress [FUNC] key if the current setting is applicable and move to other function mode.

Follow the procedure described below when current setting is to be changed.

Depress [>] or [^] or [COMP] key.

The display on the sub-display screen blinks and it indicates that the setting is ready for change. (Fig. 5.5.2 b)

Choose the component for the dual components analyzer with [COMP] key.

Depress the [^] key, and select either ON or OFF.

After setting a new parameter, depress [ENT] key and store it into the memory.

Blink of the sub-display screen stops when the new parameter is stored.

(Fig. 5.5.2c)

When holding is set as "ON", indicating light HOLD is lit during calibration.

FUNC

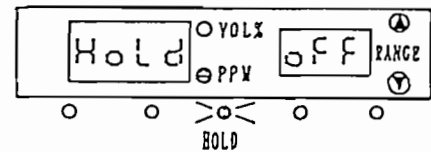


Fig. 5.5.2a

>

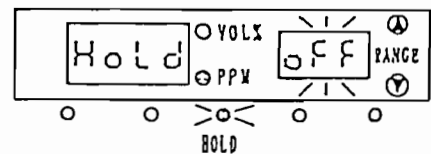


Fig. 5.5.2b

EXT

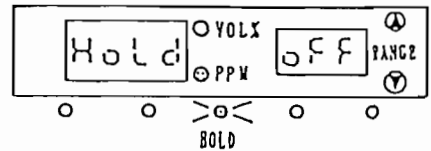


Fig. 5.5.2c

NOTE

When [ZERO] key or [SPAN] key is depressed and calibration is taking place, holding of the analog output signal is effective until the end of calibration.

When calibration ends, the holding function is released. Therefore, before the sample gas is fully introduced into the analyzer, it transmits an analog signal different from measured component concentration for a short duration. On the other hand, in automatic calibration, holding is released after analog output signal representing measured component concentration.

Besides, notwithstanding setting of the holding function ON or OFF, the analog output signal is held while the analyzer is operating in set mode.

5.5.3 SETTING OF REMOTE RANGE(OPTION)

In this function mode, either of 2 ways for selecting measuring ranges of the dual components analyzer can be selected or reviewed. The one is to perform range selection by external signal, the other is to perform it by depressing range selection keys on the front panel of the analyzer.

Depress [FUNC] key repeatedly until message "r.rAG" appears on the main display screen. Message "on" or "oFF" appears on the sub-display screen.

The indicating light RMT RANGE blinks, and it indicates that the analyzer is operating in this function mode.

"on" denotes that measuring ranges are selectable by external signal.

"oFF" denotes that measuring ranges are selectable manually by depressing range selection keys on the front panel of the analyzer.

(Fig. 5.5.3a)

If the current setting is applicable, depress [FUNC] key and move to other function mode.

When the current setting should be changed, follow the procedure described below.

Depress [>] or [^] or [COMP] key, display on the sub-display screen blinks and it indicates that the setting is ready for change.(Fig. 5.5.3b)

By depressing [^] key, change the displayed message from "oFF" to "on"

or vice versa.(Fig. 5.5.3c)

Depress [ENT] key, and store the new parameter into the memory. After the new parameter being stored, display on the sub-display screen stops blinking.(Fig. 5.5.3d)

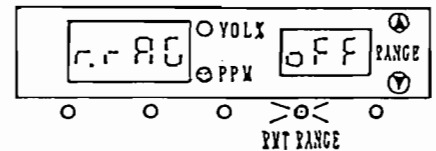


Fig. 5.5.3a

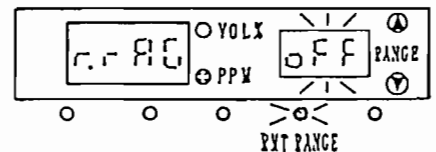
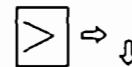


Fig. 5.5.3b

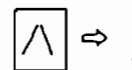


Fig. 5.5.3c

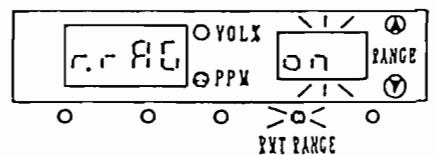
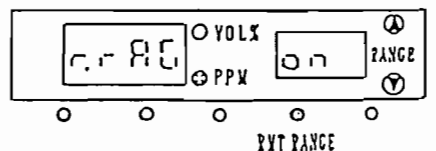


Fig. 5.5.3d



NOTE

If "Remote range" is set as ON the indicating light RMT RANGE is lit & manual range selection is not feasible.

5.5.4 KEY LOCK ON/OFF SETTING

The key lock ON/OFF function intends to protect various settings from careless alteration.

When the key lock is set as ON, all key operations except [FUNC] key becomes invalid, that is, various parameters and data can be reviewed in the state of key lock "on", but the setting cannot be changed.

Set the key lock "oFF" before setting change and manual calibration.

Depress [FUNC] key repeatedly until message "LOC" being displayed on the main display screen.

The current setting "on" or "oFF" is displayed on the sub-display screen.

(Fig. 5.5.4 a)

Follow the procedure described below when the setting should be changed.

Depress [>] or [^] or [COMP] key.

Display on the sub-display screen blinks and it indicates that the setting is ready for change. (Fig. 5.5.4 b)

Depress [^] key and set "on" or "oFF" on the sub-display screen.

(Fig. 5.5.4 c)

After setting a new parameter, depress [ENT] key and store it into the memory.

Blink of the sub-display screen stops when the new parameter is stored.

(Fig. 5.5.4 d)

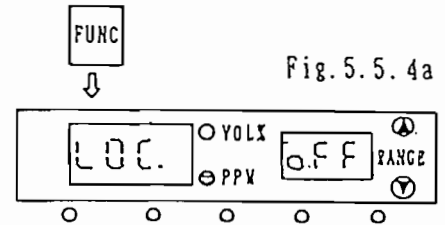


Fig. 5.5.4 a

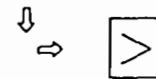


Fig. 5.5.4 b

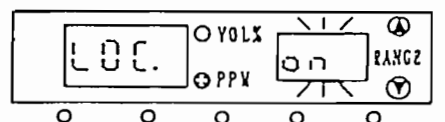
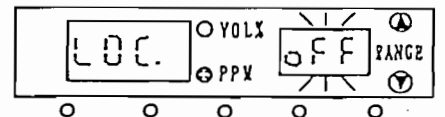


Fig. 5.5.4 c

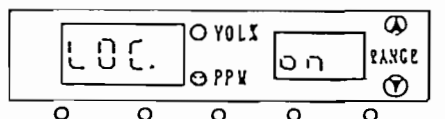


Fig. 5.5.4 d

5.6 AUTOMATIC CALIBRATION (OPTION)

The automatic calibration is performed periodically and also performed at any time by an external start signal (remote start). When automatic calibration starts, the signal outputs for solenoid valves energizing at the automatic calibration input-output terminals turn on in preset sequence.

Zero gas and span gas are introduced into the analyzer in order and calibration of zero points and calibration of span points are automatically performed.

If the dual ranges analyzer is used, automatic calibration must be performed at the measuring range in which span gas is prepared and its concentration (span value) is set beforehand.

Automatic calibration is handled as top priority. When automatic calibration starts, all other functions are interrupted.

All key operations and an external range selection signal become invalid while the automatic calibration is taking place.

NOTE

The automatic calibration initiated by an external signal (remotely started automatic calibration) handled with more priority than the periodic automatic calibration.

Periodic automatic calibration does not start at its starting time if the automatic calibration due to a remote start signal is being performed.

Moreover, when a remote start signal is given during periodic automatic calibration, the automatic calibration is interrupted and the automatic calibration initiated by the remote start signal starts.

Even if the setting of automatic calibration ON/OFF is OFF, automatic calibration due to remote signal can be performed.

The DC voltage signal to be given to the remote start signal input terminal should be 5V and longer than 100msec. in duration.

To decide how automatic calibration operates, the following parameters should be set properly.

- Setting of automatic calibration start timer (5.6.1)
- Setting of automatic calibration cycle time (5.6.2)
- Setting of calibration gas flowing time (5.6.3)
- Setting of calibration gas flowing mode (5.6.4)
- Setting of automatic calibration ON/OFF (5.6.5)

If an automatic calibration should be interrupted after it's starting, [ENT] key and [CAL] key must be simultaneously depressed. The automatic calibration is discontinued and the analyzer returns to operate in the function mode "Measuring".

If an error occurs during automatic calibration, a contact signal is transmitted from the automatic calibration input-output terminal. The corresponding error code is displayed on the sub-display screen. (Refer to P.7-13)

The calibration is not performed for the calibration gas in which error occurs and it moves to the introduction of the following calibration gas or sample gas determined in the calibration program. Fig.5.6.1 is a timing chart of typical automatic calibration.

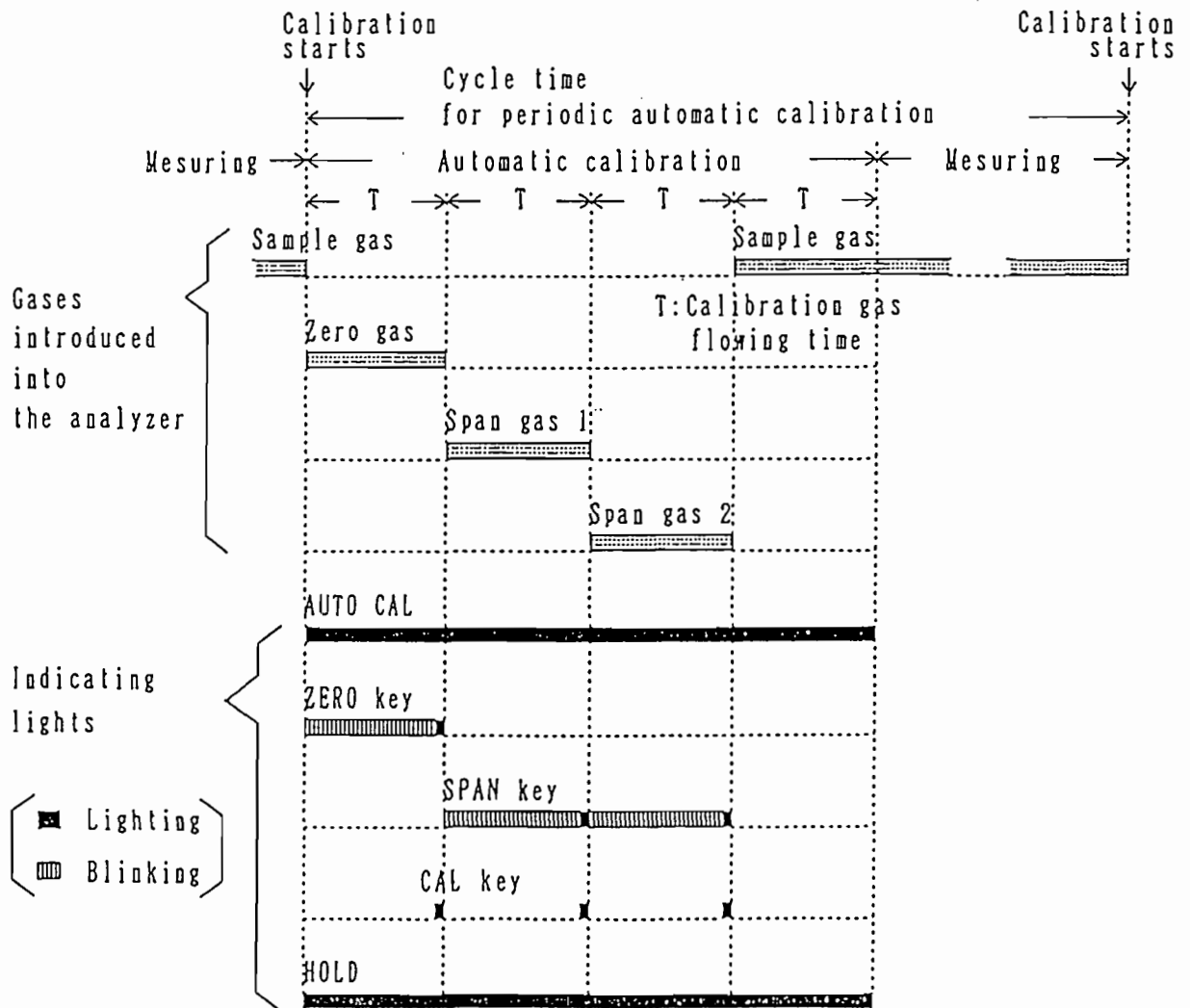


Fig.5.6.1 Timing chart of an automatic calibration

5.6.1 SETTING OF AUTOMATIC CALIBRATION START TIMER

The start timer sets starting time of the next periodic automatic calibration.

The next periodic automatic calibration begins after time set in the start timer elapsed.

This setting should be renewed at the new installation or if the time at which the periodic automatic calibration is performed deviates from desirable range because of interruption of power supply etc.

Depress [FUNC] key repeatedly until message "Strt" appears on the main display screen. The indicating light AUTO CAL blinks and the time until the next periodic automatic calibration is displayed on the sub-display screen in counting down mode. (Fig.5.6.2a)

If the current setting is applicable, depress [FUNC] key and move to other function mode.

When the start time should be changed, follow the procedure described below. Depress [>] or [^] or [COMP] key.

The display on the sub-display screen blinks and it indicates that the setting is ready for change. (Fig.5.6.2b)

The first digit below decimal point means time in 10 minutes.

Numbers upper than decimal point mean time in hours.

Depress [>] key and choose the digit to be changed.

The display of the chosen digit blinks.

Depress [^] key and change the number.

The time can be set from 10 minutes to 199 hours in 10 minutes step.

After setting, depress [ENT] key and store the new start time into the memory.

Time until the next periodic automatic calibration is displayed in counting down mode on the sub-display screen after [ENT] key depressed. (Fig.5.6.2c)

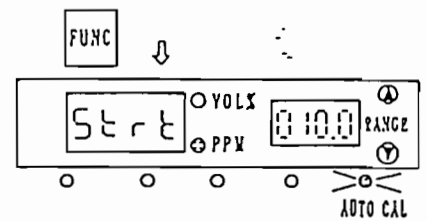


Fig. 5.6.2a

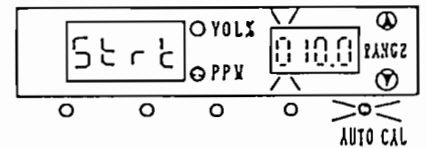


Fig. 5.6.2b

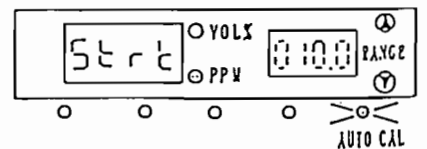


Fig. 5.6.2c

NOTE

Time until the next periodic automatic calibration is displayed on the sub-display screen either the setting of automatic calibration ON/OFF is ON or OFF.

But, the periodic automatic calibration is not performed if the automatic calibration ON/OFF is set as OFF .

5.6.2 SETTING OF AUTOMATIC CALIBRATION CYCLE TIME

In this function mode, The time interval that the periodic automatic calibration is performed is reviewed or set.

The time interval can be set 1 to 199 hours in one hour step.

Depress [FUNC] key repeatedly until message "CyCL" appears on the main display screen.

The indicating light AUTO CAL blinks.

The automatic calibration cycle time currently set is displayed on the sub-display screen.(Fig.5.6.3a)

Depress [FUNC] key and move to other function mode if the current setting is applicable.

If the setting value should be changed, follow the procedure described below.

Depress [>] or [^] or [COMP] key.

The most significant digit on the sub-display screen blinks. It indicates that the setting is ready for change.

(Fig.5.6.3b)

Choose the digit to be changed by depressing [>] key. The display of the chosen digit blinks

Depressing [^] key, the digit chosen increases one by one.(Fig.5.6.3c)

After setting, Depress [ENT] key and store the new cycle time into the memory.(Fig.5.6.3d)

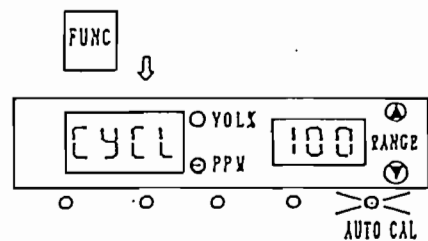


Fig. 5.6.3a

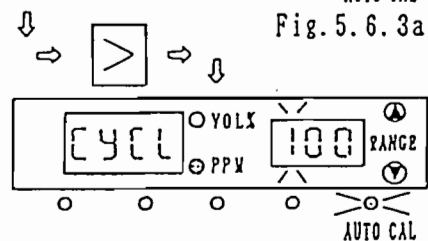


Fig. 5.6.3b

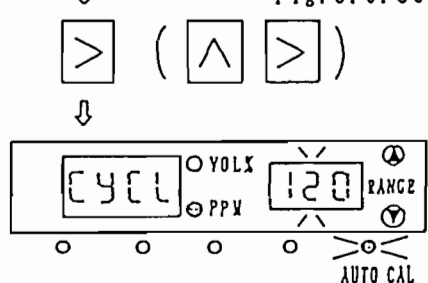


Fig. 5.6.3c

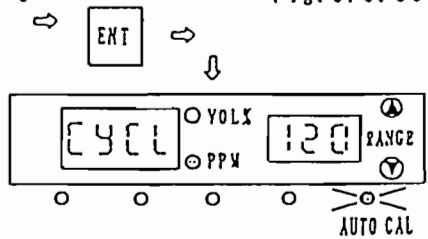


Fig. 5.6.3d

5.6.3 SETTING OF REFERENCE GAS FLOWING TIME

The gas flowing time should cover the time necessary for complete substitution of gas inside the analyzer from sample gas to calibration gas or vice versa and the concentration reading reaching to it's final value.

The time can be set from 100 to 599 seconds in one second step. Depress [FUNC] key repeatedly until message "F.SEC" appears on the main display screen.

The indicating light AUTO CAL blinks, and the calibration gas flowing time currently set is displayed on the sub-display screen. (Fig.5.6.4a)

If the current setting is applicable, depress [FUNC] key and move to other function mode.

If it is to be changed, depress [>] or [^] or [COMP] key, the analyzer becomes the state that the setting is ready for change.

Depress [>] key to choose the digit to be changed. The display of the chosen digit blinks.

Depress [^] key and change the digit. (Fig.5.6.4b)

After setting, store the new calibration gas flowing time by depressing [ENT] key. (Fig.5.6.4c)

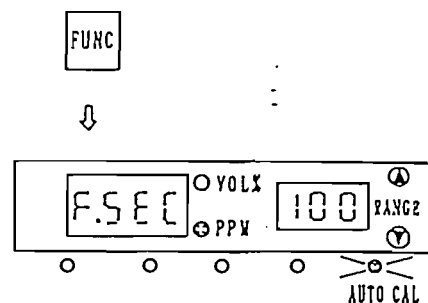


Fig. 5.6.4a

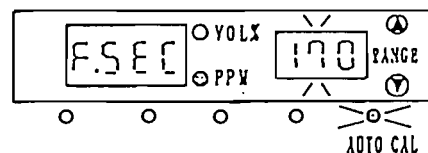


Fig. 5.6.4b

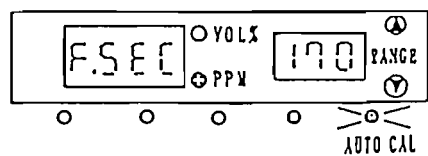


Fig. 5.6.4c

5.6.4 SETTING OF CALIBRATION GAS FLOWING MODE

In this function mode the calibration gases to be introduced into the analyzer and their order of introduction are set.

Depress [FUNC] key repeatedly until message "FLno." appears on the main display screen.

The indicating light AUTO CAL blinks. The number from 0 to 3 which indicates the flowing mode currently set is displayed on the sub-display screen.

(Fig.5.6.5a)

These numbers correspond to flowing modes as follows.

No.0:Zero gas

No.1:Zero gas-The span gas for the first component

No.2:Zero gas-The span gas for the second component

No.3:Zero gas-The span gas for the first component-the span gas for the second component

NOTE

Choose mode number 1 when zero and span automatic calibration is to be performed in single components analyzer.

Depress [FUNC] key and move to other function mode, if the current setting is applicable.

If setting should be changed, follow the procedure described below.

Depress [>] or [^] or [COMP] key, the analyzer becomes the state that the setting is ready for change.

Depress [^] key and change the mode number.(Fig.5.6.5b)

Store the new mode number by depressing [ENT] key.(Fig.5.6.5c).

FUNC

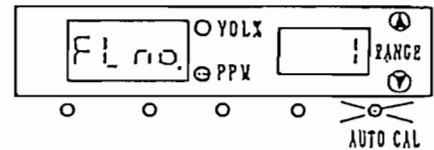


Fig. 5. 6. 5a



[>] ([^] :)

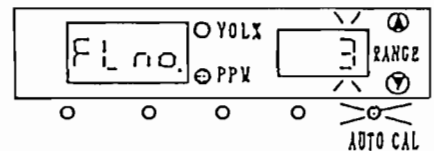


Fig. 5. 6. 5b



ENT

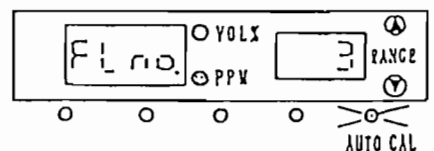


Fig. 5. 6. 5c

5.6.5 SETTING OF AUTOMATIC CALIBRATION ON/OFF

This setting is to choose either the periodic automatic calibration is performed or not.

When periodic automatic calibration is to be performed, it should be set as ON and when not, it should be set as OFF.

Periodic automatic calibration is not performed if it is set as OFF. However, the remote start automatic calibration is possible in spite of setting as OFF.

Depress [FUNC] key repeatedly until message "A.CAL" appears on the main display screen.

The indicating light AUTO CAL blinks and "on" or "off" currently set is displayed on the sub-display screen. (Fig.5.6.6a)

Depress [FUNC] key and move to other function mode if the current setting is applicable.

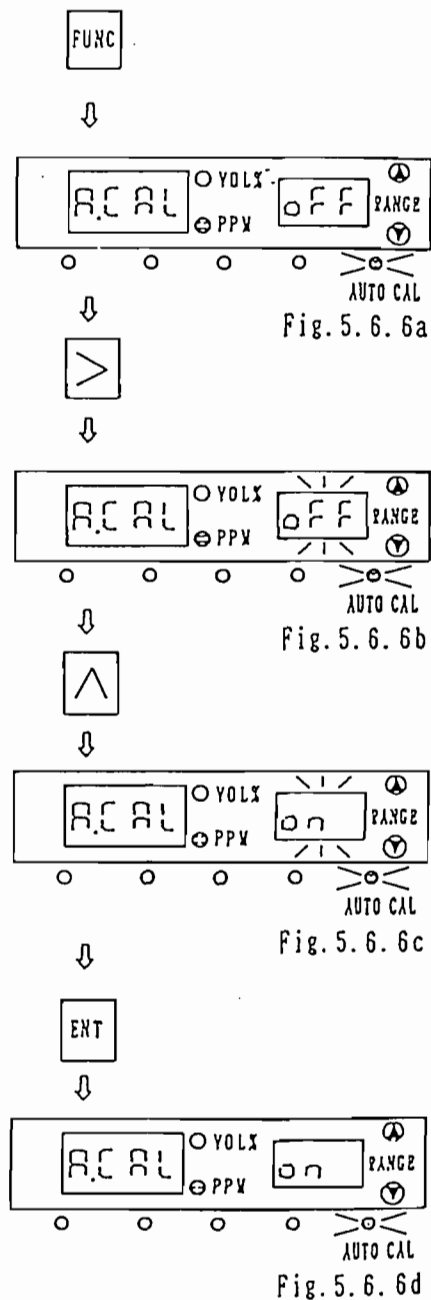
Follow the procedure described below if the current setting should be changed.

Message "on" or "off" on the sub-display screen blinks when [>] or [^] or [COMP] key is depressed and it indicates that the setting is ready for change.

(Fig.5.6.6b)

Depress [^] key and change the setting

Depress [ENT] key and store the new setting. (Fig.5.6.6d)



6. MAINTENANCE

WARNINGS

- Dangerous voltages are present inside the instrument assembly.
- Be careful with the gas leakage, especially in case of toxic gas.

To ensure normal operation of analyzer, carry out daily, weekly and yearly checks & maintenance according to the following table.

Points of daily check

Check points	Troubles	Causes	Adjustments
Digital display of concentration	Large indicating error	1) Dust is contained in measuring cell	1) Clean the cell. Check sampling systems, especially gas filter.
		2) Leaking of air into sampling piping.	2) Find leaking part & repair.
Flow rate of sample gas & purge gas (in case of interior purging)	Deviating from allowable range 0.5~1.5 l/min.		Adjust flow rate.
Dust filter (membrane filter)	Severe contamination	Breakage of primary filter etc.	1) Replace primary filter. 2) Replace membrane filter.

Points of weekly check

Analyzer zero point	Zero shift		Carry out calibration of zero point
Analyzer span point	Span shift		Carry out calibration of span point

Point of yearly check

Analyzer		Preventive maintenance	Overhaul analyzer
----------	--	------------------------	-------------------

6.1 MEASURING CELL CLEANING

When measuring cell inside is contaminated by dust or mist, a drift of measured value may be caused.

Clean the interior of the measuring cell if contaminated. At the same-time, check sampling system devices, especially filter, in order to eliminate any cause of contamination of cell interior by dust & mist.

6.1.1 HOW TO DISASSEMBLE AND REASSEMBLE MEASURING CELL

There are 2 types of measuring cell, one is a block cell (cell lengths: 4mm, 8mm, 16mm & 32mm) and the other is a pipe cell (cell lengths: 64mm, 125mm & 250mm). In case of a dual components analyzer, there is a combination cell type, which is composed of both types of cells in the optical system. For this type, disassemble pipe cell first then the block cell. (refer to Fig. 6.3)

(1) How to disassemble pipe cell (refer to Fig. 6.1)

- a. Shut sample gas flow down. When toxic gas is contained, purge measuring cell interior with zero gas sufficiently.
- b. Turn power switch off.
- c. Loosen 2 fixing screws of the front panel and draw out the inner part until stopped by stoppers inside the case. When complete drawing-out of the inner part from the case is needed, hold the front panel up and draw it out beyond stop carefully.
- d. Detach piping connection to the measuring cell.
- e. Displace the infrared source unit (No. 5 in Fig. 6.1) by loosening

- 2 fixing screws(No.1 in Fig. 6.1) to base plate so as to make a gap between pipe cell(No.12 in Fig.6.1) and IR source unit.
- f. Loosen and detach 4 screws(No.7 in Fig.6.1) of the cell holders (No.11 in Fig. 6.1).
 - g. Remove the cell from measuring unit then detach both windows (No.14 Fig. 6.1) by rotating the window holders anticlockwise.
 - h. A window plate made of calcium-fluoride is fixed to the window holder and reflector plate inside cell is fixed to cell wall, therefore both are unremovable.
 - i. Proceed reassembling in reverse to disassembling procedures. In reassembly, make a space of approx. 0.5 mm both between infra-red source unit & cell and between cell & detector.

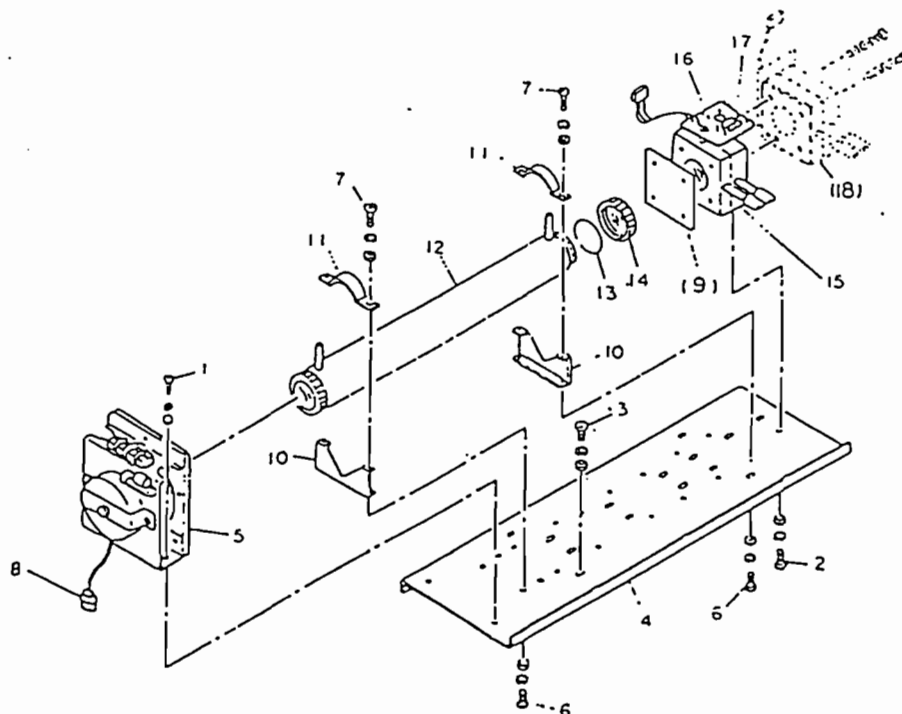


Fig. 6.1 Exploded view of measuring unit
(Pipe cell)

- | | |
|---|--------------------------------------|
| 1. Screw(for infrared source unit fixing) | 10. Support |
| 2. Screw(for detector fixing) | 11. Holder |
| 3. Screw(for base plate fixing) | 12. Pipe cell |
| 4. Base plate | 13. O-ring |
| 5. Infrared source unit | 14. Window |
| 6. Screw(for support fixing) | 15. Detector |
| 7. Screw(for holder fixing) | 16. Bridge cct. board |
| 8. Connector for chopper motor | 17. Bridge resistor |
| 9. [Filter(provided if necessary)] | 18. [Detector for the 2nd component] |

- (2) How to disassemble block cell(refer to Fig.6.2 next page)
- a. Proceed the same procedures described in a.~d. of (1)how to disassemble pipe cell.
 - e. Remove connector a of detector output cord from p.c.b..
In case of the dual components analyzer, remove connector of output cord of the 2nd component detector(No.13 in Fig.6.2) from the 2nd component printed cct. board, then remove the 2nd component detector by loosening 2 screws(No.14 in Fig.6.2).
 - f. Loosen 2 screws(No.10 in Fig.6.2), with which the detector and the infrared source unit are mounted together, then remove the detector from the measuring unit.
In this removal, the cell is also removed together with detector.
 - g. Remove the cell from the detector by loosening 2 fixing screws (No.6 in Fig.6.2).
A window(No.8 in Fig.6.2) on one side of block cell is not fixed but only inserted between detector and block cell, therefore hold the detector upside while disassembling not so as to drop the window down.
 - h. Proceed reassembling in reverse to disassembling procedures.
Locate an O-ring between the window holder and detector.
Be sure not to mislocate the O-ring.
For the dual components analyzer, the 2nd component detector should be assembled after finishing assemble of the 1st component detector.
Make sure not to make space between 1st and 2nd detectors.
Also, make sure that 2 connectors of detector output cord are connected properly to the 1st and 2nd component printed cct. boards.

CAUTION

The window on one side of block cell is not fixed. Be careful not to break it by careless falling down.(Refer to (2)g)

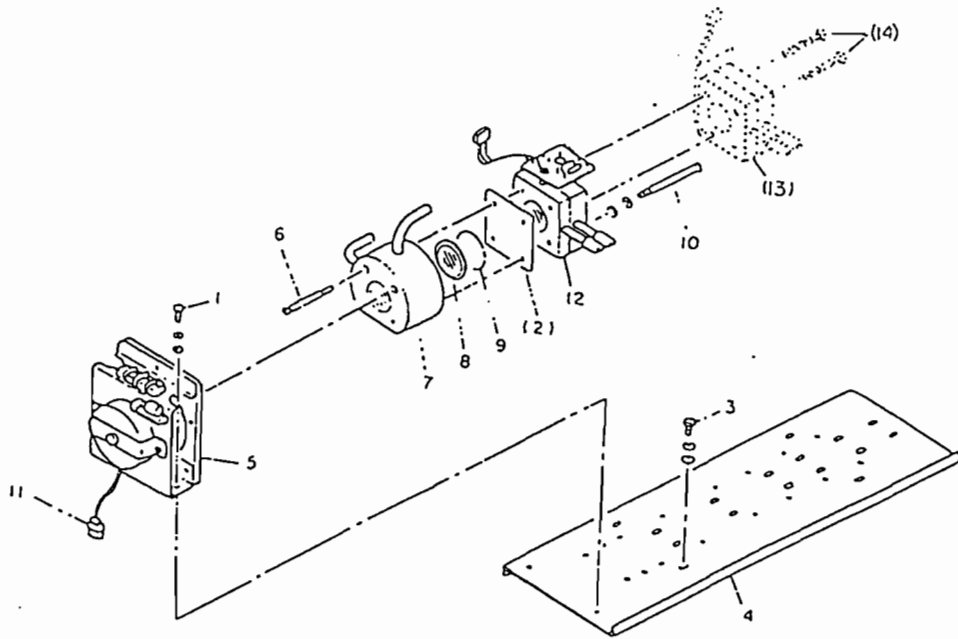


Fig. 6.2 Exploded view of measuring unit
(Block cell)

- | | |
|---|---|
| 1. Screw(for infrared source unit fixing) | 8. Window |
| 2. [Filter(provided if necessary)] | 9. O-ring |
| 3. Screw(for base plate fixing) | 10. Screw(for detector fixing) |
| 4. Base plate | 11. Connector of chopper motor |
| 5. Infrared source unit | 12. Detector |
| 6. Screw(for block cell fixing) | 13. [Detector for the 2nd component] |
| 7. Block cell | 14. [Screw(for the 2nd component
detector fixing)] |

- (3) How to disassemble combination cell: (Refer to Fig.6.3 next page)
- a. Proceed the same procedures described in a.~d. of (1) how to disassemble pipe cell.
 - e. Remove connectors of output cord of detector from printed cct. boards.
 - f. Remove both wiring to 2 pin terminals of the infrared source unit and 2 pin connectors(No.19 in Fig.6.3) of the chopper motor.
 - g. Remove 4 screws(No.20 in Fig.6-3) for fixing the base plate(No.3 in Fig.6.3) and take out the measuring unit.

CAUTIONS

- Do not give any rough handling to both pipings of detector and infrared source unit during disassembling & reassembling measuring cell. Pipe deforming may lead to irregular action due to leakage of sealed gas.
- Window(No.7 in Fig.6-3) on one side of block cell is not fixed, therefore, care not to break it by falling down.

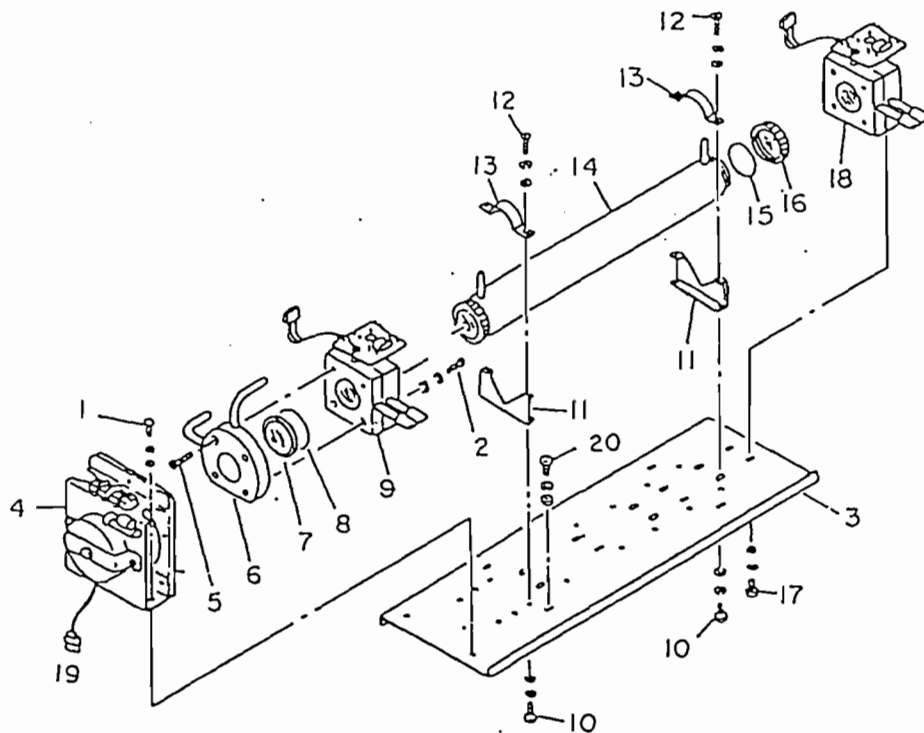


Fig.6.3 Exploded view of measuring unit
(Combination cell)

- | | |
|--------------------------------------|----------------------------------|
| 1. Screw(for infrared source fixing) | 11. Support |
| 2. Screw(for detector fixing) | 12. Screw(for holder fixing) |
| 3. Base plate | 13. Holder |
| 4. Infrared source unit | 14. Pipe cell |
| 5. Screw(for block cell fixing) | 15. O-ring |
| 6. Block cell | 16. Window |
| 7. Window | 17. Screw(for detector fixing) |
| 8. O-ring | 18. Detector |
| 9. Detector | 19. Connector of chopper motor |
| 10. Screw(for support fixing) | 20. Screw(for base plate fixing) |

CAUTIONS

- Be careful to handle cell windows as it is very fragile and easily scratched on surface.
- Be careful not to make scratch or crack on cell interior because it is utilized as optical reflection mirror face.

(1) At cleaning of cell inside and infrared ray window, firstly wipe out with soft brush etc. for rather big particles of dust, then with soft cloth lightly.

Do not use hard cloth for cleaning.

(2) In case of a heavily dirty window, clean it with alcohol or acetone moistened soft cloth.

(3) If a window were lightly corroded, remove corrosion by rubbing with chromium oxide powder on soft cloth.

However, if heavily corroded, replace it with a new one.

(4) After cleaning of cell and window, reassemble them according to disassembling & reassembling procedures of cell.

Connect piping tightly so as not to leak during operation.

Also, be sure to connect piping rightly without forced bent portion.

7. TROUBLE-SHOOTING

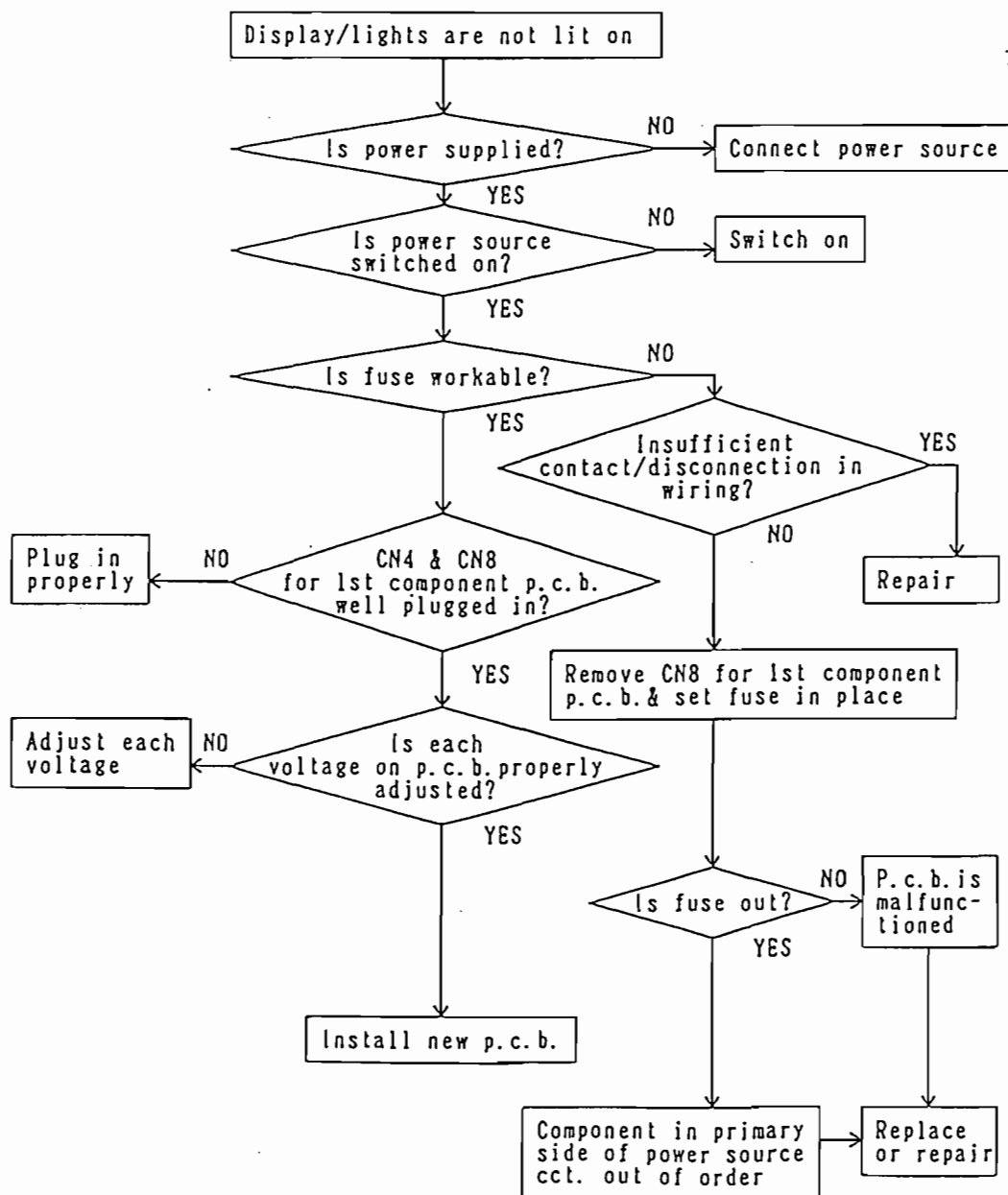
WARNINGS

- Dangerous voltages are present inside the analyzer.
- Be careful for gas leakage, especially for toxic gas.

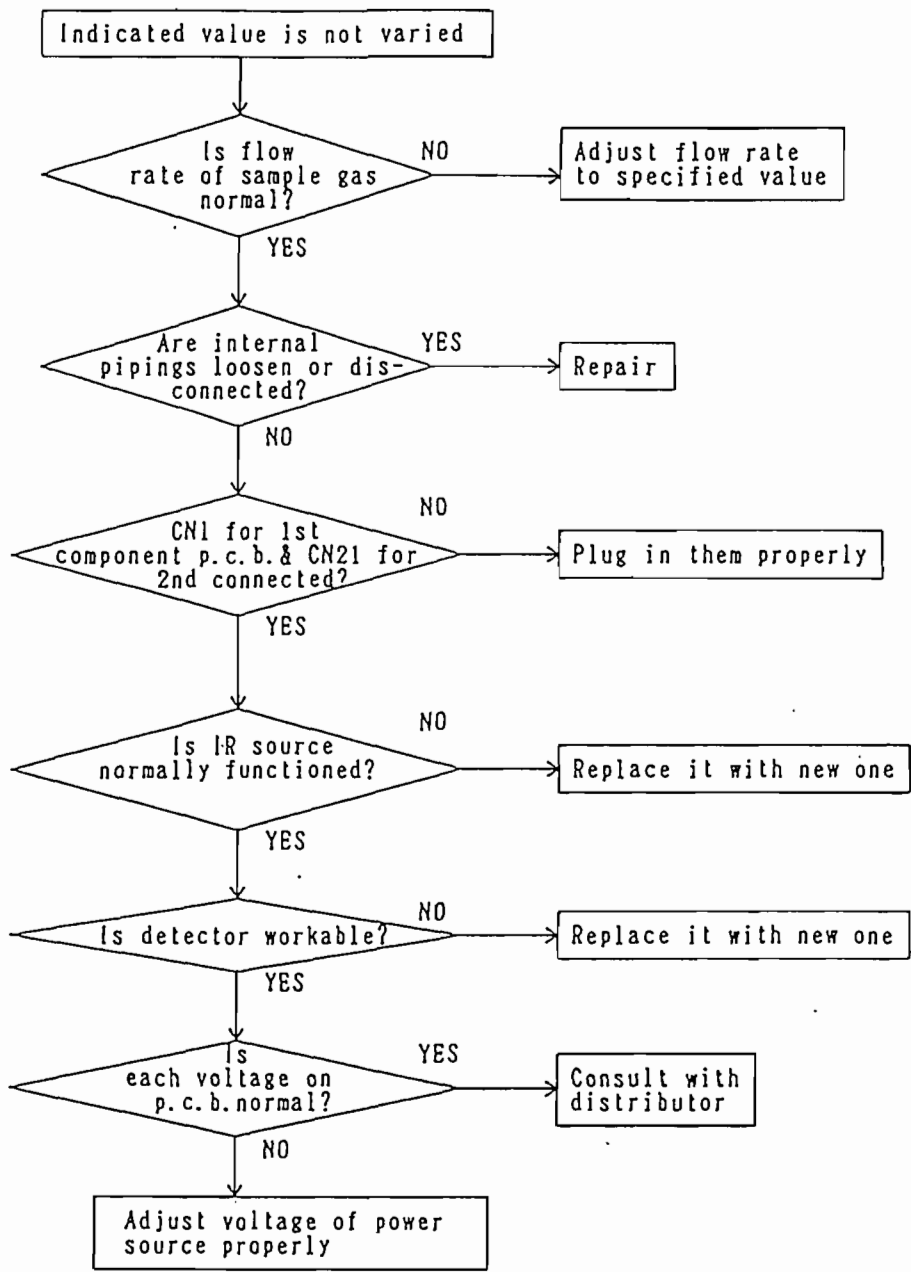
7.1 TROUBLE-SHOOTING

Proceed trouble shootings according to flow-charts in this paragraph and referring to Fig.7.1 on page 7-6.

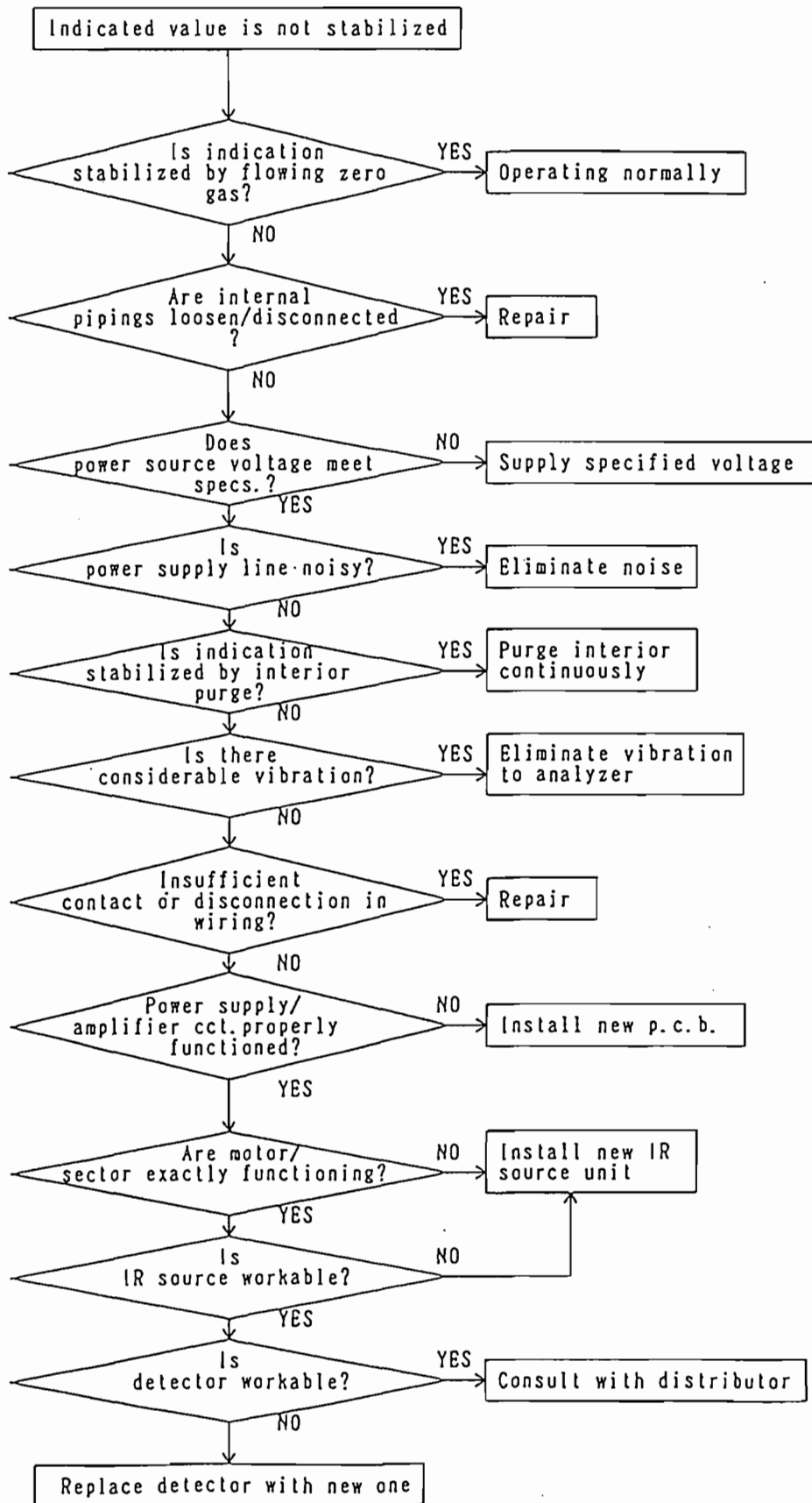
7.1.1 DISPLAY OR INDICATING LIGHTS ARE NOT LIT ON



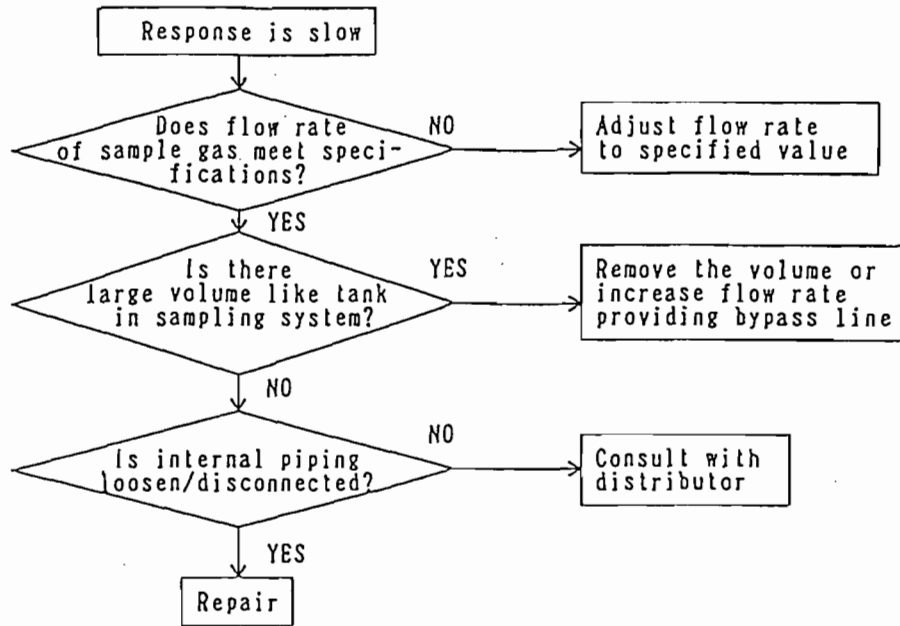
7.1.2 INDICATED VALUE IS NOT VARIED



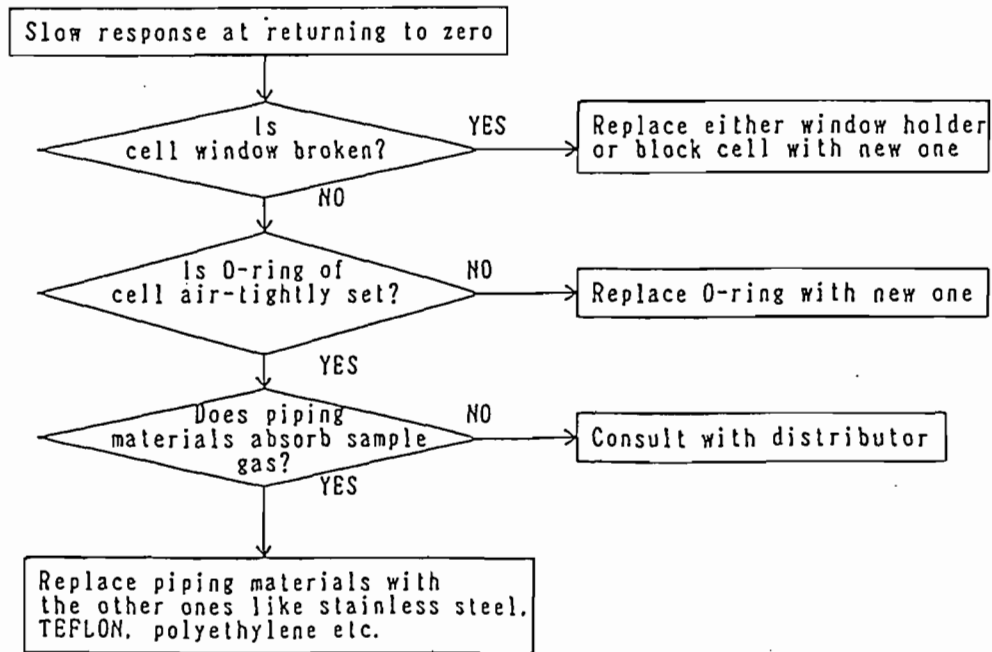
7.1.3 INDICATED VALUE IS NOT STABILIZED



7.1.4 RESPONSE IS SLOW

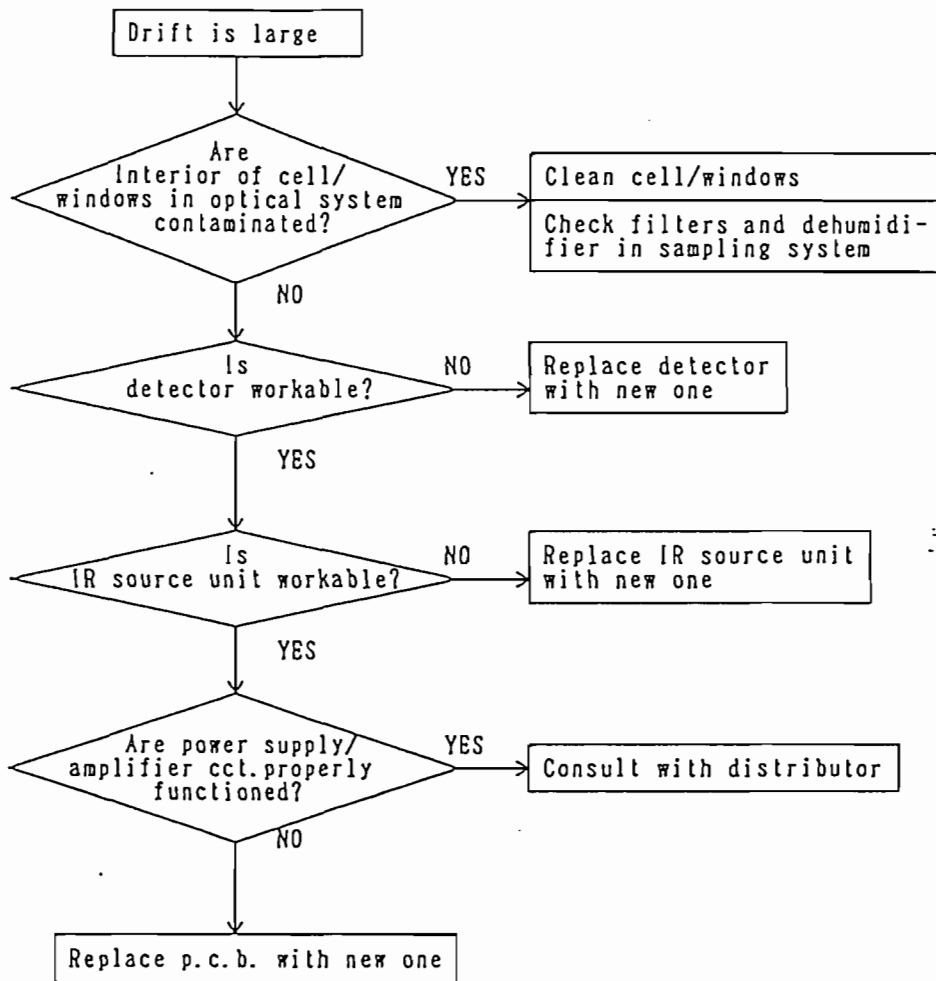


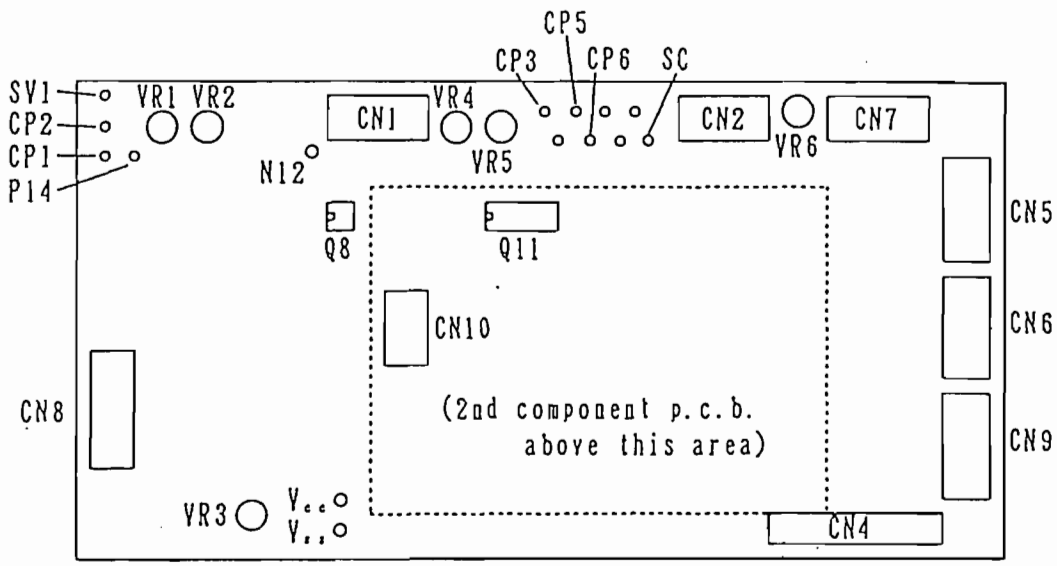
7.1.5 RESPONSE IS SLOW AT RETURNING TO ZERO



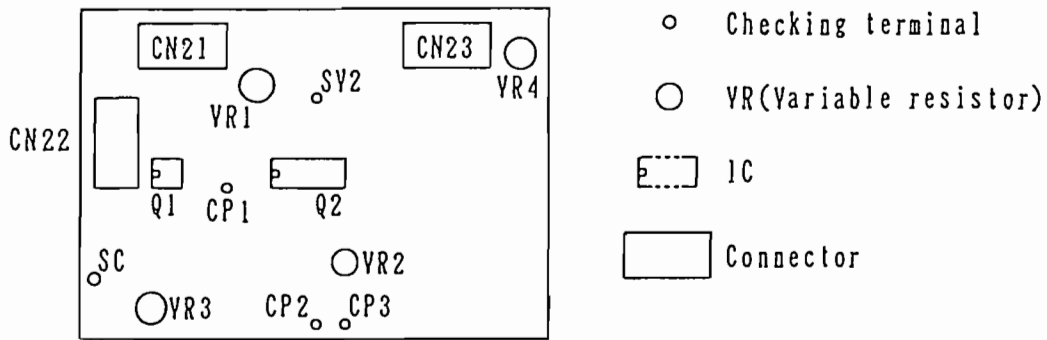
NOTE: TEFLON is a registered trade name of DuPont Inc.

7.1.6 LARGE DRIFT





1st component p.c.b.



2nd component p.c.b.

Fig.7.1 Parts lay out on p.c.bs.

7.2 CHECKING AND REPAIRING

7.2.1 DETECTOR(No.15 IN FIG. 6-1)

Symptom: Zero adjustment not feasible

Causes of trouble: Breakage of mass-flow sensor or
trouble of bridge resistances or
leakage of detector sealed gas.

- Checking:
- a) There are approx. 1.5V~2V DC voltages on between 1 & 3 and 2 & 3 terminals of bridge p.c.b. of detector (No.16 in Fig.6-1) and when the differences between both voltages are within 0.1V, the mass-flow sensor and bridge resistors (No.17 in Fig.6.1) operate properly.
 - b) Connect a synchroscope between CP6 & SC check terminals on the 1st component p.c.b..
When AC waveform(8¹/, or 10 HZ) at the check terminals is not observed although a) above is correct and the IR source unit & chopper operate properly, leakage of detector sealed gas is most probable.(Refer to 7.2.6(2))
Regarding checking of the 2nd component, proceed checking between CP2 & SC check terminals of the 2nd component p.c.b.. Checking procedures are the same with those of the 1st component.
 - c) When measured voltages are abnormal in checking a), switch off power source and remove both connector of detector & bridge resistors, then check resistance of mass-flow sensor.
Measure resistance value both between 1 & 3 and 2 & 3 terminals on bridge p.c.b.. When measured resistance ranges between 25 to 50 Ω , mass-flow sensor is in normal condition and bridge resistor may be damaged.
If resistance values are infinite, mass-flow sensor is broken.

Replacement

- of detector:
- a) Replace detector with a new one by referring to 6.1.
In case of pipe cell, replace the detector after removal of the measuring unit because it is fixed by screws on the under side of the base plate.

- b) After replacing the detector, adjust voltage between SV1 & SC terminals on the 1st component p.c.b. to specified detector voltage through VR2, and for the 2nd component, adjust voltage between SV2 & SC on the 2nd component p.c.b. through VR1 in the same manner as the 1st component.
- c) Proceed both zero & span adjustment.

7.2.2 INFRARED SOURCE UNIT(No.1 IN FIG.6.1)

Symptom: Indicated value exceeds it's range value or output signal is unstable.

Causes of trouble: Breakage of infrared source and/or leakage of infrared source unit sealed gas.

- Checking:
- a) Switch off power source and measure resistance between 2-pin terminals after removal of lead wires from 2-pin terminal block. The normal resistance value is $37 \pm 3 \Omega$. When infrared source is broken, the resistance value is extremely high.
Increase of resistance make output drift towards plus side.
 - b) Although both detector & amplifier p.c.b. are properly operating, if IR source unit sealed gas leaks, atmosphere may influence the output signal to drift.
Keep in mind, however, that atmospheric CO₂ existing in air gaps of the measuring unit may cause the output signal of low-concentration CO₂ analyzer to drift. in this case interior purge of the analyzer is the right solution.

- Replacement:
- a) Remove both wiring of 2-pin terminals and disconnect of the unit motor connector and then remove 2 fixing screws of the infrared source unit to base plate.
Carry out replacement by referring to Fig.6.1 or Fig.6.2..
 - b) After replacement, carry out both zero & span adjustment.

7.2.3 CHOPPER

Symptom: Unstable output signal and/or indicated value exceeds it's range value

Cause of trouble: Irregular rotation

Checking: a) Listen to note if a hitting noise of chopper blade on other components occurs when the power is switched on. If the hitting noise is emitted, take out the infrared source unit and remove the enclosure. Then adjust position of the chopper blade carefully so as not to touch other components. Be sure not to damage the chopper blade because it is made of very thin plate.

If the analyzer is operating properly, do not make any adjustment on the chopper blade.

- b) In case the motor does not start in spite of the power being switched on, disconnect motor power supply cord and check whether the specified power source voltage is supplied. When the motor does not rotate despite the right power source voltage supplied, check if the motor shaft or other motor parts might be touching other components. If the motor does not rotate even without any touching, the motor is out of order.

Replacement: Replace the whole infrared source unit with motor assembly with a new one.

Refer to 7.2.2

7.2.4 WINDOWS OF MEASURING CELL, DETECTOR & INFRARED SOURCE UNIT

Symptom: Zero adjustment is not feasible because of excess plus-sided drift.

Causes of trouble: Cell & windows are heavily contaminated.

Checking: After removing the cell, check whether cell and all windows are contaminated or not.

When contaminated, clean them by wiping with alcohol moistened soft cloth.

Be sure to handle windows carefully because they are easily damaged. Refer details to 6.2.

7.2.5 PIPING

Symptom: Unstable output signal and/or slow response

Causes of trouble: Loosening, disconnecting, contaminating & clogging

Checking: a) Proceed tight and firm repiping when piping is loosen or disconnected.
b) When inside piping is contaminated or clogged, remove contaminant inside then blow out them with compressed air.

7.2.6 PRINTED CCT. BOARD OF THE 1ST COMPONENT

Replacement of printed cct. board of the 1st component is needed when it is judged to be not functional through the following checkings.

(1) Power supply circuits

Checking: a) Secondary voltage of transformer
The output voltages of secondary windings of transformer are approx.AC 18V, approx.AC 17V, approx.AC 8V and aprox.AC 100V respectively.

b) Positive 14V power supply voltage
Proceed checking using P14 & SC check terminals.
The right voltage is DC $14V \pm 0.05V$.
(Adjustable through VR1. However, be very careful not to exceed the specified voltage.)

c) Positive 5V power supply voltage
Proceed checking using V_{cc} & V₊ check terminals.
The right voltage is DC $5V \pm 0.1V$.
(Adjust the voltage with VR3.)

d) Negative 12V power supply voltage
Proceed checking using N12 & SC check terminals.
The right voltage is DC $-12V \pm 1V$.

e) Negative 5V power supply voltage
Proceed checking using CP1 & SC check terminals.
The right voltage is DC $-5V \pm 0.5V$.

f) Detector voltage

Check the voltage using SV1 & SC check terminals.
The right voltage is written on the detector body.
(Adjust the voltage with VR2.)

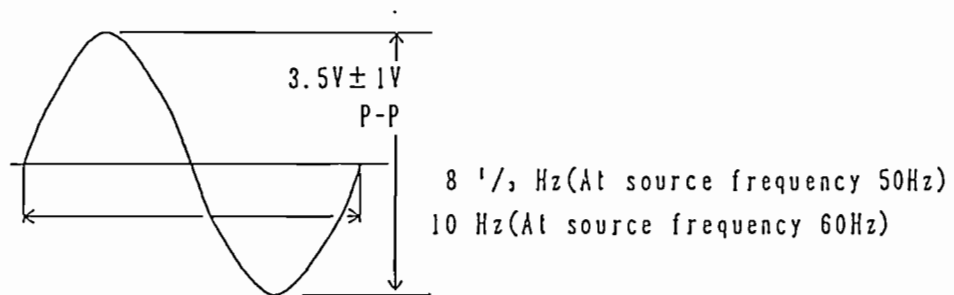
(2) Amplifier circuits

Check amplifier cct. after making sure that the power supply circuits function properly.

Checking: AC amplifier circuits

a) Check AC waveform with a synchroscope connected between CP6 & SC check terminals.

Amplitude of waveform is adjusted to be approx. $3.5 \pm 1V$ -p-p by VR4 while zero gas introduced.



- b) In case when AC waveform can not be observed in a) above, check AC wave form between CP5 & SC check terminals. When $8 \frac{1}{3}$, or 10 Hz AC waveform is observed, AC amplifier Q8 operates properly, and in this case, Q11 amplifier or VR4 is defective.
- c) In case when AC waveform is not observed on CP5 and SC check terminals, check the detector according to 7.2.1.

(3) Rectifying circuits

Checking: a) Check voltage to be approx. DC $2.3 \pm 0.2V$ between CP3 & SC checking terminals with volt meter while zero gas being introduced.

b) In case when the voltage are much different from above described value, Q11 is defective.

7.2.7 PRINTED CCT. BOARD OF THE 2ND COMPONENT

(1) Power supply circuits

Checking: a) Check and adjust each circuit voltage according to the same checking procedures of p.c.b. of the 1st component described in 7.2.6.

b) Detector voltage (for the 2nd component)

Check the voltage using SV2 and SC checking terminals. The right voltage is written on the detector body.

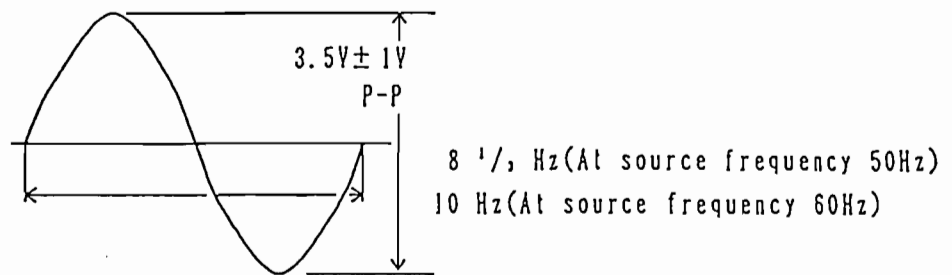
(Adjust the detector voltage with VR1.)

(2) Amplifier circuits

The amplifier circuits are to be checked after making sure that the power supply circuits function properly.

Checking: AC amplifier circuits

a) Connect a synchroscope between CP2 & SC checking terminals and observe AC waveform. While zero gas is introduced, amplitude of waveform is adjusted to be approx. $3.5 \pm 1V$ p-p by VR2.



b) In case AC waveform cannot be observed in the above a), observe AC waveform on CP1 and SC checking terminals. When AC waveform of $8 \frac{1}{2}$ Hz or 10 Hz is observed, AC amplifier Q1 is normal but AC amplifier Q2 or VR2 is defective.

c) In case AC waveform is not observed on CP1 and SC checking terminals, check detector according to 7.2.1.

(3) Rectifying circuits

- Checking: a) While zero gas is introduced, check voltage between CP3 & SC checking terminals with a voltmeter. The right voltage is approx. DC $2.3 \pm 0.2V$.
- b) In case the voltage is much different from above described value, Q2 is defective.

7.3 ERROR-CODES AND HOW TO REPAIR

As self diagnostic functions are provided in the analyzer, an error-code is displayed on occasion of error.

In case an error is displayed, carry out checking and/or repairing according to the following table.

Error code	Error details	State of analyzer	Check or repair procedure
E - 0 E - 1	Error of digital part	Analyzer wouldn't work until recovered.	· Turn off the power and turn on again.
If the error code doesn't appear again, the analyzer is normal. If the error code appears again after trying the power off and on, it is necessary to replace the 1st comp. p.c.b..			
E - 2 E - 3	Error of temperature signal procedure	Analyzer's operative but indication is incorrect.	· Turn off the power and turn on again. · Depress [ENT] key.
If the error code appears again after that disappears once, replacement of the 1st comp. p.c.b. or the temperature sensor is necessary.			
E - 4 E - 5	Correction amount in calibration is out of allowable range	Measuring is possible but zero or span calibration of the range is not performed	· Clean measuring cell. · Check the flowing gas concentration and the set value of span.

(continues to the next page)

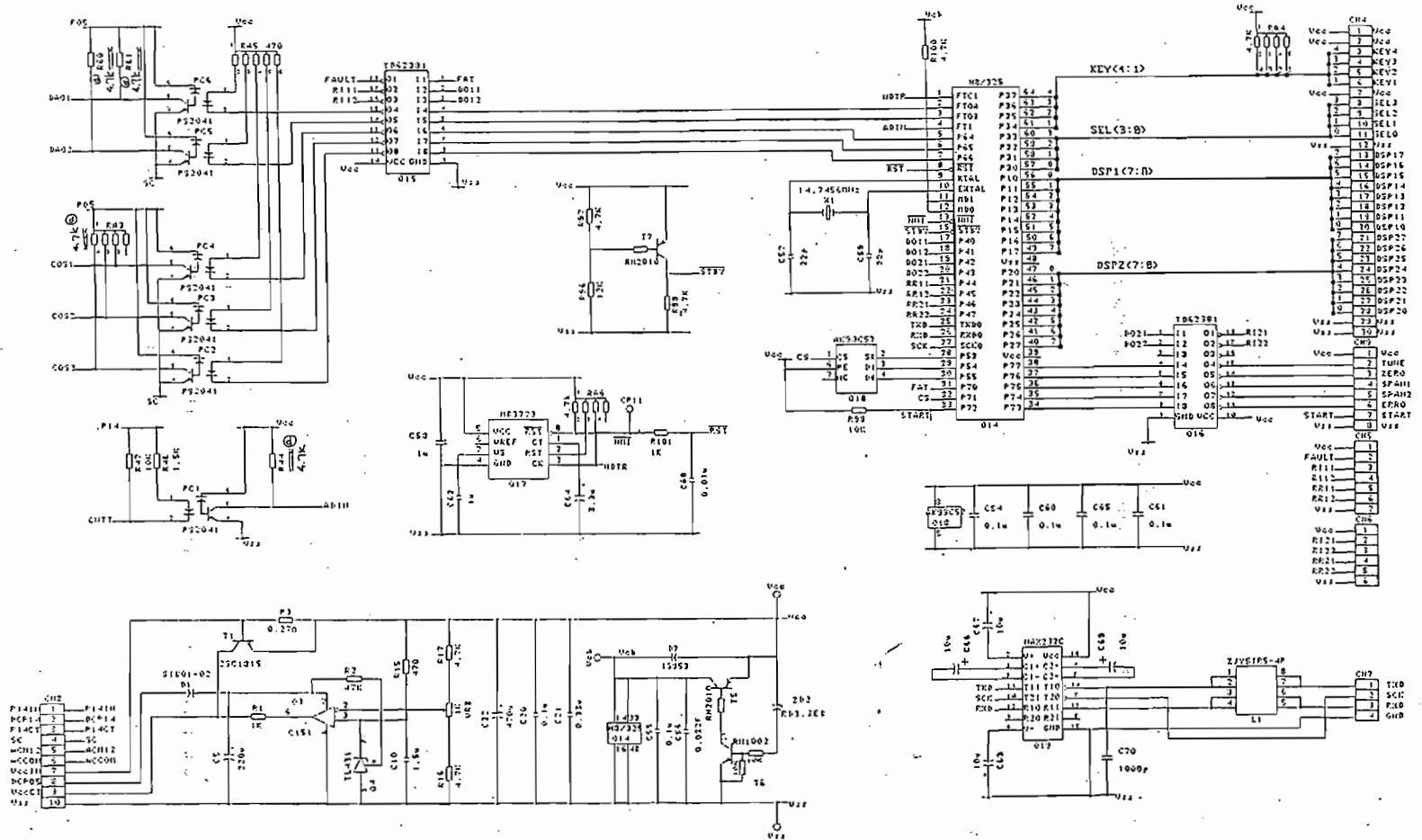
			· Check optical system
E - 6	Correction amount in calibration exceeds	Calibration cannot be performed.	Carry out the same as above.
E - 7	50% of measuring range		

Supplemental explanations on error codes

1. Error-code is displayed on the sub-display screen in the single component analyzer and on the sub-display screen of the 1st component in the dual components analyzer.
2. At the occasion of plural errors, the error codes are to be displayed in turn from the lower error-code No. by depressing [ENT] key.
After displaying all error codes, the error codes display is once off by further depression of [ENT] key, however, the error codes appear again while the error state continues.
3. In case an error-code is displayed, firstly check whether power supply and gas piping are in good order or not.
4. At occasion of error, the contact output of FAULT closes.
5. At occasion of error during automatic calibration, the contact output of automatic calibration error closes together with the contact output of FAULT.

Best Available Copy

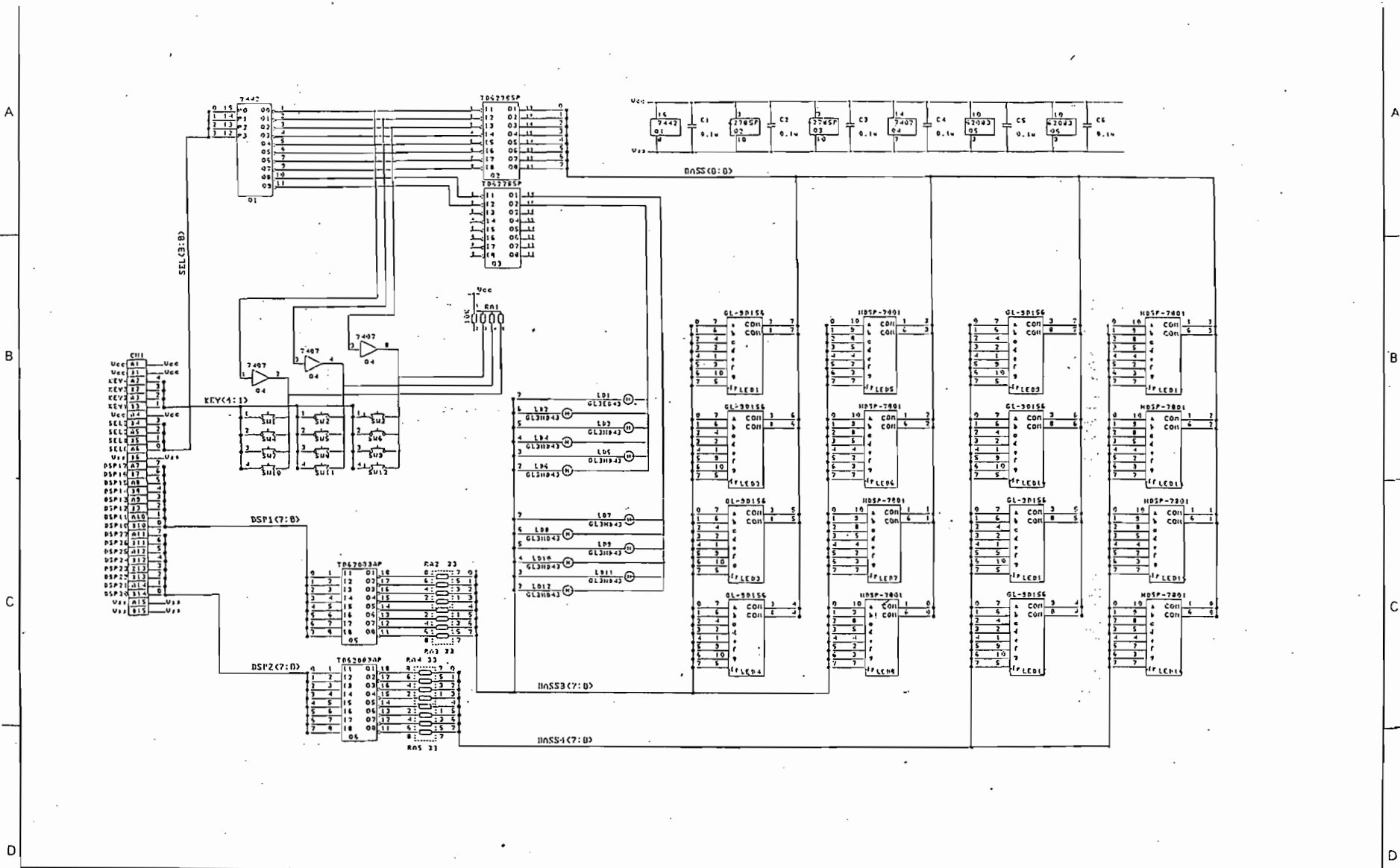
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REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO. (DWG CODE)	
DRAWN	-	-	-	-		1st COMP. P.C.B (ZRH)	-8.2-
CHECKED	-	-	-	-			
Fuji Electric Co., Ltd.					REF.	DRAWING NO. (DWG CODE)	2/2

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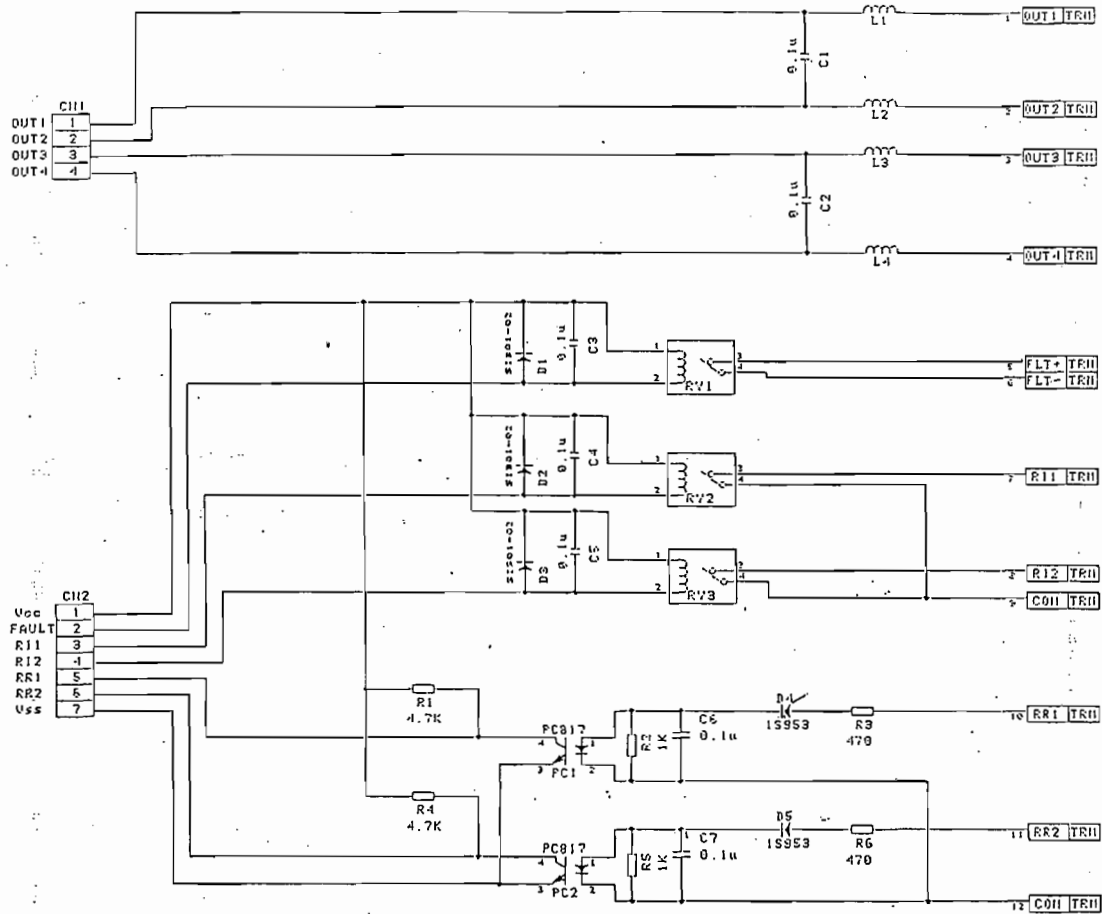
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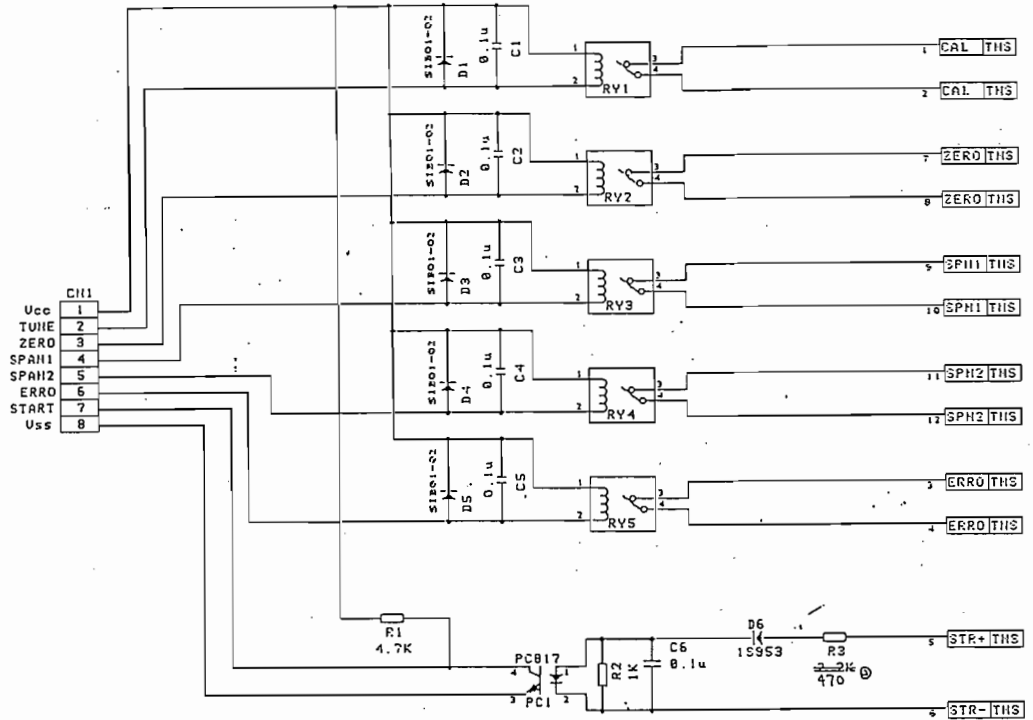
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Fuji Electric Co., Ltd.			REF.		OUTPUT P.C.B (COMP1) (ZRH)	
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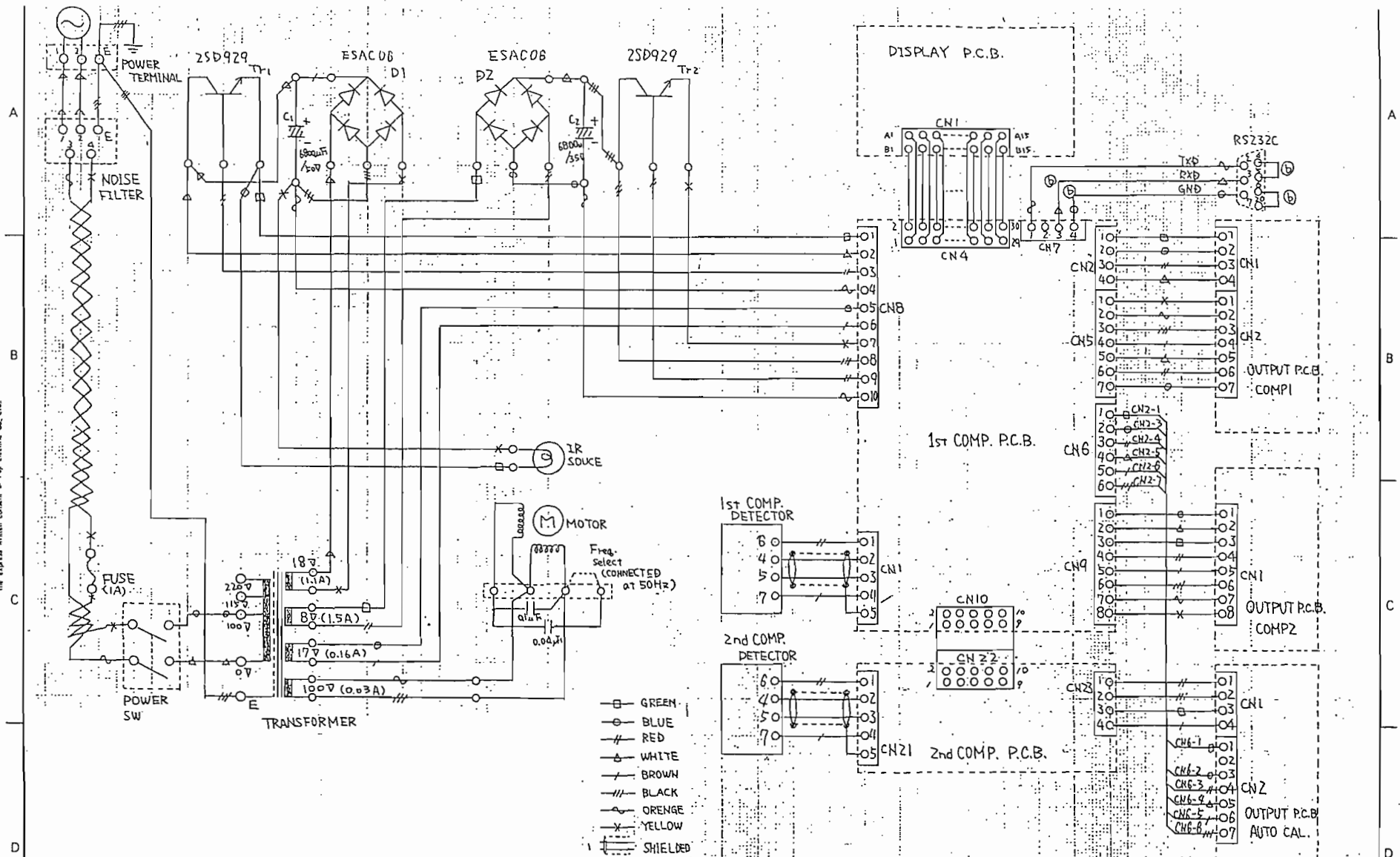
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	DRAWN	- -						
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	Fuji Electric Co., Ltd.							
		REF.					-3.6-	

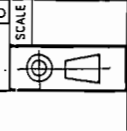
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- GREEN
- BLUE
- RED
- △ WHITE
- BROWN
- BLACK
- ORENGE
- YELLOW
- SHIELDED

REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO. (DWGCODE)
					CONNECTION DIAGRM (FULL OPTION) (ZRH)	
					-8.7-	

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DRAWING NO. (DWGCODE)

MODEL 400A

REMOTE DISPLAY PANEL

INSTRUCTION MANUAL



Thermo Environmental Instruments Inc.

INSTRUCTION MANUAL
FOR THE
MODEL 400A
REMOTE DISPLAY PANEL

IM-5321

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ADDENDUM

MODEL 400A LINEARIZER INTEGRATOR BOARD

RETROFITTING PROCESS SHEET 400-1193

1.0 INTRODUCTION

This manual describes the Model 400A Remote Display Panel and is to be used as a reference in its calibration, installation, and maintenance. Included in this section is a discussion of the basic principles of operation, together with a definition of the instrument units of measurement and its application in industry. Subsequent sections include a technical and functional description of the basic Model 400A and the accessories which comprise the total system. Calibration procedures, installation methods, and maintenance requirements are also included. Because many installations have special requirements, a factory representative should be consulted to ensure selection of the optimum system and its installation location.

1.1 MODEL 400A REMOTE DISPLAY PANEL

The Model 400A Remote Display Panel is an accessory to the basic Model 400 Transmissometer. The two main functions of the Model 400A are to linearize and time-average the opacity signals received from a stack mounted Model 400 Transmissometer. In duct or tapered stack installations, the Model 400A is capable of correcting the opacity data at the point of Transmissometer installation to represent opacity at the stack exit.

An analog panel meter is used to display opacity data in an accurate, easy-to-read form. Permanent records of opacity data may be obtained by connecting strip chart recorders or data logging equipment to the current-driver outputs of the Model 400A Panel. Both the instantaneous and integrated stack exit values are output.

Monitor circuits in the Model 400A Panel check various Transmissometer operating functions and test the level of measured opacity. Panel indicators alert operating personnel when equipment malfunctions or opacity exceedances are detected.

1.2 APPLICATION OF THE MODEL 400 TRANSMISSOMETER

A beam of light, generated in the Optical Head of the Model 400, is directed across the stack to the Retroreflector that returns the beam back on itself to the Optical Detector System. Because the beam traverses the stack twice, the Transmissometer is a double-pass instrument, and the basic electrical output signal from the detector is proportional to t^2 , the square of the signal-pass stack transmittance. Subsequent electronics process the condition the signal with the output appearing as a 0 to 10-milliampere current proportional to $1 - t^2$. Because opacity is defined as $1 - t^2$, where t is single-pass transmittance, the scale on the display meter is non-linear. Table 1 shows the relationship between single-pass transmittance t , optical density (O.D.), t^2 , $1 - t^2$, and $1 - t$ (opacity). The graph in Figure 1 shows the relationship between the $1 - t^2$ signal and $1 - t$.

If the stack diameter at the location of the Transmissometer is different from that at the stack exit, the data accumulated must be corrected. Theoretically, the particulate concentration in terms of mass per unit of volume is constant even though stack geometry and flow velocities vary, therefore, the correction can be determined by applying either of two equations, which are easily developed using the single-path transmittance at each location:

$$\log_{10} t_e = \frac{(\ell_e)}{(\ell_m)} \log_{10} t_m \quad (1)$$

or

$$t_e = t_m \frac{(\ell_e)}{(\ell_m)} \quad (2)$$

where

t_e = the transmittance at the stack exit

t_m = the transmittance at the
Transmissometer measurement location

l_e = stack internal diameter at the exit

l_m = stack internal diameter at the
Transmissometer measurement location.

Equation (2) may also be rewritten in terms of opacities as below:

$$(1 - op_e) = (1 - op_m)^{l_e/l_m}$$

or

$$op_e = 1 - (1 - op_m)^{l_e/l_m} \quad (3)$$

where

op_e = the opacity at the stack exit

op_m = the opacity at the Transmissometer
measurement location.

For conditions where the measurement path length, l_m , is greater than the exit path length, l_e , the measurement path opacity op_m , will be greater than the exit path opacity, op_e . The opposite is true when the exit path length is greater than the measurement path length. These relationships may be summarized as follows:

For $l_e < l_m$ or $l_e/l_m < 1$, then $op_e < op_m$

For $l_e > l_m$ or $l_e/l_m > 1$, then $op_e > op_m$

Given the ratio of the two internal diameters, l_e/l_m (stack taper ratio), a corrected calibration curve can be generated (Table 2). A family of correction curves, based on the values for different stack taper ratios, is shown in Figure 2.

Table 1.

Transmittance, Optical Density, Signal, and Opacity Relationships

Single Pass Transmittance t	Optical Density O.D.	Double Pass Transmittance t^2	Signal Relationship $1 - t^2$	Output Signal ma	Opacity $1 - t$
0.00	∞	0.0000	1.0000	10.000	1.00
0.01	2.000	0.0001	0.9999	9.999	0.99
0.05	1.3010	0.0025	0.9975	9.975	0.95
0.10	1.0000	0.0100	0.9900	9.900	0.90
0.15	0.8239	0.0225	0.9775	9.775	0.85
0.20	0.6990	0.0400	0.9600	9.600	0.80
0.25	0.6021	0.0625	0.9375	9.375	0.75
0.30	0.5229	0.0900	0.9100	9.100	0.70
0.35	0.4559	0.1225	0.8775	8.775	0.65
0.40	0.3979	0.1600	0.8400	8.400	0.60
0.45	0.3468	0.2025	0.7975	7.975	0.55
0.50	0.3010	0.2500	0.7500	7.500	0.50
0.55	0.2596	0.3025	0.6975	6.975	0.45
0.60	0.2218	0.3600	0.6400	6.400	0.40
0.65	0.1871	0.4225	0.5775	5.775	0.35
0.70	0.1549	0.4900	0.5100	5.100	0.30
0.75	0.1249	0.5625	0.4375	4.375	0.25
0.80	0.0969	0.6400	0.3600	3.600	0.20
0.85	0.0706	0.7225	0.2775	2.775	0.15
0.90	0.0458	0.8100	0.1900	1.900	0.10
0.95	0.0223	0.9025	0.0975	0.975	0.05
1.00	0.0000	1.0000	0.0000	0.000	0.00

Table 2.
Corrected Opacity Values* for given Stack Taper Ratios l_e/l_m

op _m	op _e											
	0.70	0.75	0.80	0.85	0.90	1.00	1.05	1.10	1.15	1.20	1.25	1.30
0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.05	0.036	0.038	0.040	0.043	0.046	0.05	0.052	0.055	0.057	0.060	0.062	0.065
0.10	0.071	0.076	0.088	0.086	0.091	0.10	0.105	0.109	0.114	0.119	0.123	0.128
0.15	0.108	0.115	0.122	0.129	0.136	0.15	0.157	0.164	0.171	0.177	0.184	0.190
0.20	0.145	0.154	0.163	0.173	0.182	0.20	0.209	0.218	0.226	0.235	0.243	0.251
0.25	0.182	0.194	0.206	0.217	0.228	0.25	0.261	0.271	0.282	0.292	0.302	0.312
0.30	0.221	0.235	0.248	0.262	0.275	0.30	0.312	0.325	0.336	0.348	0.360	0.371
0.35	0.260	0.276	0.292	0.307	0.321	0.35	0.364	0.377	0.391	0.404	0.416	0.429
0.40	0.301	0.318	0.335	0.352	0.369	0.40	0.416	0.430	0.444	0.458	0.472	0.485
0.45	0.342	0.361	0.380	0.398	0.416	0.45	0.466	0.482	0.497	0.512	0.526	0.540
0.50	0.384	0.405	0.426	0.445	0.464	0.50	0.517	0.533	0.549	0.565	0.580	0.594
0.55	0.428	0.451	0.472	0.493	0.513	0.55	0.568	0.585	0.601	0.616	0.631	0.646
0.60	0.473	0.497	0.520	0.541	0.562	0.60	0.618	0.635	0.651	0.667	0.682	0.696
0.65	0.520	0.545	0.568	0.590	0.611	0.65	0.668	0.675	0.701	0.716	0.731	0.745
0.70	0.569	0.595	0.618	0.641	0.662	0.70	0.718	0.734	0.750	0.764	0.778	0.791
0.75	0.621	0.646	0.670	0.692	0.713	0.75	0.767	0.782	0.797	0.811	0.823	0.835
0.80	0.676	0.701	0.724	0.745	0.765	0.80	0.815	0.830	0.843	0.855	0.866	0.877
0.85	0.735	0.759	0.781	0.801	0.819	0.85	0.864	0.876	0.887	0.897	0.907	0.915
0.90	0.800	0.821	0.842	0.859	0.874	0.90	0.911	0.921	0.929	0.937	0.944	0.950
0.95	0.877	0.894	0.909	0.922	0.933	0.95	0.937	0.963	0.968	0.973	0.977	0.980
1.00	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

*To express in percent opacity move the decimal two places to the right.

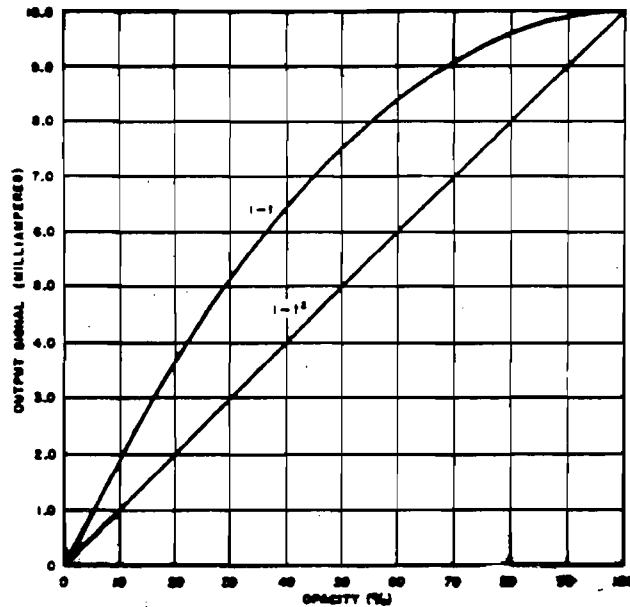


Figure 1. Output Signal vs. Opacity

If the Remote Control Unit and optional Linearizer to 400A are used with the Transmissometer, this correction can be made automatically. Additional information concerning the Remote Control Unit and Linearizer is included in Sections 2.0 and 4.0.

Federal and many state and local regulatory agencies specify both opacity and particulate emission limits for various sources, both new and old. The opacity limits are generally between 10% and 20% depending upon the type of source, while particulate emission rates, in terms of pounds or kilograms per hour, vary widely depending upon both the type of particulate and source. If opacity is the controlling parameter, the output of the Transmissometer, corrected for any stack taper ratio, can be used directly to determine regulatory compliance. For particulates, the relationship between various mass emission rates and optical density is a linear function with a constant of proportionality that must be determined by some appropriate sampling method. If the

mass emission rate is the controlling parameter, the Model 400A can also be set to provide the Transmissometer output directly in terms of optical density, where optical density is defined as:

$$O.D. = \log_{10} \frac{1}{t}$$

The Transmissometer is an effective and precise regulatory compliance device on stacks with particulate effluents. If water vapor is present in the effluent, it is transparent to the optical beam and of no effect provided the stack gas temperature is high enough to keep the water in vapor form. If condensed water droplets are present, however, these will be detected and will affect the reading. The Transmissometer must, therefore, be used either at a position where the water is in vapor form, or where a suitable sample of the stack effluent has been reheated to vaporize the water.

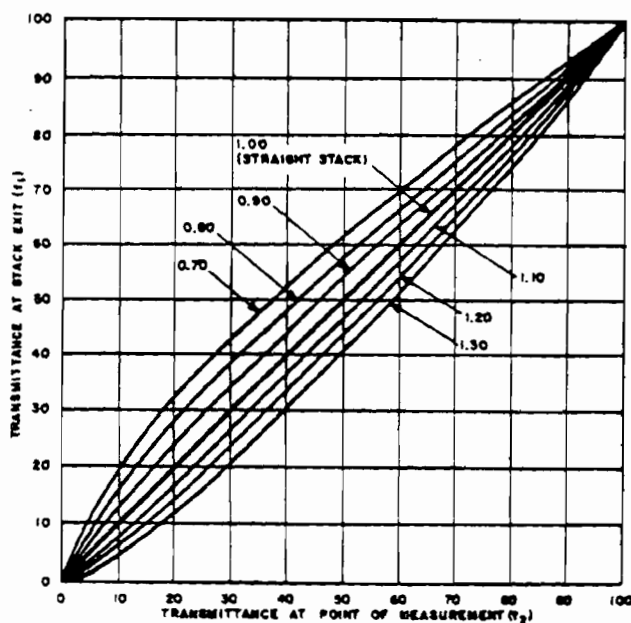


Figure 2. Correction Curves for Different Stack Taper Ratios

2.0 GENERAL DESCRIPTION

The basic Model 400A Remote Display Panel and its accessories comprise a complete 400A Control System. They are available individually, however, to satisfy particular customer requirements and consist of the following items:

1. Remote Control Unit
No. 715-0055
2. Linearizer/Integrator
No. 007-0181
3. Remote Control Unit Enclosure
No. 400-1104
4. Data Cable
No. 400-0012
5. Recorder, 1-Pen
No. 715-0055-01
6. Recorder, 2-Pen
No. 715-0055-02

The Basic 400A Remote Display Panel includes the Remote Control Unit and the Linearizer/Integrator (Items 1 and 2); Items 3 through 6 are optional.

2.1 SUMMARY OF FEATURES

- Analog Display
- Alarm; with an adjustable exceedance level, variable time delay, and output relay.
- Individual panel indicators for:
 - Window Dirty/Window Clean (LED)
 - In Calibration Status (LED)

- Manual Calibration Controls
- Choice of Integration Times
- Variable Stack Taper Compensation
- 4-20ma Current Drivers for Output of Instantaneous Exit and Integrated Exit Parameters
- 50 HZ or 60 HZ Operation (117 VAC)
- All critical controls and adjustments are behind the panel avoid accidental changes or tampering
- Chassis and slides for front access of (optional):
 - Conversion to Optical Density
 - Stack Taper Adjustment
- Controls for Display of:
 - Path or Exit output parameters
 - Instantaneous or Average Values

2.2 DATA CABLE

The Data Cable is used to connect the output of the Model 400 Transmissometer Optical Head Assembly to the M400A. The cable assembly and wiring diagram are shown in Figure 3. The Data Cable has a connector which mates with that on the Optical Head Assembly and is spade-lug terminated at the M400A end. all of the lugs are number-coded to match the connections on the control unit panel at TB2. This cable is made to order for individual installation requirements. The cable is electrically shielded, but it is suggested that it be routed in conduit to avoid adverse

electrical environments such as the immediate vicinity of welders, brush type electric motors, transmitting equipment, and other similar devices. A factory representative should also be consulted if cable runs longer than 5000 feet (1524 meters) are required.

2.3 REMOTE CONTROL UNIT

The Remote Control Unit can be supplied with or without a Linearizer/Integrator as an option. This item will linearize and integrate the stack opacity to give a corrected average exit value. The front panel of the Remote Control Unit is shown in Figure 4 and contains a meter, reading in 0 to 100% opacity, a two-speed strip chart recorder for continuously recording the Transmissometer output data, and LED indicators for Transmissometer exit window status and calibration. The panel contains controls for the Transmissometer NORMAL, ZERO, and SPAN modes. It also includes an alarm set and time delay adjustment, a two-position chart speed switch, and recorder full scale calibration and scale expansion adjustments.

The schematic for the Remote Control Unit is shown in Figure 5. The input signal enters at TB2, Pins 7 and 8, and is directed to the meter which indicates the opacity as measured at the Transmissometer site. The signal is taken across the meter, amplified, and then routed through Pins 5 and 6 of J5 to one side of R32. Potentiometers R2 and R3 control the amplitude of the signal received by the recorder. R2 allows approximately a 10 to 1 scale expansion capability while R3 is a fine adjustment for full scale.

The amplified signal also goes to the alarm circuit where potentiometer R5 on the front panel (called the alarm delay) controls the time for which the signal must exceed the

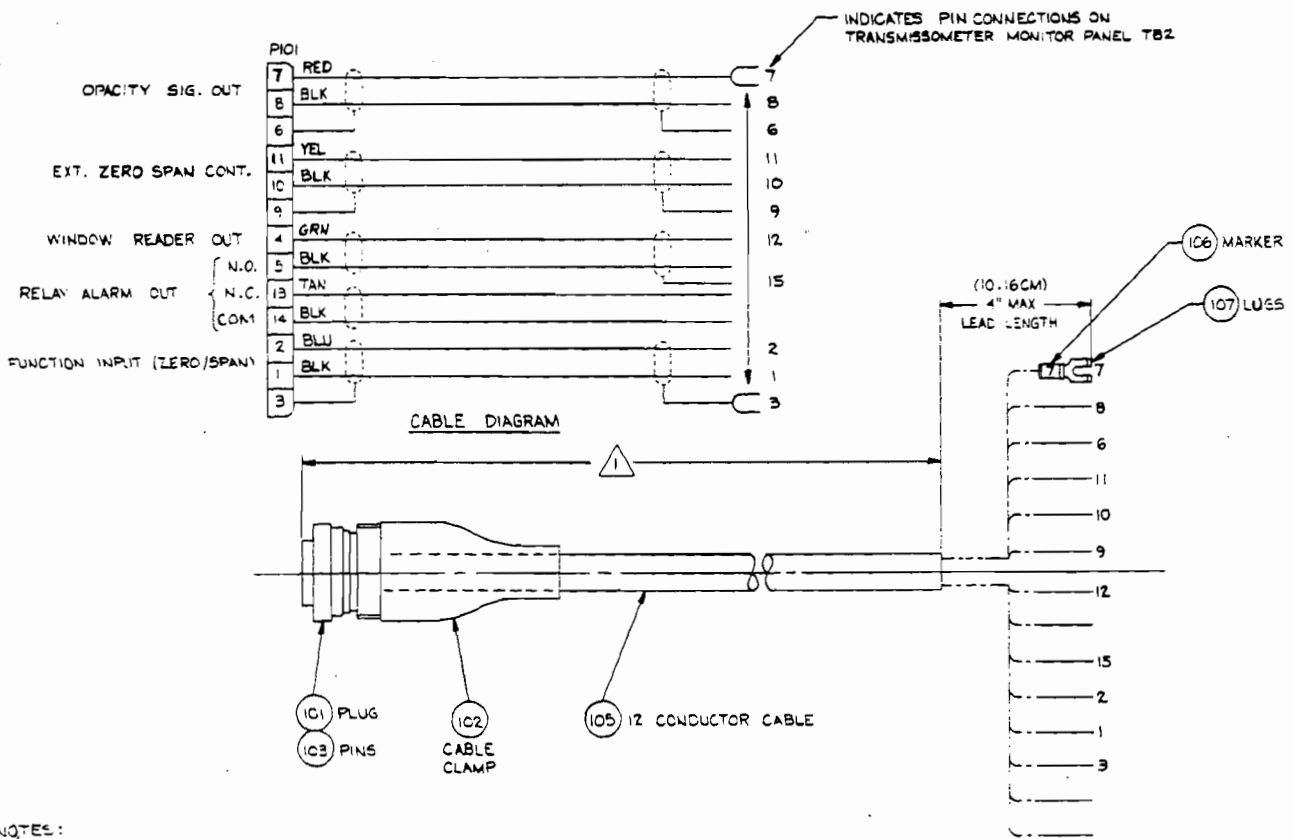
values set by potentiometer R4 before the alarm is tripped. The alarm set point is adjusted by moving the momentary switch S3 to the ALARM SET position and adjusting R4. With switch S3 in this position the meter will read the current passing through R14 and R14A. The gain through the IC1 stage along with the values of R10, R11, and R28 ensures that when the opacity reaches the level set on the meter (with S3 in the ALARM position), that IC2, Pin 4, will go to +15 volts.

Zener CR13 lowers this voltage to 2.4 volts, which is integrated by the following stage at a rate controlled by the alarm delay potentiometer R5. When the output of the integrator, IC3, Pin 3, reaches a sufficiently high negative value, IC2, Pin 12, will go positive. This positive voltage will result in Q2 being turned on and relay K1 being energized. TB1, Pins 6, 7, and 8 output the two normally opened contacts of K1 which are rated at 115 VAC, 5 amperes.

Transistor Q1 is used to prevent the alarm system from activating during the ZERO and SPAN calibration cycles. During normal operation, Q1 is off, since +15 volts is present on TP2, Pin 2. If the unit is either manually or automatically placed into the ZERO or SPAN mode, this 15 volts will disappear and Q1 will turn on, preventing the opacity signal from reaching the alarm circuit. The 15 volt signal at Pin 2 of TB2 also controls the conduction of Q4 and CR18. When the Transmissometer is in either calibration mode, Q4 will turn off and the yellow CAL STATUS LED on the front panel will be illuminated.

The circuit consisting of IC3, Q5, and associated components is used only when the optional Linearizer/Integrator is supplied in conjunction with an optional two-pen recorder. The circuit is a 4-20 ma current driver whose output (pins 13 and 14 of TB2) is connected to the second channel of the two-pen recorder to monitor the instantaneous opacity signal. R50 and R47 are used for adjustment of the zero and full scale signals, respectively.

The red and green LED indicators (CR16 and 17), located on the front panel, are controlled by the voltage signal from Pin 12 of TB2. This signal is provided by the window status circuitry in the Optical Head Assembly. A -15 volt signal at Pin 12 will illuminate the green LED (CR17). A +15 volt signal will illuminate the red LED (CR16) and indicates a need for Transmissometer exit window cleaning.



- NOTES:
1. LENGTH CUT TO ORDER. MIN. LENGTH 50 FEET.
 2. NOTE THAT THERE ARE 6 PAIRS OF WIRES IN THIS CABLE. THE WHITE BLACK PAIR ARE NOT USED AND ARE TO BE CUT AT BOTH ENDS AT THE OUTER INSULATION ENDS.
 3. ALL SHIELDS & DRAIN WIRE TO BE INSULATED FROM EACH OTHER. USE APPROPRIATE HEAT SHRINK TUBING.

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DATA CABLE (DASH 2)

400-0012

Figure 3. Data Cable

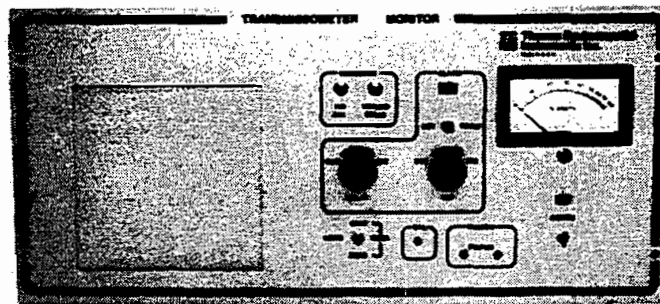
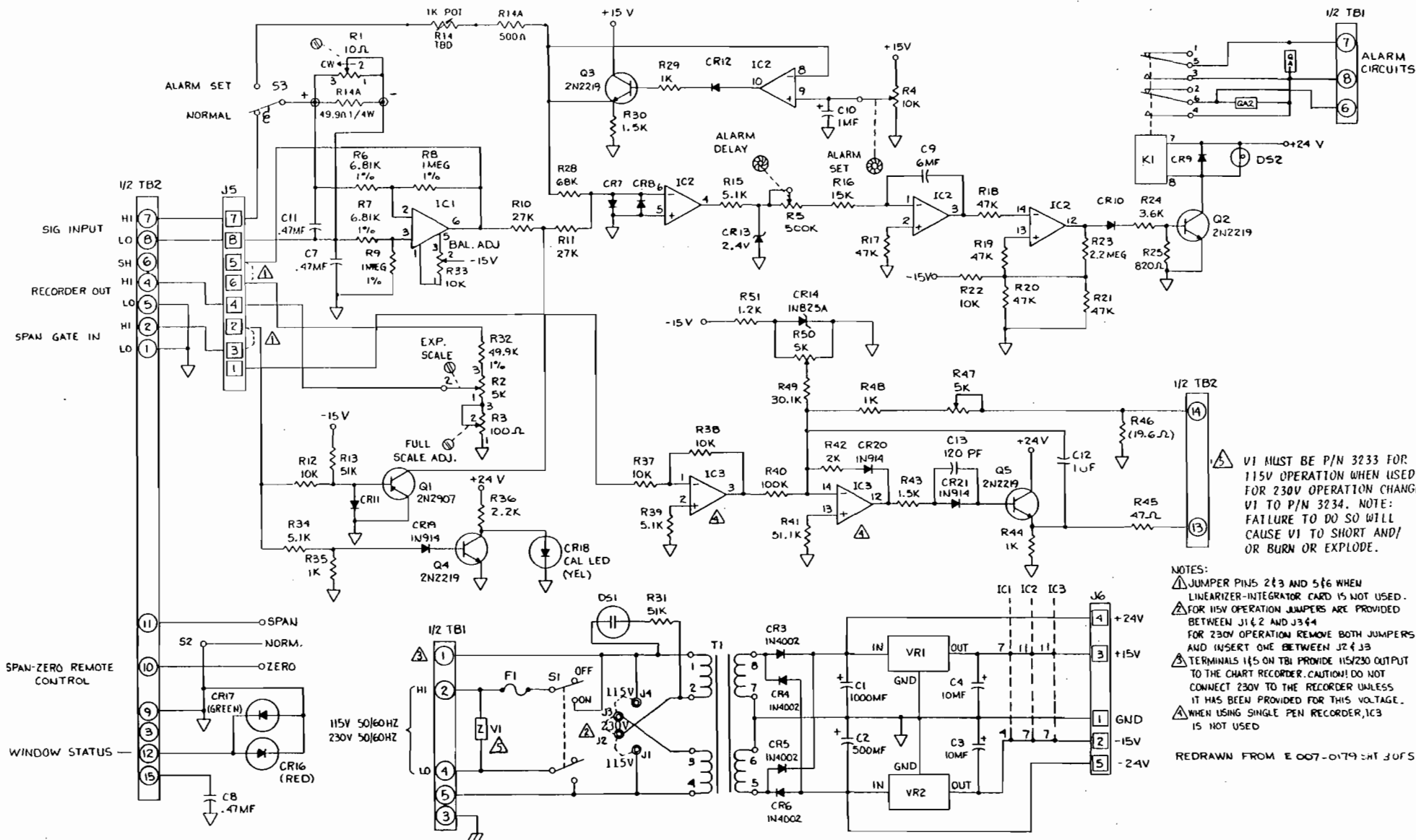


Figure 4. Remote Control Unit



REMOTE CONTROL UNIT SCHEMATIC

Connectors J5 and J6 are provided for the Linearizer/Integrator option. The power supply used in the Remote Control Unit may be connected to either 115 or 230 VAC, 50/60 Hz. If the unit is connected to 115 VAC, the jumper plugs (shown in the lower left-hand portion of Figures 5 and 6) are connected between J1 and J2 and between J3 and J4. For 230-volt operation, only one jumper plug is used between J2 and J3.

NOTE

IF THE OPTIONAL RECORDER IS PURCHASED WITH THE REMOTE CONTROL UNIT, IT MUST BE FACTORY-WIRED TO ACCEPT THE PROPER LINE VOLTAGE. IF NOT SPECIFIED, IT WILL BE WIRED FOR 115 VOLTS.

The Remote Control Unit is made to receive the optional recorder complete with its door assembly. This recorder is a 100-millivolt full scale unit wired to run at two speeds, 3 cm/hour and 30 cm/hour. A set of optional scales can be attached to the recorder that read in either opacity, optical density, or Ringelmann. These are shown in Figure 7. The normal scale used for single-pass opacity measurement will be nonlinear as $1 - t^2$, Scale "C".

2.4 LINEARIZER/INTEGRATOR MODULE (Figure 6)

The Remote Control Unit can be supplied with an optional plug-in module to perform the following functions:

1. To linearize the opacity ($1 - t^2$) signal from the Transmissometer for output to a strip chart recorder.

2. To provide output to the strip chart recorder in terms of either:
 - a) Linear Opacity or
 - b) Linear Optical Density
3. To correct the recorder information for stack taper ratios from 0.2 to 5.0 (see Section 1.2).
4. To provide 6-minute integrated readings for automatic averaging of the instantaneous opacity values in accordance with the EPA requirements appearing in the Federal Register (consult the factory for other integration times).

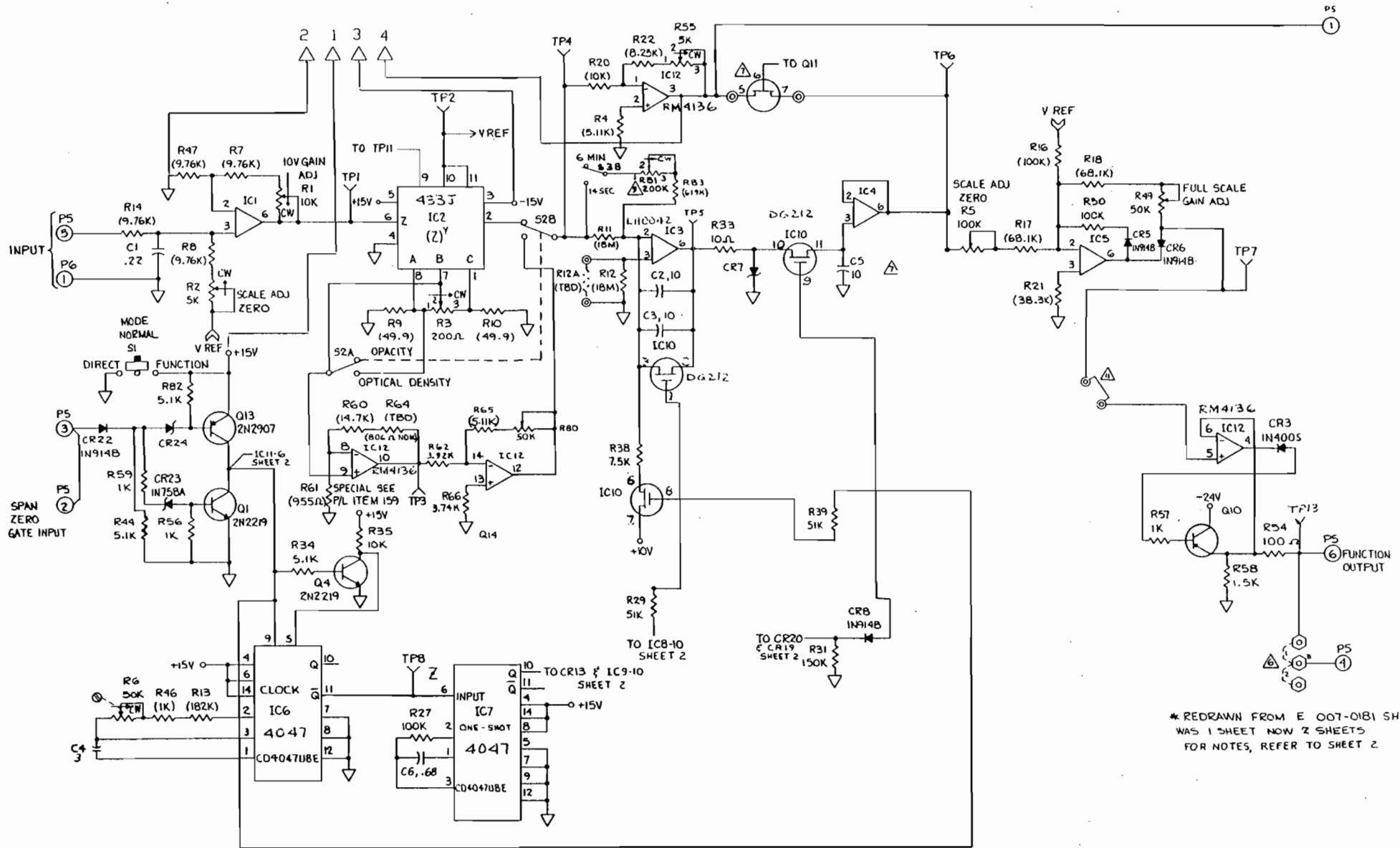
A switch is provided on the Linearizer/Integrator card which allows the output to be displayed as either linear opacity (0 to 100%), or linear optical density (0 to 1). Both the instantaneous and integrated output must operate in the same mode (opacity or O.D.).

If the single-pen strip chart recorder is to be used with the system, placement of a jumper plug on the Linearizer/Integrator board will select either the instantaneous or integrated readings for output. Both the instantaneous and integrated signals may be obtained simultaneously for output to a two-pen recorder; however, the optional simultaneous output requirement should be specified at the time the system is ordered to ensure proper wiring of the Remote Control Unit.

The Linearizer/Integrator cannot be used without the Remote Control Unit. The unit must be plugged into the motherboard on the back of the Remote Control Unit. The motherboard provides both power and signal inputs for system operation.

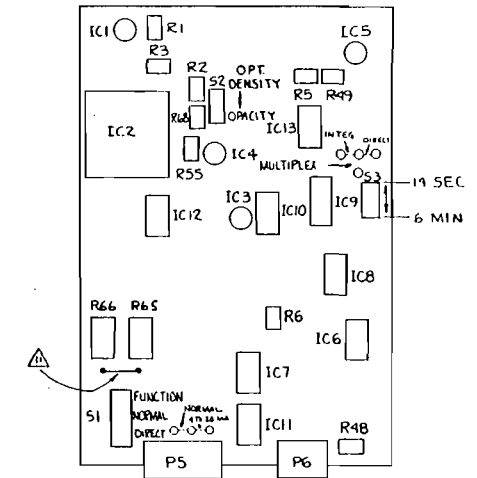
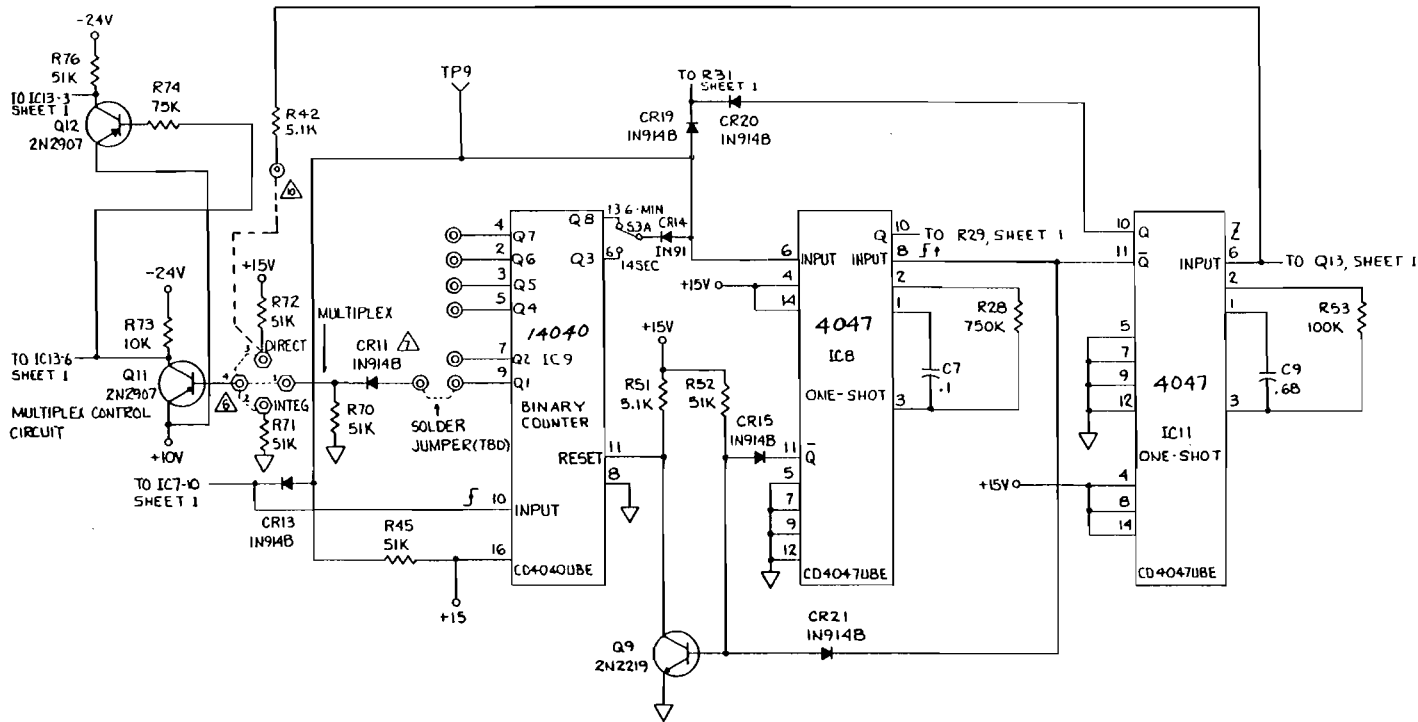
2.4.1 SIGNAL PROCESSING SECTION (Figure 6) -

The nonlinear $(1 - t^2)$ signal from the Transmissometer is fed into P5-5 (via the Remote Control Unit) into scaling amplifier IC1. Amplifier IC1 serves two functions: one is for scaling, and the other is to invert the signal to the input of IC2. The output voltage as seen on TP1 will be +10.0 VDC when the input voltage is equal to 0% opacity and 0.0 VDC when the Transmissometer is indicating 100% opacity. This scaling must be set accurately for proper linearized operation. To ensure accuracy a digital voltmeter should be used for set-up and periodic checks.



INTEGRATING LINEARIZER P.C BOARD

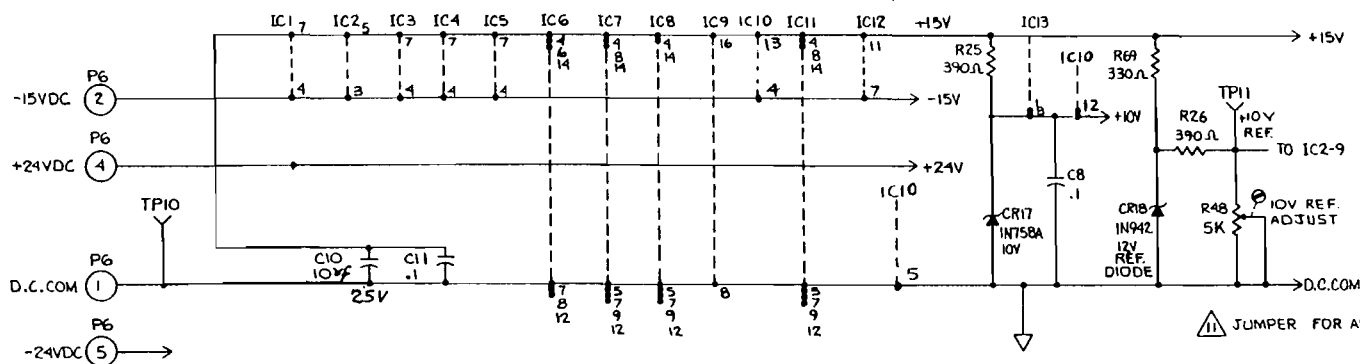
* REDRAWN FROM E 007-0181 SHT. 1 WAS 1 SHEET NOW 2 SHEETS FOR NOTES, REFER TO SHEET 2



- NOTES:
1. ALL RESISTOR VALUES IN () ARE 1%.
 2. CAPACITOR VALUES ARE IN MFD UNLESS OTHERWISE NOTED.
 3. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE NOTED.
 4. Ⓞ SYMBOL INDICATES SOLDER PAD WITH A HOLE TO ACCOMMODATE A #20 SOLID WIRE
 5. Ⓢ SYMBOL INDICATES JUMPER JACKS PER: ITEM 171 ON PARTS LIST.
- ⚠ PHYSICAL LAYOUT OF JACKS TO BE AS SHOWN BY DOTTED LINES, SPACING MUST BE SUCH THAT JUMPER CANNOT BE INSERTED INTO THE WRONG JACKS.

* REDRAWN FROM E 007-0181 SHEET 1 WAS 1 SHEET NOW 2 SHEETS

- ⚠ REMOVE FOR DASH-4 W/2-PEN ONLY
- ⚠ JUMPER FOR DASH-4 W/2-PEN ONLY
- ⚠ USED ON UNITS BUILT AFTER 6-1-78 ONLY
- ⚠ ADD JUMPER FOR SINGLE PEN 4-20MA (BASE PAD OF DELETED TRANSISTOR Q2)



INTEGRATING LINEARIZER P.C. BOARD

Dash 3 & 4

2.4.2 LINEARIZATION MODULE IC2 -

The operation of this module provides both log and anti-log circuits interconnected for an output:

$$e_o = \frac{10}{9} V_y \left(\frac{V_2}{V_x} \right)^m$$

The log circuit provides the log of V_x/V_z to terminals A, B, and C where, for exponents other than unity, it is scaled by external programming resistors R3, R9, and R10. The scaled log ratio from terminal C(1) is subtracted from a signal proportional to the log of V_y . The resulting expression is operated on by the anti-log circuit, yielding the output equation shown above. The reference voltage at Pin 11 is a highly stable (0.005%/°C) voltage source which is generated internally and is used as a constant connected to V_y (Pin 10). R3 can be adjusted to vary the exponent m from 0.2 to 5 which is used to compensate for stack taper ratios. This is normally factory set for a specific installation and should not be changed unless the instrument is placed on another stack with a different stack taper ratio.

Another circuit is placed around IC2 and its purpose is to provide an output in units of optical density. This is accomplished by switch S2 and two sections of IC12. The switch (S2) is in the OPACITY mode of operation when its slide handle is toward the connector end of the board. Moving the switch toward the outside edge of the board will change the function to optical density. With the switch in this position, the first section of IC12 is a voltage follower and the second section of IC12 is a scaling amplifier which inverts the signal to provide the proper output for optical density. It should be noted that when operating in the OPACITY mode, the strip chart recorder will display 0 to 100% opacity with 0 being on the righthand margin of the chart paper. However, when operating in the OPTICAL DENSITY mode, the

recorder displays 0 to 1 optical density with a lefthand zero. From switch S2B the signal is fed in two directions. The input signal to IC3 is the integrated path, while the input to IC12 is the instantaneous path.

The integrator, IC3, C2, C3, R11, and R11a is a precision high Q circuit with a linear charging rate. FET switches are provided at the output of IC3 and across the capacitors. The timing is designed to dump the integrated voltage into the sample-and-hold circuit (C5 and IC4) on the falling edge of the pulse from TP9. The FET across the capacitors shorts out any residual voltage remaining on the capacitors after the sample-and-hold has been updated. This assures that with each cycle of integration time, the integrator starts at zero. The FET that feeds 10 volts into the summing junction of IC3 is turned on only during the ZERO and SPAN modes.

The time constant of the integrator is:

$$t = 1/RC$$

R1 is 18 megohms and C1 is 20 μ fd (standard RC values for a normally selected 6-minute integration period).

2.4.3 SAMPLE-AND-HOLD -

The sample-and-hold circuit is comprised of C5 and precision FET operational amplifier IC4. After the integration time has lapsed, the FET switch between the integrator and the sample-and-hold to accept the voltage from the integrator and store it. After C5 has stored the voltage generated by the integrator, it will hold this voltage level until the next integration interval has lapsed.

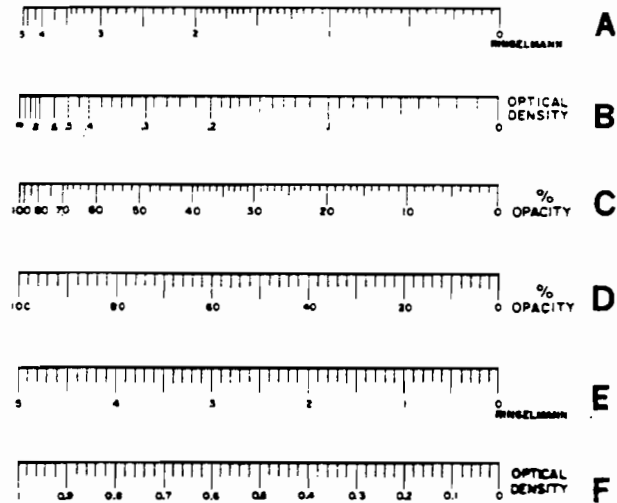


Figure 7. Scales for Indicator

2.4.4 INSTANTANEOUS SIGNAL PATH -

Pin 1 of IC12 also receives the signal from TP4. This path is the instantaneous or non-integrated section. This is a simple DC amplifier with variable gain. Its primary function is to scale and provide the instantaneous output of the signal.

If a two-pen recorder is to be used with the system to monitor both the integrated and instantaneous signals, IC13 is removed and the instantaneous signal is provided at Pin 1 of connector P5 for output to the current driver located on the Remote Control Card (Figure 5). A jumper is also placed between Pins 2 and 4 of IC13 to allow the integrated signal to be supplied to the IC5 scaling circuit and driver IC12 and Q10 for output on Pin 6 P5 to the Remote Control Unit.

The FET switches IC13, gates 3 and 6, located on the direct signal output and the output of

the sample-and-hold, are provided for the purpose of selecting either output when using a single-pen recorder. Note that all the FET switches are OFF when a positive voltage is applied to the gate, and ON when a negative voltage is applied. Refer to IC9; you will note an output line from Pin 9 through a jumper wire to diode CR11 and onto a jumper selecting circuit. This jumper circuit is for the purpose of selecting three (3) modes of operation. These modes are MULTIPLEX, DIRECT, and INTEGRATE. The MULTIPLEX mode, which is used when making initial adjustments of the Linearizer/Integrator, provides both instantaneous and integrated signals at P5, Pin 6 alternately every 2.8125 seconds.

In the DIRECT mode, the jumper at Q11 is placed between resistor R72 and the base of Q11. Because R72 is connected to +15 VDC, Q11 will be turned off activating Q12. With Q12 activated the FET switch IC13-3 will be opened preventing the integrated signal from being fed through. At the same time, IC13-6 is ON and the signal path is open. In this state, only the direct information is output to the recorder.

If the jumper is placed in the INTEGRATE mode, everything is reversed and the recorded output will be the integrated information only, with the direct information being blocked.

The final stage of the signal path is amplifier IC5. As previously stated, the outputs of the integrator and the direct signals will be present at TP6, which is the input to IC5. IC5 provides two functions; one is scaling and the other is gain. This stage, along with the follower output stage, can be adjusted to compensate for the many types of recorders including the 4 to 20 ma units. Adjustment of R54 output resistor may be necessary to achieve the 20 ma output depending on the recorder's input impedance. The output of Q10 will safely provide 10 volts at 30 ma which means a minimum impedance of 330 ohms. For any load greater than this, the factory should be consulted prior to hook-up.

2.4.5 TIMING SECTION -

The purpose of this section is to clock the integrator and gate the multiplexing circuit in proper sequence.

The timing section is comprised of IC6, IC7, IC8, IC9, and IC11. The timer IC6 operates as an astable multivibrator requiring a high level input at Pin 5. The frequency of the output square wave at IC6, Pin 11, is determined by the external capacitor and resistors connected to Pins 1, 2, and 3. The timer is gated on and off by the Gating Control Circuits Q1, Q13, and Q4.

The Transmissometer has three modes of operation: NORMAL, ZERO, and SPAN. In the NORMAL mode of operation, a positive voltage level comes from the Transmissometer and is present at P5, Pin 3. This positive voltage turns on Q1 putting a ground potential at the collectors of Q1 and Q13. This ground is present at IC6-9 (the reset input). The ground present at the base of Q4 causes the collector that feeds to Pin 5 of IC6 to go to +15 VDC. This condition allows the multivibrator to operate. As can be seen on the schematic in Figure 6, the lines feeding IC6-9 and Q4 base also feed other circuits. These functions will be explained later in the Gating Section.

In the NORMAL mode a ground level must be on Pin 9 and a plus level must be on Pin 5 of IC6 to set the multivibrator into operation. When the Transmissometer mode changes to either ZERO or SPAN, the voltage level at P5-3 changes from positive to ground. This reverses both levels at the multivibrator and will inhibit its operation. The purpose of inhibiting the multivibrator in the ZERO and SPAN modes is to ensure a full 6-minute integration time when the instrument returns to the NORMAL mode.

The remaining sections of the timing circuit are a series of one shots and monostable multivibrators with one binary counter, IC9. The output signal of IC6 (Pin 11) is a 0 to approximately 15 volt square wave, the period of which is factory set at 2.8125 seconds. This signal is present at TP8.

The output of IC6 is fed into IC7-6 and can be monitored at TP8. The output of IC7 is an asymmetrical square wave with a period of 2.8125 seconds. This signal is fed into the binary counter IC9 and into the AND gate diode CR13.

The binary counter IC9 is a 12-stage ripple-carry type device with reset. The integrating time may be changed by removing the jumper between IC9-13 and CR-14, and using one of the other binary outputs connected to CR-14. This is only the coarse adjustment. The fine adjustment is accomplished by changing the values of the resistors and capacitor C4 located on IC6. The timing is factory set for 6 minutes which is specified in the EPA reporting procedure.

Switch S3, which is connected to Pins 13 and 6 of IC9, allows adjustments of the integrated circuitry to be made with the integration time set at 14 seconds. This will reduce check-out time since adjustments can only be made after one full integration period has been completed. After all adjustments have been made with S3 in the 14-second position, S3 may be placed in the 6-minute position for operation.

The binary counter IC9 output at Pin 13 is 0 volts during the 6-minute counting period. This zero state is also seen at TP9 and is fed to IC8 and diode CR19. CR19 feeds the base of Q5 which controls the FET switch IC10-10. IC10-10 gates the integrated voltage from IC3 to the sample-and-hold circuit C5 and IC4.

Assuming that ground potential is on both anodes of the two diodes, CR19 and CR20, this

indicates that Q5 is conducting and providing the necessary positive 10 volts to hold the FET switch OFF. If either the anode of CR19 or CR20 should go to the +15 volt level, Q5 will turn OFF and cause the FET IC10-10 to turn ON. This happens at the end of each timing cycle and also with a mode change. Referring back to the output of IC9, Pin 13, the output is zero during the integration period and feeds into CR14. CR13, CR14, and R45 make up an AND gate circuit which controls the timing sequence between dumping and resetting of the integrator. IC10-3 (FET) across the two integrating capacitors C2 and C3 applies a momentary short after the voltage has been dumped into the sample-and-hold. Its purpose is to assure a zero voltage starting point for each successive integration period.

2.4.6 GATING CIRCUIT -

In addition to the timer control, the gating circuit controls the Transmissometer signal path during mode changes. It should be noted that the Linearizer/Integrator does not process the Transmissometer signal during the ZERO or SPAN modes of operation (also called the CALIBRATE mode). The Transmissometer signal enters P5-5 which is shown connected to the open contact of relay K1 and also to R14 resistor at the input to amplifier IC1. In the NORMAL mode, K1 is deenergized and K2 is energized thus providing a complete signal path into IC1 and out of IC12.

When the mode changes to CALIBRATE, ZERO or SPAN, relay K1 energizes and K2 deenergizes changing the Transmissometer signal path. Even though the signal path is not broken to IC1, it has no effect on the recorded output. This is because K2 has opened the output between IC5 and IC12.

Since the mid-span signal has a value of opacity which comes from the Transmissometer,

and is neither linearized nor integrated, it will not be displayed linearly on the recorder chart. This is to prevent false integration. The recorder paper and recorder were designed to accept a linear input from the Linearizer/Integrator. The difference in the reading of the chart paper and the opacity meter is of no consequence unless the value varies.

Another function performed by the gating circuit is to condition the Integrator to produce zero output after the ZERO or SPAN mode has been switched back to NORMAL. This prevents random recorder information at the beginning of each start in the NORMAL mode. This function is accomplished by Q7 and IC11. Both Q7 and IC11 are connected to the gating control line from the collectors of Q1 and Q13. This line changes voltage level with changes in mode of operation. In NORMAL mode, the voltage is at ground potential and changes to +15 volts when in ZERO or SPAN mode. The mode switching is controlled automatically by the Transmissometer or manually by the control switches on either the Remote Control Unit or the Transmissometer.

Assuming the mode to be NORMAL, the voltage on the control line from Q1 and Q13 is at ground potential. A ground at the base of Q7 will cause the transistor to conduct putting a +10 volt level on FET switch IC10-6. This positive voltage holds the FET switch open, preventing the +10 volts connected to it from passing through to the input of the Integrator. When the mode changes to ZERO or SPAN, the positive voltage at the base of Q7 turns off the transistor by applying -24 volts to FET switch IC10-6. This -24 volts on the FET gate will close the switch allowing the integrator to charge very rapidly to 10 volts. The time constant of the Integrator is made small by the input resistor R38 which is 7.5K. The Integrator will remain charged until the mode is changed back to NORMAL.

When the mode changes to NORMAL, first the signal line goes from +15 volts to ground causing the FET switch IC10-6 to open via Q7. At the same time the level changes at IC11-6 which causes the output IC11-10 to momentarily go to zero volts turning off Q5. Q5 controls FET switch IC10-10 which closes dumping the 10 volts from the Integrator into the sample-and-hold which represents zero opacity on the recorder. When the mode changes back to NORMAL after a calibration check of ZERO or SPAN, the recorder will always indicate zero opacity for the integrated value. The integrated value will remain at the zero reading until a 6-minute period has elapsed.

IC11 performs two additional functions when the mode changes back to NORMAL. Following the signal path from IC11-11, it goes in two directions. One line goes to CR21 which is part of an AND gate used to reset the binary counter, and the other line feeds IC8. IC8 is used to short out the residual charge across the Integrator capacitors and to reset the binary counter. This always assures that after a calibration check, either automatic or manual, the Integrator output will always read zero and be reset ready to accept new data.

Regardless of the type of signal response curve the output can be taken from the Remote Control Unit with the Linearizer/Integrator as either a 0 to 10 ma signal or a 4 to 20 ma signal.

2.5 REMOTE CONTROL UNIT ENCLOSURE

An enclosure for the Remote Control Unit is available to permit desk or table mounted installation where the normal rack type control room console is not used. The enclosure is shown in Figure 4 with the Remote Control Unit in place. It is of all

aluminum construction, 10-5/16" (26.19 cm) deep, 19-3/4" (50.17 cm) long, and 9-3/4" (24.77 cm) high, and will accept a standard 8-3/4" (22.23 cm) x 19" (48.26 cm) rack mounted panel. Four rubber pads protect the mounting surface from being marred or scratched.

2.6 RECORDER

The optional Remote Control Unit can be supplied with either a single-pen or two-pen strip chart recorder to record the Transmissometer system output. If the Linearizer/Integrator has been supplied with the system, the two-pen recorder may be used to record both the instantaneous and integrated stack information simultaneously. The recorders use a 10-cm wide Z-fold chart. The chart speed is selectable on the monitor front panel. On the low setting the chart speed is 3 cm/hr, while on the high setting the chart speed is 30 cm/hr. Chart speeds from 1.5 cm/hr to 300 cm/hr can be obtained if the factory is consulted prior to shipment.

The writing system uses a disposable cartridge pen which contains both the ink and stylus.

The recorder power requirement is 117 VAC, 50/60 Hz. 230 VAC, 50/60 Hz is optional but must normally be wired at the factory. The recorder is supplied with a complete operations manual. Optional scales are available in terms of nonlinear or linear opacity, and nonlinear or linear optical density.

3.0 BASIC CALIBRATION AND CHECKOUT

Pre-installation calibration ensures precise operation of the 400A Control Panel when installed. This is normally done at the factory prior to shipment and when the true flange to flange mounting distance is known. It can also be performed on-site by the customer if a VTVM is available or by CGC Field Service personnel (see Section 7.3, Field Service).

3.1 LINEARIZER/INTEGRATOR SET-UP (Figure 6)

With the Model 400 Transmissometer and Model 400A Remote Control Unit adjusted and operating properly, the Linearizer/Integrator card should be installed into connectors J5 and J6 on the rear of the Remote Control Unit printed circuit card. The recorder to be used should be installed and be in proper operating condition. Reference to recorder output will assume that the 0 to 100 mv recorder typically supplied with the system has been used.

The Transmissometer and Remote Control Unit should be allowed an initial warmup period of at least 15 minutes before any adjustments are attempted. In making Linearizer/Integrator adjustments, it will be necessary to provide zero, 100%, and some mid-scale opacity values to the Remote Control Unit. The Calibration Test Kit is convenient for this purpose.

Percent opacity signals to the Remote Control Unit may be obtained in two ways:

- (1) using the Transmissometer Calibration Test Kit, or
- (2) using the ALARM SET switch on the Remote Control Unit.

When the momentary ALARM SET switch is depressed, a signal is generated within the Remote Control Unit that is switched into the signal path causing deflection of the panel meter. The amount of deflection is determined by the setting of the alarm set adjustment potentiometer on the front panel. Although it is normally used to check and adjust the alarm set point, this circuit may also be used in making quick checks of Remote Control Unit and Linearizer/Integrator performance. If the spring return ALARM SET switch is activated, a simulated opacity reading of any value may be produced by adjusting the ALARM SET potentiometer. The Linearizer/Integrator operates on the signal output after the panel meter, therefore, the signals for linearization, integration, and stack taper ratio compensation are displayed on the strip chart recorder only. The recorder output can either be in optical density or opacity units. The panel meter, however, only indicates the instantaneous opacity at the Transmissometer sampling path, or alarm set information when the ALARM SET switch is depressed. These are displayed on a 1 - t! basis, which expands the lower portion of the scale so that 30% opacity is about 1/2 full scale.

3.2 ADJUSTMENT OF +10-VOLT REFERENCE

Connect a digital voltmeter from DC common (TP10) to the +10 volt reference (TP11) and adjust R48 until the voltage at TP11 is +10.0 volts DC.

3.3 ADJUSTMENT OF ICI CIRCUIT

1. Place the Transmissometer in NORMAL

2. Place Linearizer/Integrator mode switch S1 in the NORMAL (center) position.
3. Set the multiplex control jumper (single-pen recorder) in the MULTIPLEX position. (See card layout in Figure 6.)
4. Place Linearizer/Integrator switch S2 in the OPACITY position (See card layout in Figure 6.)

With the system operating as above, obtain a 100% opacity reading on the Remote Control Unit meter by blocking the light path of the Transmissometer or by holding the ALARM SET switch and adjusting the set control for 100% on the panel meter. Adjust R2 on the Linearizer/Integrator board so the voltage at TP1 is 0.00 volts DC. Now obtain a 0% opacity reading from the Transmissometer and adjust the voltage at TP1 to +10.00 volts DC using R1. Repeat these steps as required to ensure proper adjustment.

3.4 ADJUSTMENT OF THE INTEGRATOR

1. Place the Transmissometer in NORMAL mode of operation.
2. Place Linearizer/Integrator mode switch S1 in the NORMAL (center) position.
3. Set the multiplex control jumper (single-pen recorder) in the MULTIPLEX position. (See card layout in Figure 6.)

4. Place Linearizer/Integrator switch S2 in the OPACITY position (toward the panel).
5. Place Linearizer/Integrator switch S3 in the 14-SECOND position.
6. Continue ICl circuit adjustments for the one- or two-pen recorder systems as follows:

A. Two-Pen Recorder

Adjustments to the Integrator on two-pen recorder systems should be done only after instantaneous linearization adjustments have been completed. Proceed to Section 3.5.

B. Single-Pen Recorder

With the system operating as above, introduce an opacity reading of from 20% to 50% using either the Calibration Test Kit and filters or the Remote Control Unit ALARM SET switch. This reading should be left unchanged for at least 30 seconds to allow one full 14-second integration period. The strip chart recorder will display either an erroneous level or zero output until the integrator goes through two cycles. At the end of the 30-second period adjust R55 on the Linearizer/Integrator card until there is no visible movement in the recorder pen. Place switch S1 in the 6-MINUTE position and then change the opacity reading and allow it to remain unchanged for 12 minutes. After 12 minutes there should be no movement of the pen. The magnitude of the signal displayed on the recorder is of no concern at this point, only the fact that the instantaneous and integrated signals are equal. Further adjustments are necessary to properly linearize the Transmissometer signal.

3.5 ADJUSTMENT OF 0% AND 100% INSTANTANEOUS OPACITY

1. Place the Transmissometer in NORMAL mode of operation.
2. Place Linearizer/Integrator MODE switch S1 in the NORMAL (center) position.
3. Place the multiplex control jumper (single pen recorder) in the DIRECT position (See card layout in Figure 6.)
4. Place Linearizer/Integrator switch S2 in the OPACITY position (toward the panel).
5. Continue opacity adjustments for the one- or two-pen recorder as follows:

A. Single-Pen Recorder

With the system operating as above, adjust R49 on the Linearizer/Integrator board so that with a 100% opacity signal from the Transmissometer the recorder will indicate full scale. Now generate a 0% opacity signal to the Remote Control Unit and adjust the recorder zero using potentiometer R5 on the Linearizer/Integrator card. Care must be taken in making the zero adjustment to avoid below zero readings due to the clamping effect of the recorder. Proper zero adjustment requires that R5 be adjusted counterclockwise until some upscale movement is noticed, then turned clockwise until the recorder indicator just falls on the 0% opacity mark. This procedure should be repeated until no further adjustments are necessary. Proceed to Section 3.6.

B. Two-Pen Recorder

Generate a 100% opacity reading on the panel meter and adjust R47 on the Remote Control Unit printed circuit card (Figures 5 and 6) until the pen of the instantaneous channel indicates full scale. Then generate a 0% opacity signal and adjust R50, also on the

Remote Control Unit board, until a recorder zero is obtained. Repeat this procedure until no further adjustments are necessary.

3.6 ADJUSTMENT OF LINEARIZATION AND STACK TAPER RATIO

1. Place the Transmissometer in NORMAL mode of operation.
2. Place Linearizer/Integrator MODE switch S1 in the NORMAL (center) position.
3. Place the multiplex control circuit jumper (single-pen recorder) in the DIRECT position. (See card layout on Figure 6.)
4. Place Linearizer/Integrator switch S2 in the OPACITY position.

Linearization and stack taper ratio adjustments are made using potentiometer R3 on the Linearizer/Integrator card. For direct linearization (no taper ratio connection) of the opacity signal, several up-scale readings must be provided to the Remote Control Unit. With the Remote Control Unit panel meter indicating an opacity reading of 50%, for example, R3 should be adjusted until the strip chart recorder indicates 50% on its linear scale. The 0% and 100% readings must now be rechecked and adjusted. Several other opacity readings should be checked to ensure linearization is correct throughout the scale.

If the stack exit diameter is different from that of the instrument measurement path, the stack taper ratio adjustments must be made to have the system read in terms of exit opacity. Calculations of stack exit opacity and measurement path opacity must be made using the information provided in Section

1.2. With the Remote Control Unit panel meter indicating the opacity at the measurement path, R3 should be adjusted until the recorder indicates the corresponding calculated value for the stack exit opacity. Example:

Measurement Opacity, op_m (Remote Control Unit Meter)	Stack Taper Ratio, l_e/l_m	Exit Opacity, op_e (Recorder)
50%	0.5	29.3%
50%	0.5	16.3%

At least four points should be calculated and checked. If difficulties are experienced in making linearization or stack taper ratio adjustments that are correct throughout the scale, it may be necessary to recheck the zero and full scale adjustments described in the previous section.

3.7 ADJUSTMENT OF THE INTEGRATOR (TWO-PEN RECORDER ONLY)

1. Place the Transmissometer in NORMAL mode of operation.
2. Place Linearizer/Integrator MODE switch S1 in the NORMAL (center) position.
3. Place Linearization/Integrator switch S2 in the OPACITY position.
4. Place Linearizer/Integrator switch S3 in the 14-SECOND position.

NOTE

THESE ADJUSTMENTS MUST NOT BE ATTEMPTED UNTIL THE INSTANTANEOUS OPACITY ADJUSTMENTS OF THE PREVIOUS SECTION HAVE BEEN COMPLETED.

Generate a 0% opacity signal through the system. The recorder channel, monitoring the instantaneous opacity, should indicate 0%. Allow this signal to remain unchanged for at least 30 seconds. Then adjust R5 on the Linearizer/Integrator circuit board until the integrated channel also indicates a 0% reading. Proper zero adjustment requires that R5 be adjusted counterclockwise until some upscale movement is noticed, then turned clockwise until the indicator just falls on the 0% opacity mark.

Generate an up-scale opacity reading between 30% and 60% and allow this reading to remain unchanged for at least 30 seconds. R49 may then be adjusted until the integrated channel of the recorder indicates the same reading as the instantaneous channel.

3.8 ADJUSTMENT OF OPTICAL DENSITY

1. Place the Transmissometer in NORMAL mode of operation.
2. Place Linearizer/Integrator MODE switch S1 in the NORMAL (center) position.
3. Place the multiplex control circuit jumper in the DIRECT position. (See card layout on Figure 6.)
4. Place Linearizer/Integrator switch S2 in the OPTICAL DENSITY position (away from the panel).

If stack effluent information is required in terms of optical density, the system should be connected as above and a 0% opacity reading should be provided to the Remote Control Unit. Potentiometer R80 is then adjusted to produce a 0 optical density reading on the strip chart recorder. If R80 is not capable of producing a 0 optical density signal, R5 and R49 may be used for additional control. Note that when operating in the optical density mode that 0 optical density is displayed on the left side of the strip chart recorder and an optical density of one (1) is displayed on the right. Several values of optical density should be calculated according to the equation:

$$\text{Optical density} = \log \frac{1}{10t}$$

where

t = transmittance,

then checked through its operating range.
Example:

Measured Opacity (Remote Monitor Meter)	Optical Density, O.D. (Recorder)
50%	0.30
30%	0.155

An optical density of 0.30 would be indicated by the recorder pen being three major divisions from the left margin of the recorder strip chart.

4.0 INSTALLATION

These procedures are to be followed in the installation of the Transmissometer System after selection of the measurement site.

4.1 SITE PREPARATION

Prior to installation, certain information must be known to assure proper calibration, adjustment, and electrical connection of the system.

The required information should be recorded in the checklist and should be provided to the factory so that proper installation drawings can be prepared. This is normally done in the early stages of ordering the Transmissometer System.

4.2 MODEL 400A CONTROL PANEL INSTALLATION CHECKLIST

Electrical Power:
(all power must be single phase)

Remote Monitor, 115 Volt, 15W

Data Cable:

a) Length

b) Conduit Size
(minimum 1 in. diameter)

Stack Taper Ratio
(if linearizer is supplied):

a) Stack inside diameter at
transmissometer location

- b) Stack inside diameter
at exit

Tighten the gasket ring hex head screws then attach the weather cover to the hinges on top of the blower mounting plate, close the cover, and fasten the latches.

4.3 REMOTE CONTROL UNIT

The output from the Transmissometer Optical Head Assembly is connected to the Remote Control Unit through the optional data cable (Figure 3). The connector end of the cable mates with J101 on the Optical Head Assembly. The terminal end is fitted with labeled spade lugs that attach to the corresponding terminals of TB2 in the Remote Control Unit shown in Figure 8 and the back of the panel shown in Figure 9.

4.3.1 ADJUSTING THE RECORDER ZERO AND FULL SCALE SET POINTS -

A two-speed strip chart recorder is offered as an option to the Remote Control Unit (Figure 4). The proper connections of the recorder to the Remote Control Unit are shown in Figures 8 and 9. Two chart speeds, 3.0 cm/hr and 30.0 cm/hr, are standard with this recorder although others are available.

Normally the zero and full scale readings for the recorder are factory set. Should adjustments be necessary, allow the unit to operate for at least 30 minutes.

To adjust the zero set point, disconnect the input lead to Pin 7 on TB2 of the Remote Control Unit. The meter on the front of the panel should read 0. Place a jumper from Pin 5 of J5 to ground and adjust the recorder zero. Remove the jumper from J5 and adjust potentiometer R33, see Figure 9, until the recorder pen also reads 0 on the strip chart. Reconnect the input lead to Pin 7 on TB2.

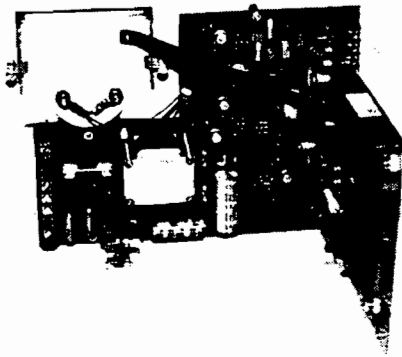
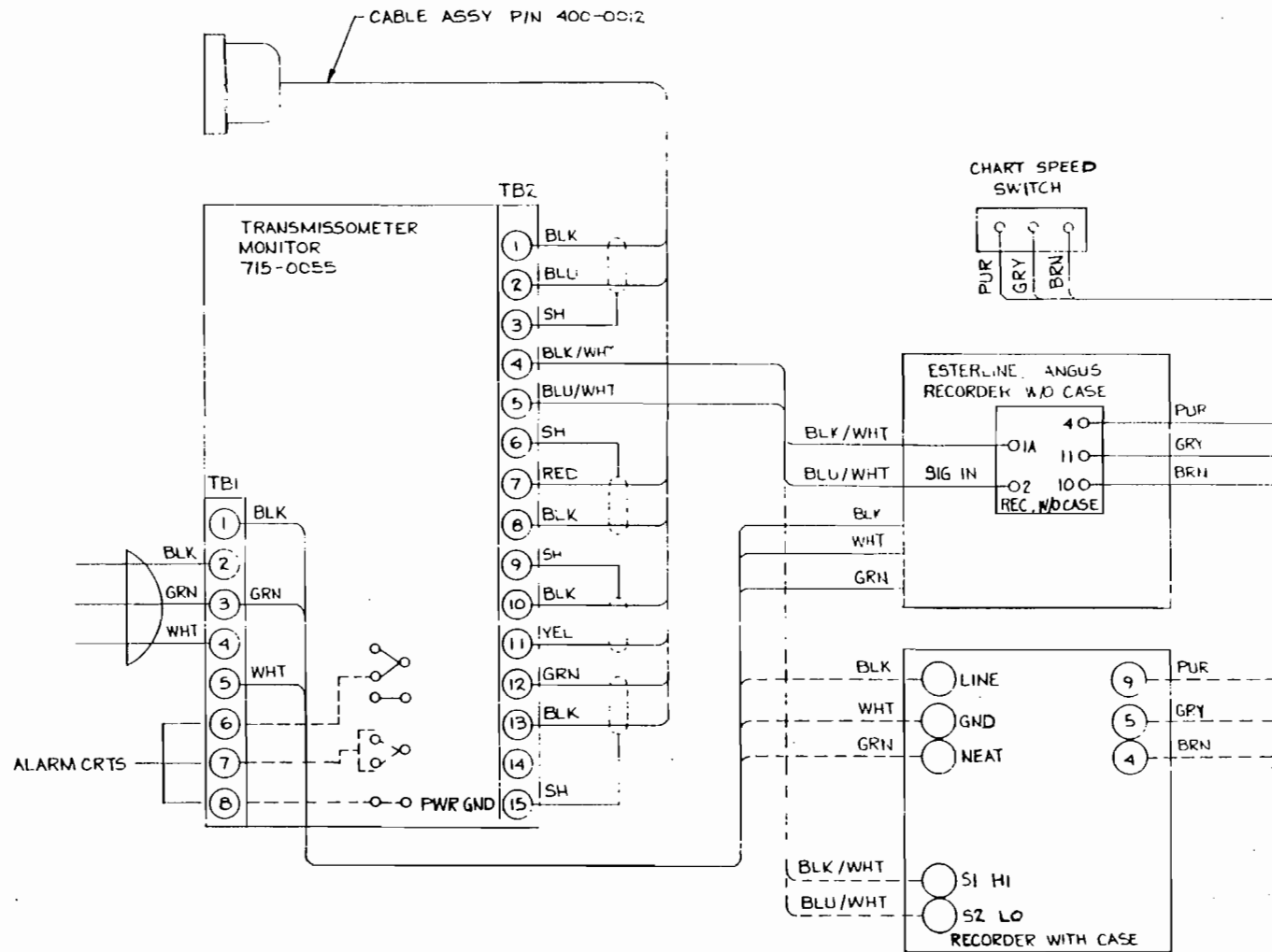


Figure 9. Rear View of Remote Control Unit Panel

Figure 8. Remote Control Unit Wiring Diagram



To adjust the full scale set point, hold the alarm switch on the front face of the panel in the SET position and adjust the alarm set potentiometer (Figure 9) until the meter reads exactly 100% opacity. While still holding the switch in the SET position, adjust the recorder full scale potentiometer until the recorder pen reads full scale on the strip chart, then release the switch to the NORMAL position.

The recorder display may also be expanded to set its full scale reading to any point between 10% and 100% opacity. To accomplish this, hold the ALARM SET switch in the SET position and adjust the alarm set potentiometer until the meter reads the opacity value desired to be full scale on the recorder chart. While still holding the switch in the SET position, adjust the EXPAND SCALE potentiometer on the front face of the panel until the recorder pen reads full scale on the strip chart. Release the switch to the NORMAL position.

4.3.2 ADJUSTING THE ALARM SET POINT AND TIME DELAY -

To adjust the alarm set point, hold the ALARM SET switch in the SET position and adjust the alarm set potentiometer until the meter reads the desired opacity value, then release the switch to the NORMAL position.

The alarm time delay is variable from 0 to a maximum of 30 seconds. Turn the alarm delay potentiometer fully counterclockwise for the 0 position and fully clockwise for the 30-second limit. Since the potentiometer is approximately linear, any point in between can be set by turning the potentiometer knob a proportional amount of the full distance (i.e., 1/4 of the way from zero toward the 30-second maximum would be approximately 7.5 seconds delay, etc.).

5.0 MAINTENANCE

The basic 400A Control Panel is designed to operate unattended for extended periods. Very little maintenance is required although it is suggested that a routine inspection schedule be adopted to monitor the condition of the system since the physical environment will vary from one installation site to another. As part of the inspection schedule, the following items should be checked for cleanliness or serviceability. After initial installation, there should be no need for adjustments to the system unless electronic settings have been disturbed. A factory representative should be consulted for equipment and component failures, warranty repairs, and field service.

There are four levels of maintenance for the transmissometer system:

Level 1 - Routine Maintenance

Level 2 - Parts Replacement with
No adjustment

Level 3 - Parts Replacement with
Adjustment or Recalibration

Level 4 - Factory Repair

LEVEL 1. Routine Maintenance

This level of maintenance is preventative and diagnostic in nature, and should be conducted on a regular schedule determined by environmental conditions at the instrument site. This maintenance, however, should be conducted at least quarterly.

LEVEL 2. Parts Replacement with No Adjustment

At this level of maintenance, certain basic parts and system components can be replaced without adjusting or recalibrating the system.

LEVEL 3. Parts Replacement with Adjustment or Recalibration

This level of maintenance must be done using the instructions and/or schematics of this manual.

LEVEL 4. Factory Repair

This level of maintenance covers all other phases of maintenance to parts that have been disturbed or severe physical damage has been sustained. Under these conditions, factory tooling and adjustment systems should be used to properly effect the repairs.

In this section replacement of the most common routine maintenance items are discussed which is a Level 3 maintenance item.

6.0 SPARE PARTS LIST

The following list, which is arranged by maintenance level category, covers major assemblies and parts that are normally replaced in accordance with routine maintenance procedures, or in the case of equipment component failure. Field repairs by the customer should not be attempted without consulting a factory representative or the equipment warranty will be void. However, upon factory recommendation failed components should be immediately replaced, and the defective item, if salvageable, returned to the factory for repair or replacement.

Items marked with an asterisk (*) are recommended spare parts which will probably require replacement during the normal course of equipment maintenance. The other items listed are recommended to minimize down-time in the event of unexpected component failure.

Level 2, Parts Replacement with No Adjustment

<u>Part No.</u>	<u>Item</u>
007-0179/156	Fuse
007-0179/151	Lamp
007-0179/152	
007-0179/187	L.E.D
007-0179/188	
007-0179/189	

Level 3, Parts Replacement with Adjustment or Recalibration

<u>Part No.</u>	<u>Item</u>
007-0181	Linearizer/Integrator Board
715-0055/107	Panel Meter

7.0 WARRANTY AND FIELD SERVICES

All goods sold hereunder are warranted to be free from harmful defects in material and workmanship and to conform to the specifications, if any, agreed upon between the Purchaser and Thermo Environmental Instruments T.E.I. or in the absence of such specifications, to the catalogued description. This express warranty is in lieu of and excludes all other warranties, express or implied, by operation or law or otherwise. In no event shall CGC be liable for consequential or special damages. T.E.I. agrees to reword or replace, at its option, any defective goods provided we are notified of such defects within ninety (90) days after receipt of the goods, by the Purchaser or such other period as may be mutually agreed upon. Transportation charges on goods claimed to be defective will be allowed only in case defects are found by T.E.I. to exist, and not otherwise. All goods claimed to be defective should be returned to the point of manufacture unless otherwise advised.

7.1 FACTORY SERVICE

Defective equipment not covered by the above warranty will be repaired at the factory on a time and material basis. Equipment received for repair will be inspected and the cost for all requested and/or necessary repairs will be quoted to the customer. No repair work will be initiated without the customer's written authorization to proceed. All shipping charges will be paid by the customer.

7.2 FIELD SERVICE

The costs of maintenance or repair of T.E.I. equipment not covered by the above warranty and conducted on the customer's site will be charged on a time and material basis. The time charges will include travel time to and from the customer's facility and actual on-site service time. Premium labor rates will be charged for overtime, Saturday, and Sunday work. Material charges will include the cost of replacement parts not covered by the warranty and any additional parts or materials requested by the customer for that particular installation. Equipment not repairable on site will be removed by Field Service Personnel upon customer's authorization and returned to the factory for the required work. Repaired equipment will be returned to the customer for reinstallation. Assistance in reinstallation by T.E.I. Field Service Personnel will be charged on a time and material basis. Additional on-site service of the repaired or replaced equipment required within 30 days of the reinstallation will be provided at no extra charge, and will be considered as part of the original service call.

Calibration for a given installation is normally completed at the factory prior to shipment of the instrument. Should the instrument be required at a different location within the customer's facility or at a different facility, where the flange to flange distance is different than that at the initial installation, the instrument must be recalibrated. Assistance in this effort can be provided on a time and material basis. The site must also be wired for power. **FAILURE TO DO THIS WILL RESULT IN ADDITIONAL CHARGES.** Factory personnel should be consulted in the case of unusual installation requirements.

7.3 MAINTENANCE SERVICE

A maintenance contract is also offered by T.E.I. for the inspection and service of installed Transmissometer equipment. Due to the individual nature of each installation, the maintenance contract cost is based on the amount, location, and type of equipment at each site and any local labor requirement conditions. The service includes periodic visits to the installation site to perform all routine maintenance required, to make any system adjustments considered necessary, and to replace or repair faulty or failed parts, that are still under warranty. Equipment under warranty that must be returned to the factory will be repaired and failed parts replaced at no charge.

Equipment or parts failed or damaged not under warranty will be replaced with only a material charge to the customer, provided the repairs can be made on-site. Equipment that must be removed from the site and returned to the factory for repair will be subject to the normal factory service time and material charges. Reinstallation and any further service work on-site will be considered covered under the maintenance contract currently in force.

8.0 INTERFACE PC Board 715-0167 (OPTIONAL)

The Interface PC Board was developed to provide isolated status and isolated 4-20 MA signal to the user's DAS system. There are two versions of this module and are referred to as DASH-1 Version and DASH-2 Version. (Refer to Drawing C715-0167)

8.1 DASH-1 VERSION

The Dash-1 Version is to be used when the Model 400 System includes a Model 400A Remote Display. The Interface Module will provide isolated status inputs to a DAS while causing minimum loading effect on the Model 400 status signal output circuits.

The window dirty and function inputs are parallel connected with the window dirty and function inputs to the Model 400A. The window dirty input (TB-IN 4) will be loaded by LED's in the Model 400A so that the status input to the interface module will be ≈ 1.4 VDC neg. when normal and ≈ 1.4 POS. when window is dirty. The gain of the interface buffer IC4 will insure that IC1 isolator has a sufficient level of voltage applied. A power fail is indicated when both IC1 and IC2 are in the high state (non-conducting). IC1 through IC3 must be connected remotely to a DC power source through pull-up resistors, this power source is normally +5 VDC.

The function input (TB-IN 2) is normally at a +12 VDC level which will override the negative bias applied to buffer stage IC4 pin 6. IC3 will therefore be in a conductive state during normal mode. When the Model 400 unit goes into a calibration mode, the function input level goes to zero volts. With zero volts input, the negative biased buffer stage IC4-6 will shift the IC4-10 output to a negative 15 volts. IC3 will then be in a non-conducting state, indicating a calibration mode status.

8.2 DASH-2 VERSION

The Dash-2 Version is to be used when the Model 400 System has no remote display panel and is to be interfaced to a Model 910 Data Acquisition System or the user's DAS. The interface module will provide isolated status inputs to the DAS. Included as a separate item is an isolating transmitter used to convert the non-linear 0-10V opacity signal to a non-linear 4-20 MA current signal, the output of which is connected to the DAS input.

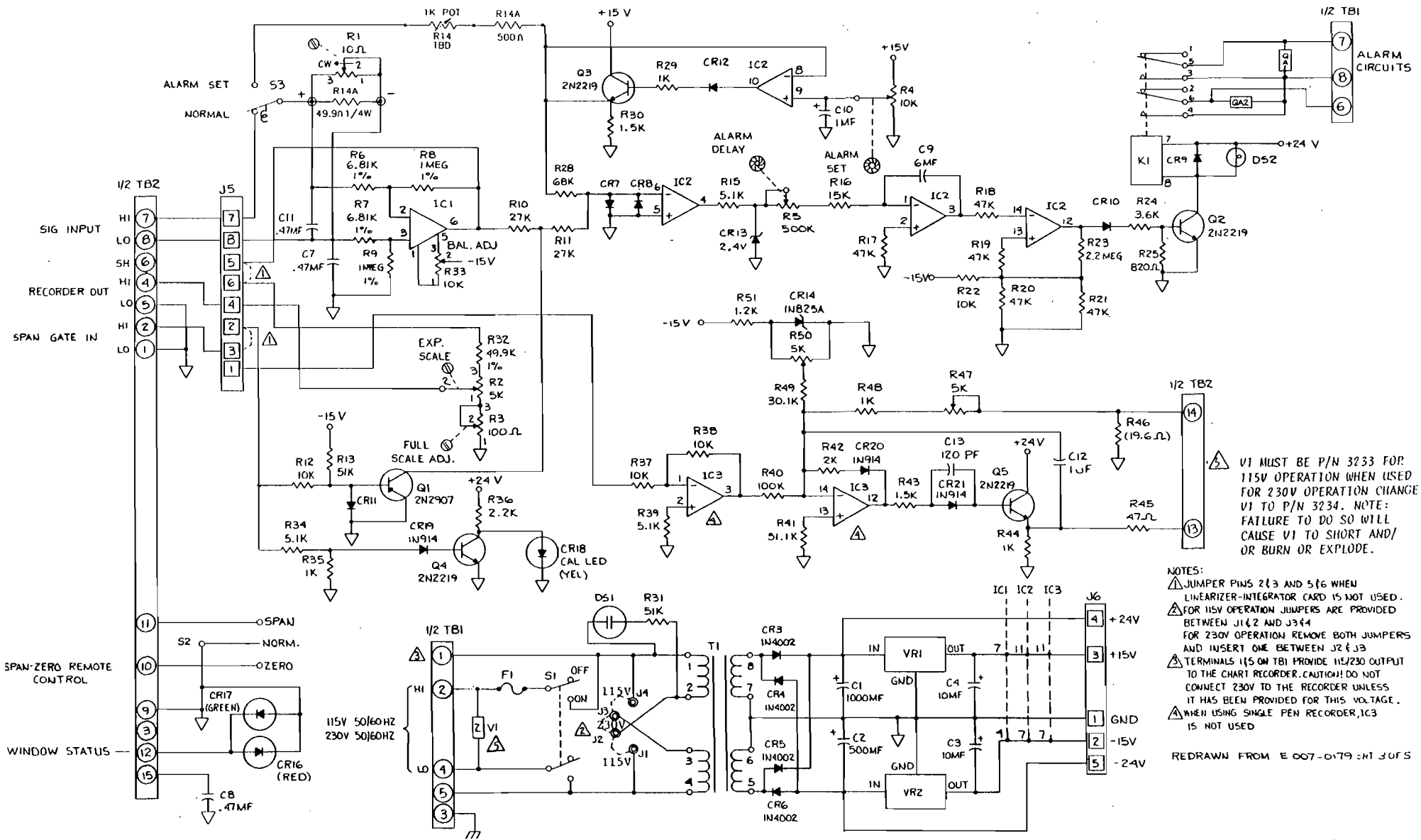
The buffer stages of IC4 and its associated resistive components and power supply are not required and therefore not provided with the DASH-2 Version.

IC1, IC2, and IC3 will provide the status outputs to the DAS when connected to a power source (normally +5VDC) through separate pull-up resistors.

The function and window dirty status lines from the Model 400 are to be directly connected to the input of the interface module. The window dirty input (TB-IN 4) will be at a -15VDC level in normal operation, +15VDC when the window is dirty, and zero volts if ever a power fail occurs at the Model 400 Unit. Therefore, if neither IC1 and IC2 are conducting (high voltage output state), there has occurred a power fail status.

The function input (TB-IN 2) is normally at a +12VDC level which places IC3 in the conducting state. When the Model 400 Unit goes into a calibration mode, the function input level drops to zero volts. With zero volts input IC3 goes to a non-conducting state (high level output) indicating a calibration mode status.

The isolating transmitter supplied for the 4-20 MA conversion required 115VAC 5 watts line power. The unit provides input to output isolation of 600VDC or peak AC. Top accessed screwdriver adjustments provide +/- 15% typical zero and span adjustability for fine in-field calibration.

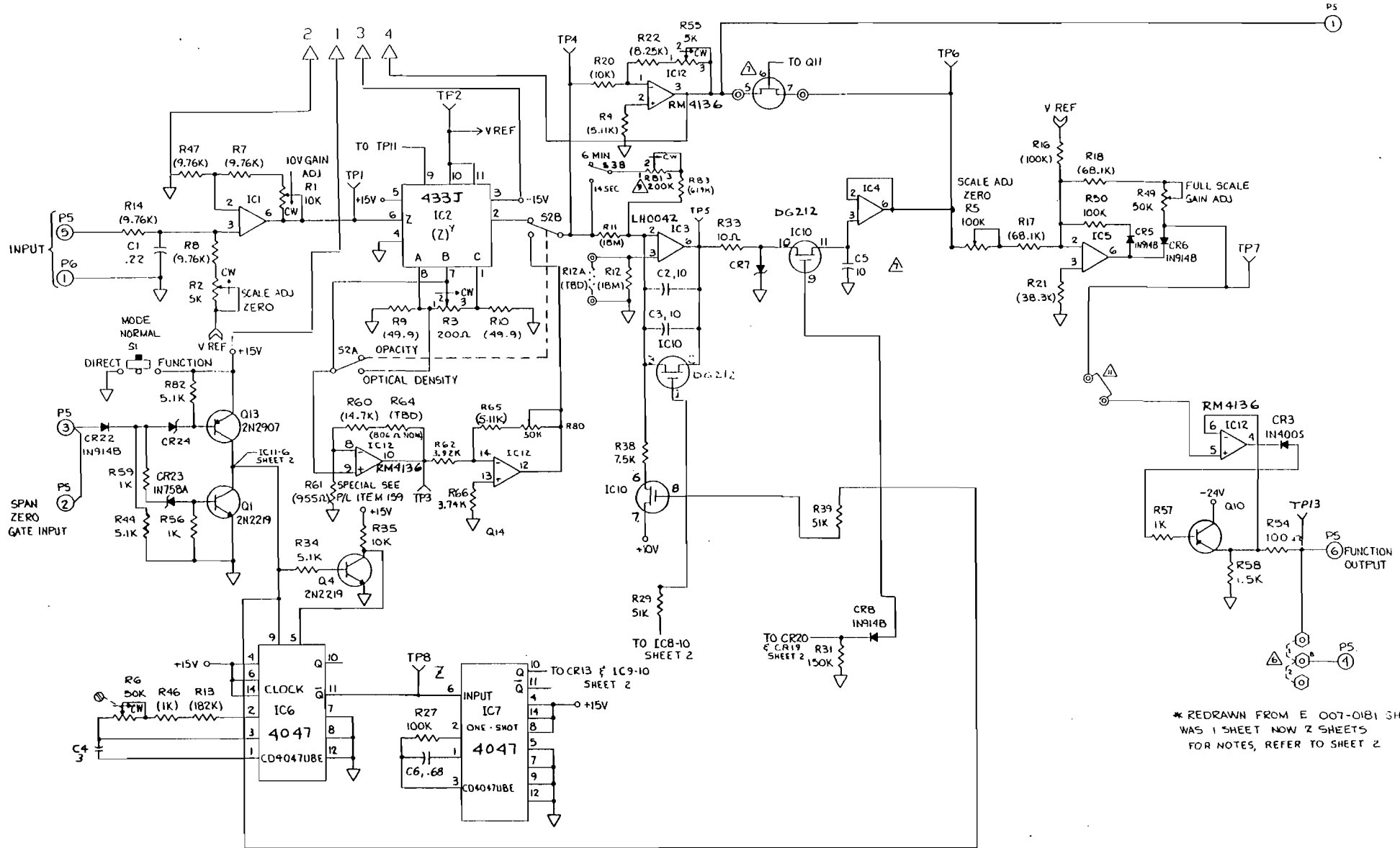


V1 MUST BE P/N 3233 FOR 115V OPERATION WHEN USED FOR 230V OPERATION CHANGE V1 TO P/N 3234. NOTE: FAILURE TO DO SO WILL CAUSE V1 TO SHORT AND/OR BURN OR EXPLODE.

- NOTES:
- ⚠️ JUMPER PINS 2&3 AND 5&6 WHEN LINEARIZER-INTEGRATOR CARD IS NOT USED.
 - ⚠️ FOR 115V OPERATION JUMPERS ARE PROVIDED BETWEEN J1&2 AND J3&4 FOR 230V OPERATION REMOVE BOTH JUMPERS AND INSERT ONE BETWEEN J2&3
 - ⚠️ TERMINALS 1&5 ON TBI PROVIDE 115/230V OUTPUT TO THE CHART RECORDER. CAUTION! DO NOT CONNECT 230V TO THE RECORDER UNLESS IT HAS BEEN PROVIDED FOR THIS VOLTAGE.
 - ⚠️ WHEN USING SINGLE PEN RECORDER, IC3 IS NOT USED

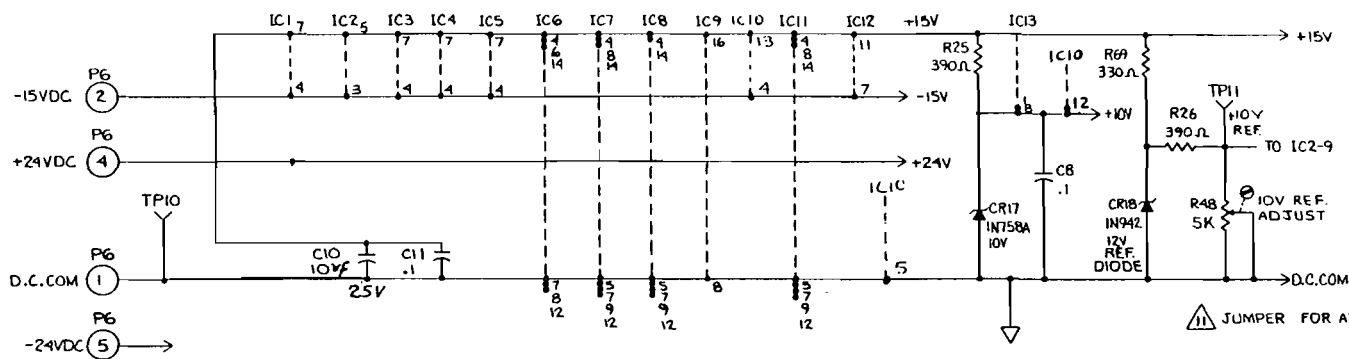
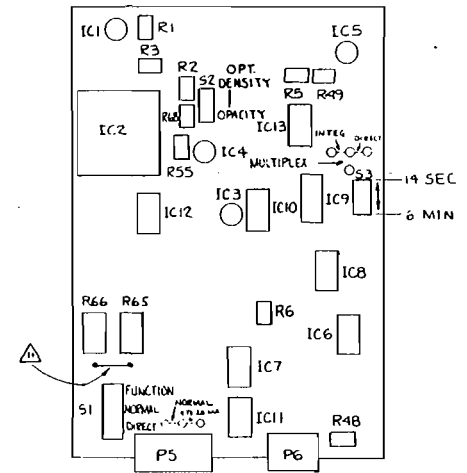
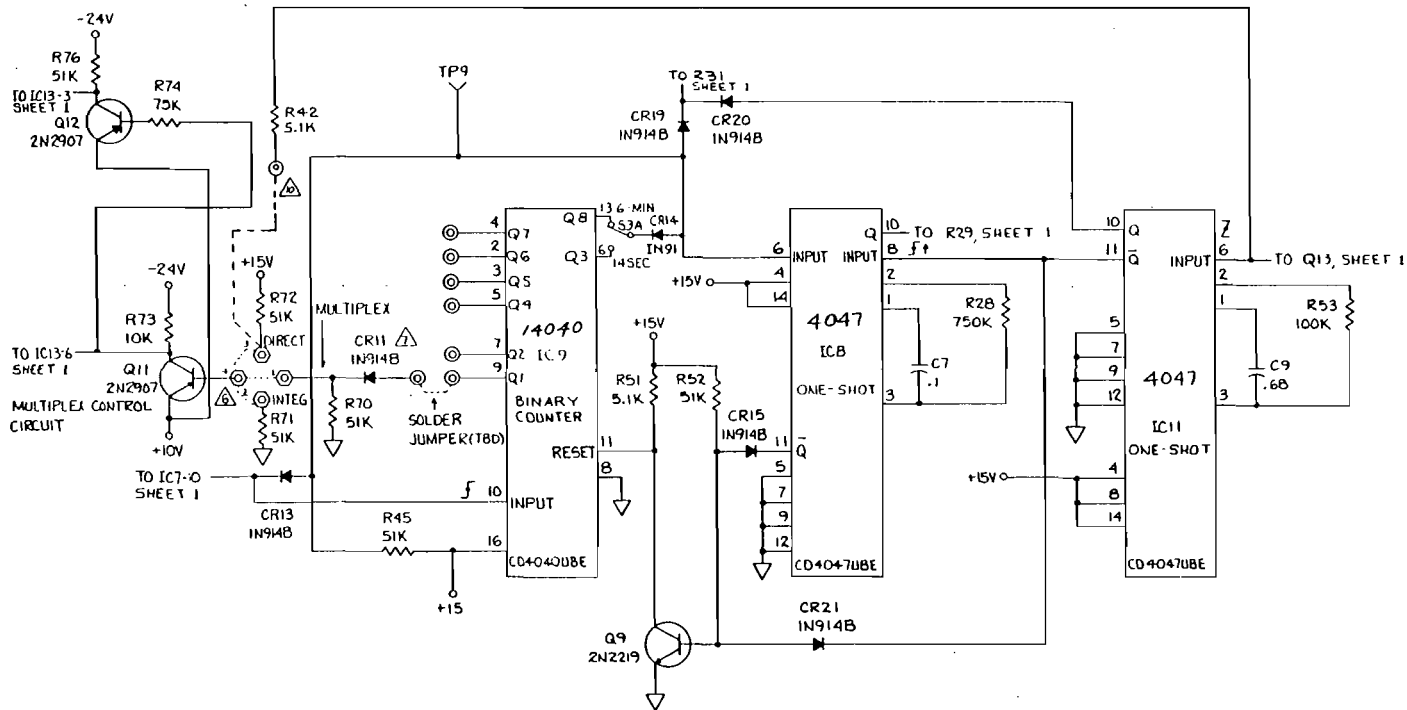
REDRAWN FROM E 007-0179: H1 J015

REMOTE CONTROL UNIT SCHEMATIC



INTEGRATING LINEARIZER P.C BOARD

* REDRAWN FROM E 007-0181 SHT. 1
 WAS 1 SHEET NOW 2 SHEETS
 FOR NOTES, REFER TO SHEET 2



INTEGRATING LINEARIZER P.C. BOARD

Dash 3 & 4

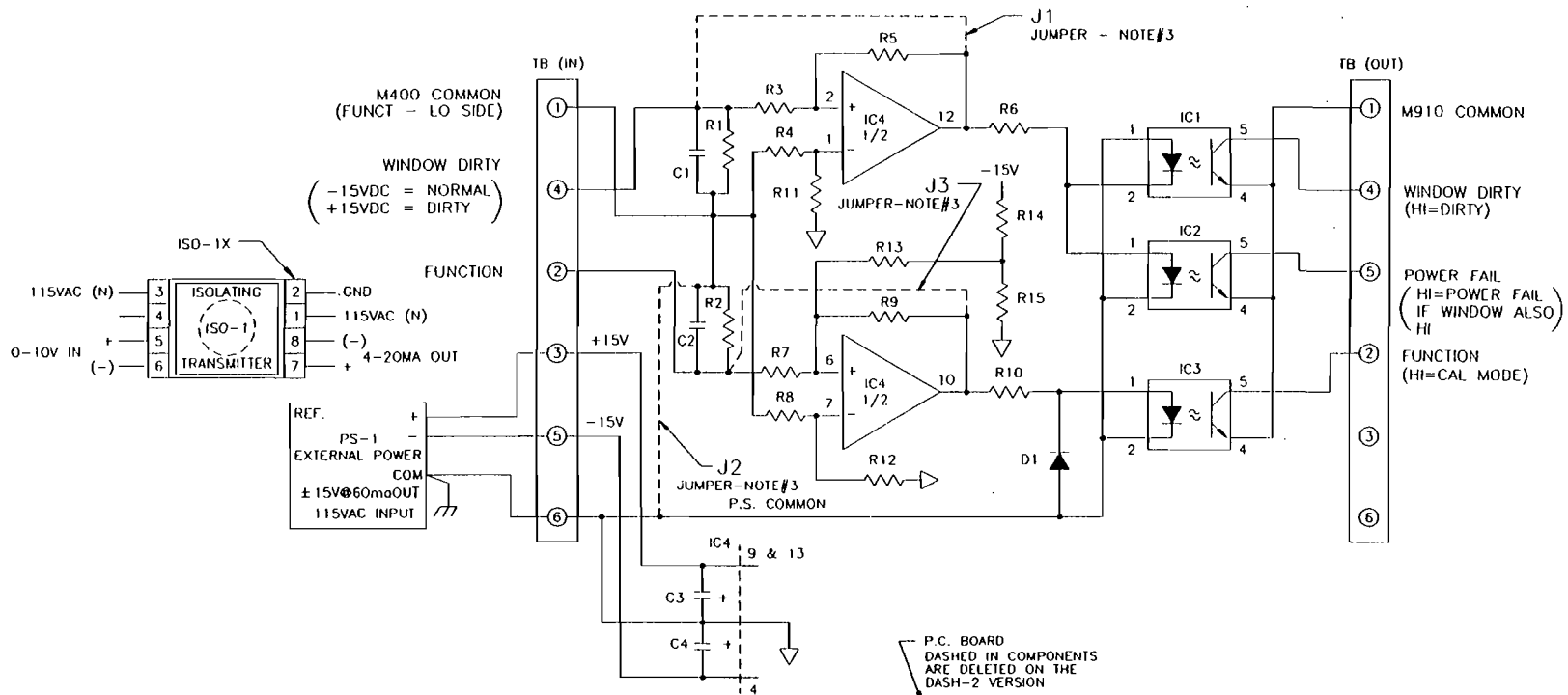
NOTES:

1. ALL RESISTOR VALUES IN () ARE 1%.
2. CAPACITOR VALUES ARE IN MFD UNLESS OTHERWISE NOTED.
3. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE NOTED.
4. () SYMBOL INDICATES SOLDER PAD WITH A HOLE TO ACCOMMODATE A #20 SOLID WIRE
5. () SYMBOL INDICATES JUMPER JACKS PER: ITEM 171 ON PARTS LIST.
- △ PHYSICAL LAYOUT OF JACKS TO BE AS SHOWN BY DOTTED LINES, SPACING MUST BE SUCH THAT JUMPER CANNOT BE INSERTED INTO THE WRONG JACKS.

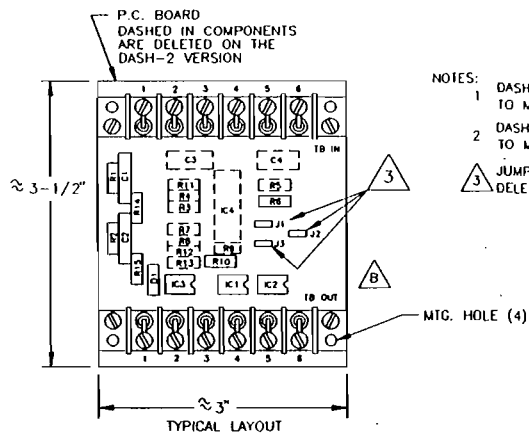
* REDRAWN FROM E 007-0181 SHEET 1 WAS 1 SHEET NOW 2 SHEETS

- △ REMOVE FOR DASH-4 W/2-PEN ONLY
- △ JUMPER FOR DASH-4 W/2-PEN ONLY
- △ USED ON UNITS BUILT AFTER 4-1-78 ONLY
- △ ADD JUMPER FOR SINGLE PEN 4-20MA (BASE PAD OF DELETED TRANSISTOR Q2)

△ JUMPER FOR ALL DASH-4

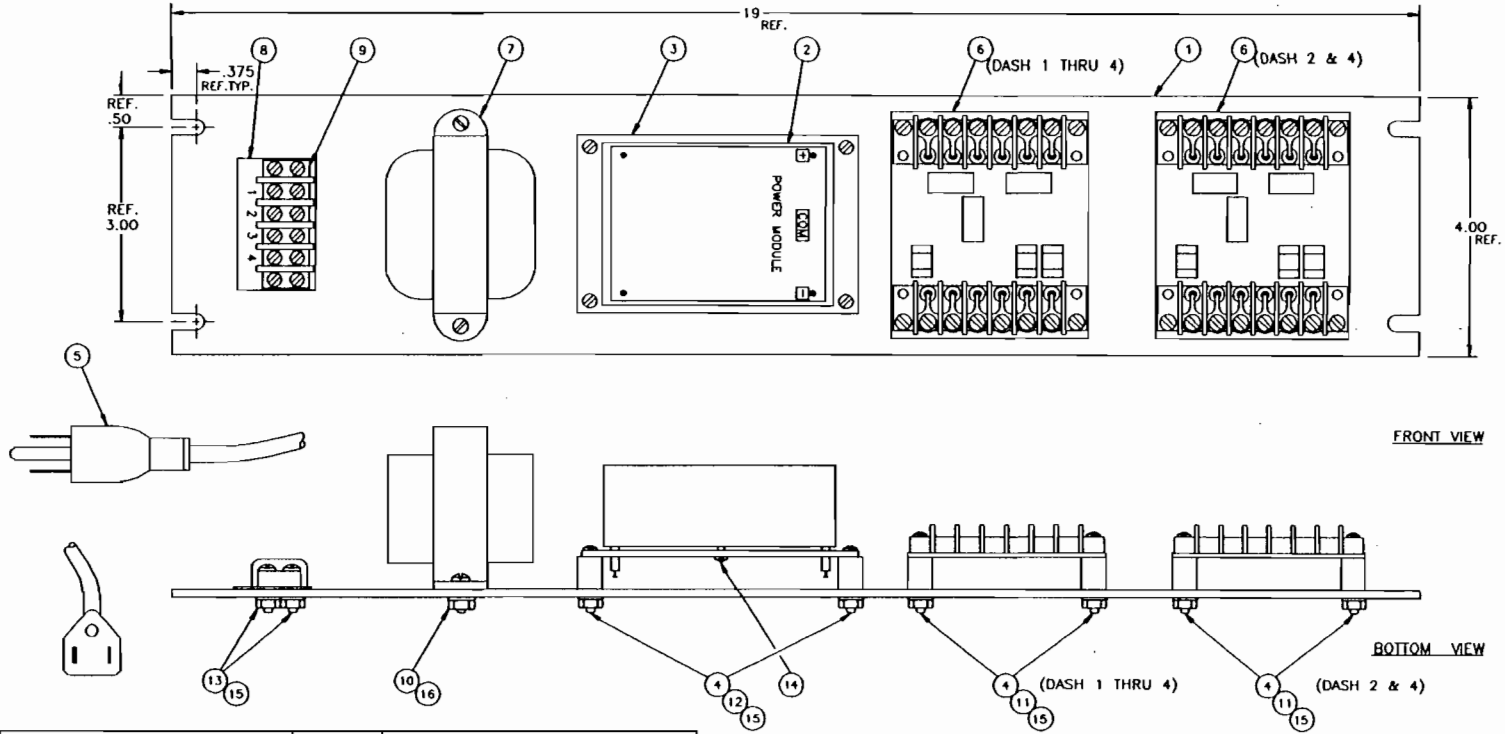


REF.	QTY.	DESCRIPTION	REF.	QTY.	STOCK No.
P.C.B.	1	PC. BOARD 715-0167	P.C.B.	1	2463
ISO 1X	---	SOCKET, 8 PIN, EAGLE SIGNAL P/N 60SR2P06	ISO 1X	1	5229
ISO 1	---	ISOLATOR, ACTION INST. P/N AP4300	ISO 1	1	
PS-1	1	POWER SUPPLY #902 100MA	PS-1	1	4982
TB	2	TERMINAL BLOCK, 6 CKTS	TB	2	6895
R15	1	10K, 5%, 1/4W	R15	---	6008
R14	1	68K, 5%, 1/4W	R14	---	6051
R5	1	2.2 MEG	R5	---	6109
C1,2	2	.01µf, 500V	C1,2	2	8209
P.C.BOARD	1	ICB-935	P.C.BOARD	1	5567
D1	1	1N4002	D1	1	4268
C3,4	2	10µf, 50V	C3,4	---	5617
R6,10	2	330Ω, 5%, 1/4W	R6,10	2	2649
R9,11,12	3	1M, 5%, 1/4W	R9,11,12	---	6104
R,3,4,7,8,13	5	100K, 5%, 1/4W	R,3,4,7,8,13	---	6055
R1,2	2	22K, 5%, 1/4W	R1,2	2	6016
IC4	1	MC1747	IC4	---	4656
IC1,2,3	3	4N26	IC1,2,3	3	2523
REF.	QTY.	DESCRIPTION	REF.	QTY.	STOCK No.
DASH-1 BILL OF MATERIALS			DASH-2 TECO		



- NOTES:
- 1 DASH-1 VERSION IS FOR M400A INTERFACE TO M910. /DAS P/N 9045
 - 2 DASH-2 VERSION IS FOR M400 INTERFACE TO M910. /DAS
 - 3 JUMPERS FOR DASH-2 VERSION ONLY DELETE ON DASH-1 VERSION

M400/M400A TO M910DACS
INTERFACE P.C. BOARD
C715-0167 (SHT#6of6) REV.C

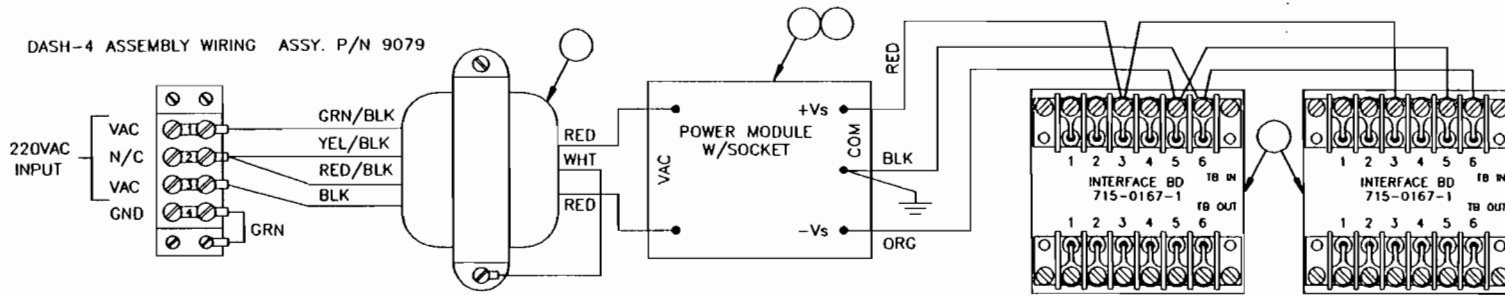


ITEM	DESCRIPTION	PART NO.	QTY.			
			DASH-1	DASH-2	DASH-3	DASH-4
1	PANEL (C715-1031)	3103	1	1	1	1
2	POWER SUPPLY +/-15V SUPPLY	4981	1	1	1	1
3	SOCKET +/-15V SUPPLY	4897	1	1	1	1
4	STANDOFF	9516	8	12	8	12
5	POWER CORD	6675	1	1		
6	INTERFACE BOARD (715-0167-1)	9045	1	2	1	2
7	STEPDOWN TRANSFORMER N6BX	5409			1	1
8	MARKER STRIP	5281	2	2	2	2
9	TERMINAL STRIP	5275	1	1	1	1
10	SCREW #8-32 X 3/8 LG. PAN HD	5858			2	2
11	SCREW #6-32 X 1 1/2 LG. BIND HD	5838	4	8	4	8
12	SCREW #6-32 X 1 1/4 LG. BD HD	8442	4	4	4	4
13	SCREW #6-32 X 3/4 LG. BIND HD	5839	4	4	4	4
14	SCREW #4-40 X 1/4 LG. BIND HD	5814	2	2	2	2
15	LOCK NUT #6-32	8460	16	12	16	12
16	LOCK NUT #8-32	5890			2	2
17	HEX NUT SMALL PATTERN #6-32	5801	4	4	4	4

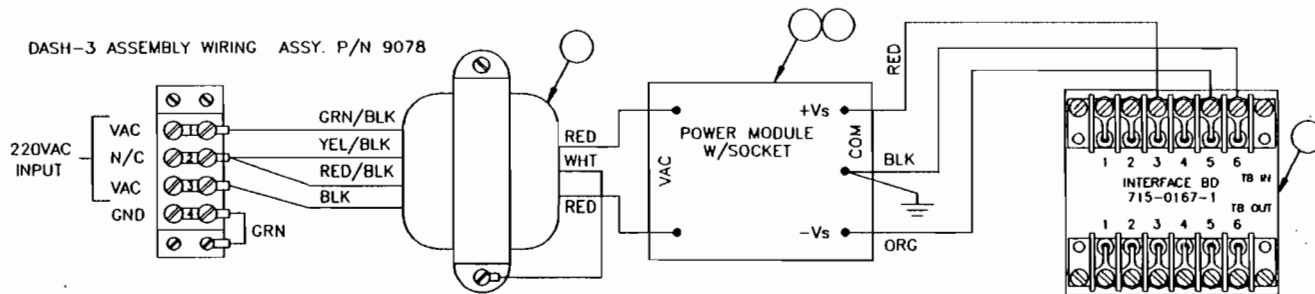
ASSY.	PART No.
DASH-1	9076
DASH-2	9077
DASH-3	9078
DASH-4	9079

INTERFACE PANEL ASSY MODEL 400A
 715-0168 REV D Sheet 1 of 2

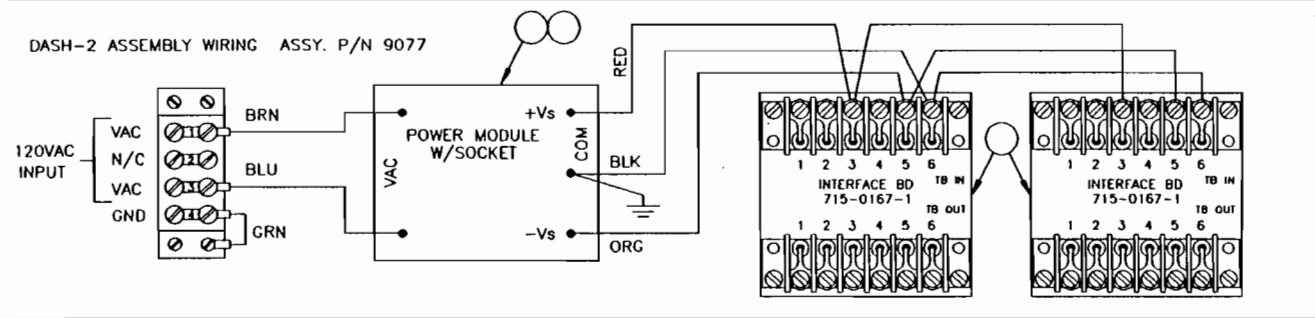
DASH-4 ASSEMBLY WIRING ASSY. P/N 9079



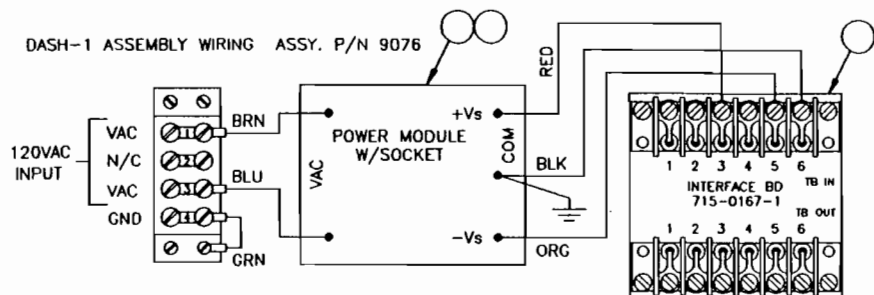
DASH-3 ASSEMBLY WIRING ASSY. P/N 9078



DASH-2 ASSEMBLY WIRING ASSY. P/N 9077

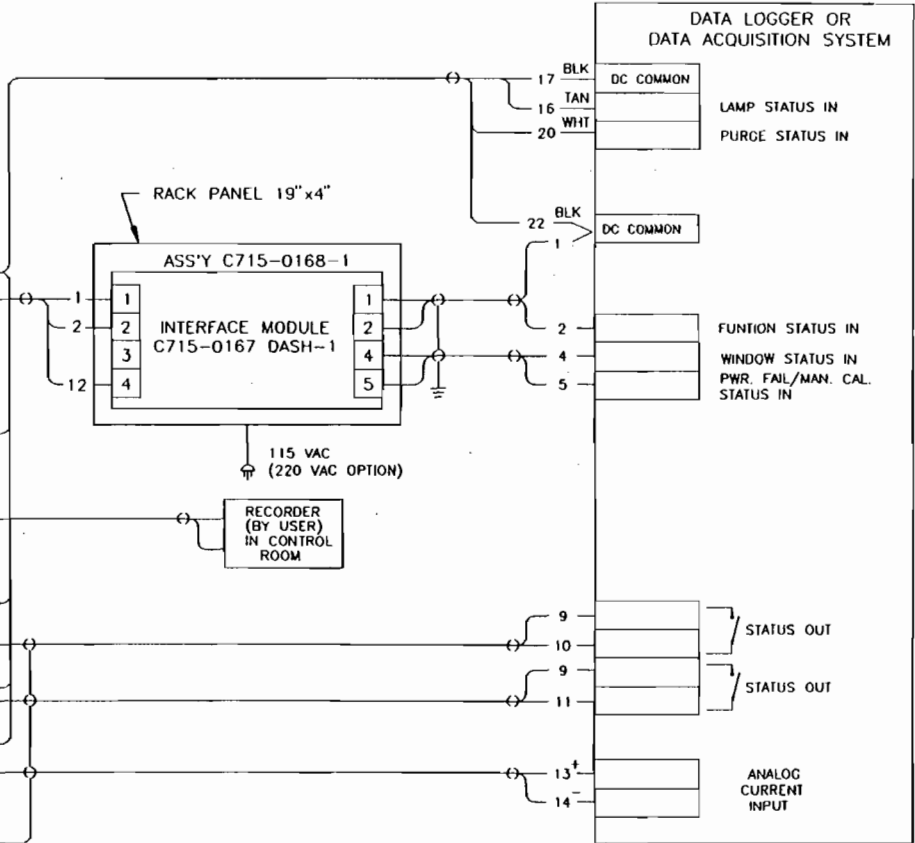
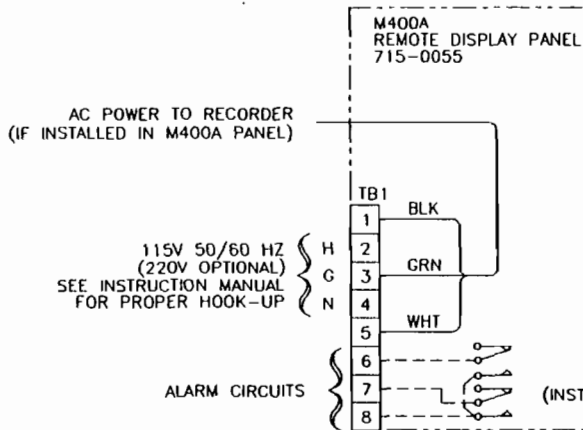
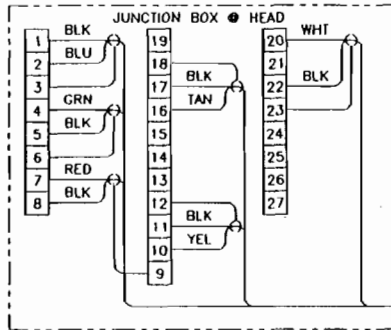


DASH-1 ASSEMBLY WIRING ASSY. P/N 9076



WIRING DIAGRAM
 INTERFACE PANEL ASSY MODEL 400A
 715-0168 REV D Sheet 2 of 2

MODEL 400 TRANSMISSOMETER



INTERCONNECTION
M400/M400A TO DAS
(REFERENCE DRAWING)
C703-0076

MODEL 400B

TRANSMISSOMETER

INSTRUCTION MANUAL



Thermo Environmental Instruments Inc.

**MODEL 400B
TRANSMISSOMETER**

INSTRUCTION MANUAL

PART NO. 7675

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FACSIMILE: (508) 520-1460**

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1.0 INTRODUCTION

This manual describes the Transmissometer System and is to be used as a reference in its calibration, installation, and maintenance. Included in this section is a discussion of the basic Transmissometer principles of operation, together with a definition of the instrument units of measurement and its application in industry. Subsequent sections include a technical and functional description of the basic Transmissometer and the accessories which comprise the Transmissometer System. Calibration procedures, installation methods, and maintenance requirements are also included. Because many installations have special requirements, a factory representative should be consulted to ensure selection of the optimum system and its installation location.

1.1 SYSTEM OPERATION AND DESIGN FEATURES

The basic Transmissometer (U.S. Patent No. 3,885,162), consisting of the Optical Head and Retro Assemblies shown schematically in Figure 1, is essentially a photometer that measures the attenuation of a light beam which traverses an intervening medium twice. The Optical Head Assembly contains an incandescent quartz-halogen light source and a Beam Projection Optical System. The beam is internally chopped to provide a modulated carrier signal. This beam is projected through the medium to the Retroreflector unit, returned through the medium, and focussed by the optical system onto the main detector. The detector has an optical filter which restricts the spectral interval of the system to the visible portion and eliminates errors that can be encountered in the infrared region. This system also contains a unique external chopper which allows the detector system to alternately look across the stack at the Retroreflector Assembly, and then at this chopper for a zero opacity reference and a mid-span opacity value through a cycle that repeats itself 10 times per second. Using this technique the system continuously compensates for light fluctuations, temperature changes, aging and drift of electronics, fluctuations in line voltage, and soiling drift due to dirt accumulation on the Transmissometer window. This technique also makes the instrument insensitive to ambient light.

The Optical Head Assembly Control Panel, located on the back of the Optical Head under a removable access cover, has a meter which directly displays percent opacity. This output is also available for remote readout on a strip chart recorder in an optional Remote Control Unit. When the MODE switch on the control panel is set in the NORMAL position, the signal processing electronics compares the signal from the reference channel with that from the Retroreflector across the medium, and the result is displayed on the meter in measured opacity.

When the switch is in either the ZERO or SPAN position, a zero reference or mid-span signal is generated through the entire electro-optical system and is displayed on the meter. An automatic, solid-state timing circuit provides a zero and mid-span cycle sequentially for a 4 minute period, approximately once every two hours.

Connections are available for manual operation of the Normal, Zero, and Mid-Span output functions from the Remote Control Unit.

The Transmissometer Optical Head and Retroreflector Unit are contained in rugged, cast aluminum housings with a hard, weather-resistant finish. The system is compact, lightweight, and handled easily by one person. The Optical Head is equipped with lift-off hinges between the main case casting and the mounting flange section to allow the main optics and electronics to be removed for ease of installation, coarse alignment of the mounting flange, or maintenance of the system. An alignment window is built into the Optical Head to assist in fine alignment of the system. Alignment is accomplished by using a positively locked, external, threaded, alignment mechanism that is insensitive to vibration.

The Transmissometer is a precision instrument with a calibration error of less than $\pm 3\%$ full scale ($\pm 2\%$ from 0 to 30% opacity) and will operate unattended for prolonged periods of time. The instrument is typically capable of continuous operation for 60 to 90 days between maintenance periods; this assumes normal installation conditions and ambient factors consistent with the Specification summary, Section 2.1.1. Air Valve Unit Assemblies are included in all installations; optional Blower assemblies are required for certain installations which do not have a normally negative draft. (Purge Fail Assemblies are optional for the -5 and -6 units.)

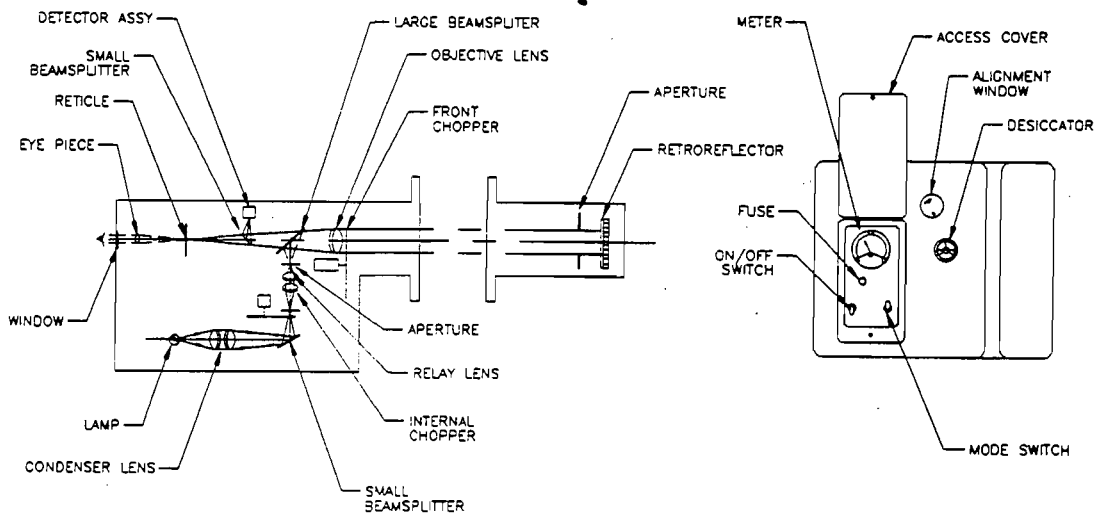


Figure 1
Basic Transmissometer Schematic

* -1 through -4 units only; -5 and -6 units don't have these functions.

1.2 INSTRUMENT UNITS OF MEASUREMENT AND APPLICATIONS

A beam of light, generated in the Optical Head is directed across the stack to the Retroreflector that returns the beam back on itself to the Optical Detector System. Because the beam traverses the stack twice, the Transmissometer is a double-pass instrument and the basic electrical output signal from the detector is proportional to t^2 , the square of the single-pass stack transmittance. Subsequent electronics process and condition the signal with the output appearing as a 0 to 10 milliamper current proportional to $1 - t^2$. Because opacity is defined as $1 - t$, where t is a single-pass transmittance, the scale on the display meter is non-linear. Table 1 shows the relationship between single-pass transmittance t , optical density (O.D.), t^2 , $1 - t^2$, and $1 - t$ (opacity). The graph in Figure 2 shows the relationship between the $1 - t^2$ signal and $1 - t$.

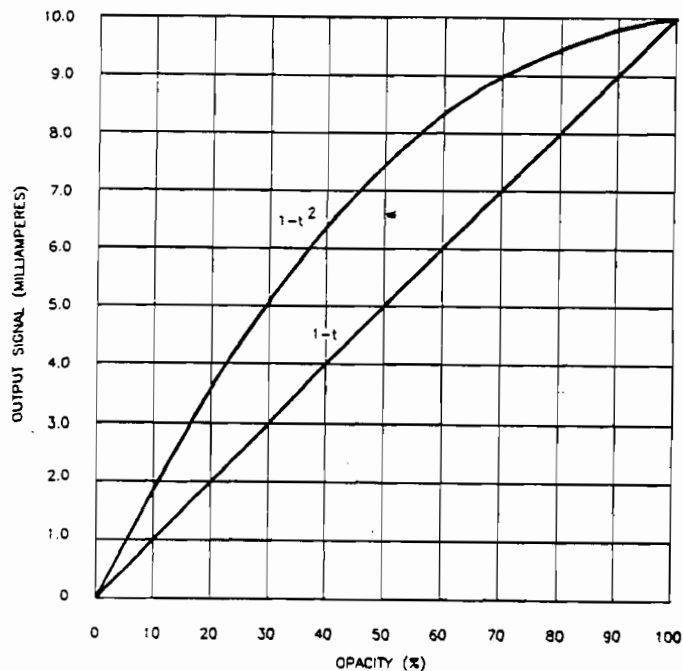


Figure 2

Output Signal vs. Opacity

Single Pass Transmittance t	Optical Density O.D.	Double Pass Transmittance t^2	Signal Relationship $1 - t^2$	Output Signal ma	Opacity $1 - t$
0.00	∞	0.0000	1.0000	10.000	1.00
0.01	2.000	0.0001	0.9999	9.999	0.99
0.05	1.3010	0.0025	0.9975	9.975	0.95
0.10	1.0000	0.0100	0.9900	9.900	0.90
0.15	0.8239	0.0225	0.9775	9.775	0.85
0.20	0.6990	0.0400	0.9600	9.600	0.80
0.25	0.6021	0.0625	0.9375	9.375	0.75
0.30	0.5229	0.0900	0.9100	9.100	0.70
0.35	0.4559	0.1225	0.8775	8.775	0.65
0.40	0.3979	0.1600	0.8400	8.400	0.60
0.45	0.3468	0.2025	0.7975	7.975	0.55
0.50	0.3010	0.2500	0.7500	7.500	0.50
0.55	0.2596	0.3025	0.6975	6.975	0.45
0.60	0.2218	0.3600	0.6400	6.400	0.40
0.65	0.1871	0.4225	0.5775	5.775	0.35
0.70	0.1549	0.4900	0.5100	5.100	0.30
0.75	0.1249	0.5625	0.4375	4.375	0.25
0.80	0.0969	0.6400	0.3600	3.600	0.20
0.85	0.0706	0.7225	0.2775	2.775	0.15
0.90	0.0458	0.8100	0.1900	1.900	0.10
0.95	0.0223	0.9025	0.0975	0.975	0.05
1.00	0.0000	1.0000	0.0000	0.000	0.00

Table 1
Transmittance, Optical Density, Signal, and Opacity Relationships

If the stack diameter at the location of the Transmissometer is different from that at the stack exit, the data accumulated must be corrected. Theoretically, the particulate concentration in terms of mass per unit of volume is constant even though stack geometry and flow velocities vary, therefore, the correction can be determined by applying either of two equations, which are easily developed using the single-path transmittance at each location:

$$\log_{10} t_e = \frac{(l_e)}{(l_m)} \log_{10} t_m \quad (1)$$

or:

$$t_e = t_m \frac{(l_e)}{(l_m)} \quad (2)$$

t_e = the transmittance at the stack exit

t_m = the transmittance at the Transmissometer measurement location

l_e = stack internal diameter at the exit

l_m = stack internal diameter at the Transmissometer measurement location

Equation (2) may also be rewritten in terms of opacities as below:

$$\begin{aligned} \text{or:} \quad (1 - op_e) &= (1 - op_m) l_e/l_m \\ op_e &= 1 - (1 - op_m) l_e/l_m \end{aligned} \quad (3)$$

where:

op_e = the opacity at the stack exit

op_m = the opacity at the Transmissometer measurement location

For conditions where the measurement path length, l_m is greater than the exit path length, l_e , the measurement path opacity op_m , will be greater than the exit path opacity, op_e . The opposite is true when the exit path length is greater than the measurement path length. These relationships may be summarized as follows:

For $l_e < l_m$ or $l_e/l_m < 1$, then $op_e < op_m$

For $l_e > l_m$ or $l_e/l_m > 1$, then $op_e > op_m$

Given the ratio of the two internal diameters, l_e/l_m (stack taper ratio), a corrected calibration curve can be generated (Table 2). A family of correction curves, based on the values for different stack taper ratios, is shown in Figure 3. Stack taper ratio correction and linearization are accomplished at the Remote Panel, which is covered in a separate manual.

If the optional Remote Control Unit and Linearizer are used with the Transmissometer, this correction can be made automatically. Additional information concerning the Remote Control Units is presented in their specific instruction manuals. (The beginning of Section 2 presents a list of Transmissometer accessories which includes the various control panels. For your specific application, consult the factory representative for the appropriate instruction manual.)

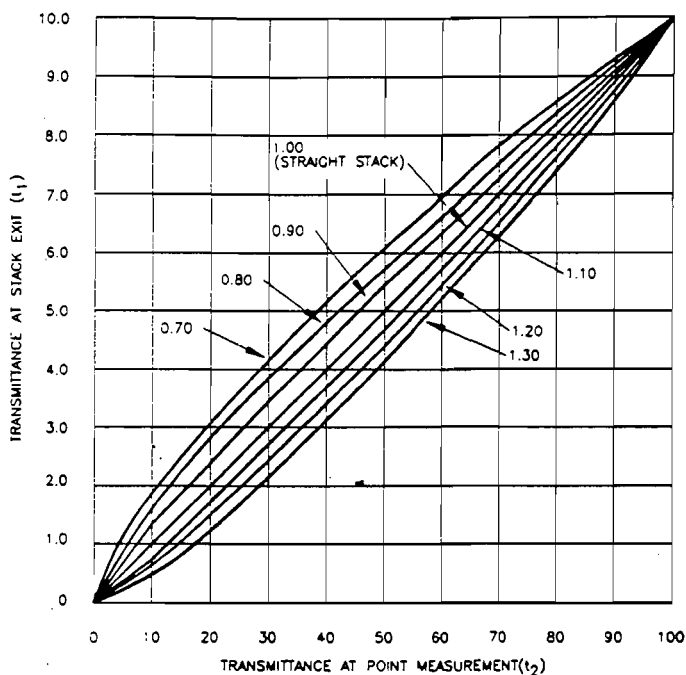


Figure 3. Correction Curves For Different Stack Taper Ratios

Federal and many state and local regulatory agencies specify both opacity and particulate emission limits for various sources, both new and old. The opacity limits are generally between 10% and 20% depending upon the type of source, while particulate emission rates, in terms of pounds or kilograms per hour, vary widely depending upon both the type of particulate and source. If opacity is the controlling parameter, the output of the transmissometer, corrected for any stack taper ratio, can be used directly to determine regulatory compliance.

op _m	op _e											
	0.70	0.75	0.80	0.85	0.90	1.00	1.05	1.10	1.15	1.20	1.25	1.30
0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.05	0.036	0.038	0.040	0.043	0.046	0.05	0.052	0.055	0.057	0.060	0.062	0.065
0.10	0.071	0.076	0.088	0.086	0.091	0.10	0.105	0.109	0.114	0.119	0.123	0.128
0.15	0.108	0.115	0.122	0.129	0.136	0.15	0.157	0.164	0.171	0.177	0.184	0.190
0.20	0.145	0.154	0.163	0.173	0.182	0.20	0.209	0.218	0.226	0.235	0.243	0.251
0.25	0.182	0.194	0.206	0.217	0.228	0.25	0.261	0.271	0.282	0.292	0.302	0.312
0.30	0.221	0.235	0.248	0.262	0.275	0.30	0.312	0.325	0.336	0.348	0.360	0.371
0.35	0.260	0.276	0.292	0.307	0.321	0.35	0.364	0.377	0.391	0.404	0.416	0.429
0.40	0.301	0.318	0.335	0.352	0.369	0.40	0.416	0.430	0.444	0.458	0.472	0.485
0.45	0.342	0.361	0.380	0.398	0.416	0.45	0.466	0.482	0.497	0.512	0.526	0.540
0.50	0.384	0.405	0.426	0.445	0.464	0.50	0.517	0.533	0.549	0.565	0.580	0.594
0.55	0.428	0.451	0.472	0.493	0.513	0.55	0.568	0.585	0.601	0.616	0.631	0.646
0.60	0.473	0.497	0.520	0.541	0.562	0.60	0.618	0.635	0.651	0.667	0.682	0.696
0.65	0.520	0.545	0.568	0.590	0.611	0.65	0.668	0.675	0.701	0.716	0.731	0.745
0.70	0.569	0.595	0.618	0.641	0.662	0.70	0.718	0.734	0.750	0.764	0.778	0.791
0.75	0.621	0.646	0.670	0.692	0.713	0.75	0.767	0.782	0.797	0.811	0.823	0.835
0.80	0.676	0.701	0.724	0.745	0.765	0.80	0.815	0.830	0.843	0.855	0.866	0.877
0.85	0.735	0.759	0.781	0.801	0.819	0.85	0.864	0.876	0.887	0.897	0.907	0.915
0.90	0.800	0.821	0.842	0.859	0.874	0.90	0.911	0.921	0.929	0.937	0.944	0.950
0.95	0.877	0.894	0.909	0.922	0.933	0.95	0.937	0.963	0.968	0.973	0.977	0.980
1.00	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

* To express in percent opacity, move the decimal two places to the right

Table 2
Corrected Opacity Values* For Given Stack Taper Ratio l_e/l_m

For particulates, the relationship between various mass emission rates and optical density is a linearity that must be determined by some appropriate sampling method. If the mass emission rate is the controlling parameter, the remote monitor can also be set to provide the Transmissometer output directly in terms of optical density, where optical density is defined as:

$$\log_{10} \frac{1}{t}$$

The transmissometer is an effective and precise regulatory compliance device on stacks with particulate effluents. If water vapor is present in the effluent, it is transparent to the optical beam and of no effect provided the stack gas temperature is high enough to keep the water in vapor form. If condensed water droplets are present, however, these will be detected and will affect the reading. The transmissometer must, therefore, be used either at a position where the water is in vapor form, or where a suitable sample of the stack effluent has been reheated to vaporize the water.

2.0 TRANSMISSOMETER SYSTEM

The basic Transmissometer, accessories, and options shown in Figure 4 comprise a complete transmissometer system. They are available individually, however, to satisfy particular customer requirements and consist of the following items:

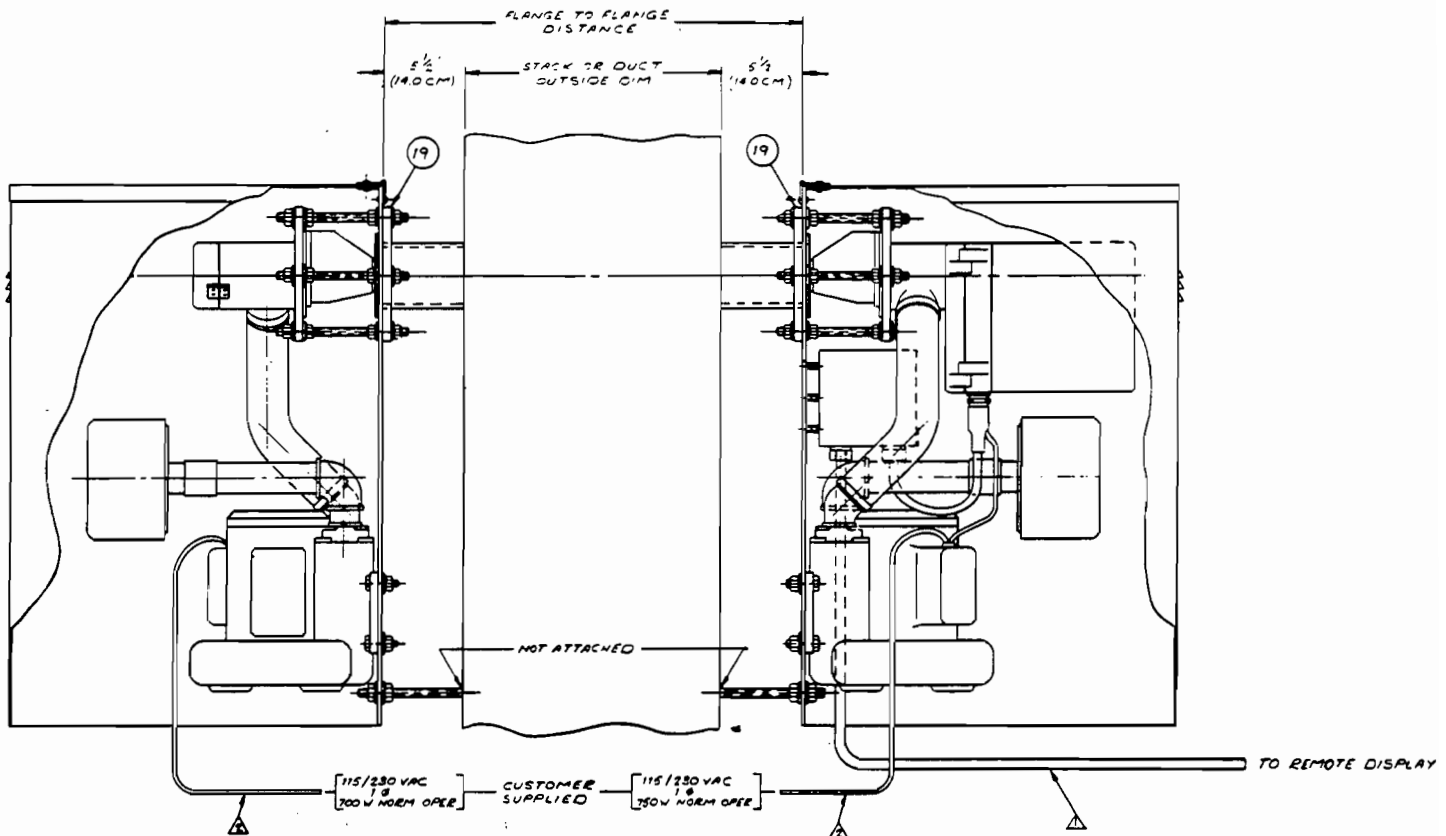
1. Optical Head Assembly, dwg. no. 400-0010
2. Standard Retro Assembly, dwg. no. 400-0011-1
3. Long Range Retro Assembly, dwg. no. 400-0011-2
4. Short Range Retro Assembly, dwg. no. 400-0011-3
5. Blower Assembly, dwg. no. 400-0013
6. Air Valve Unit, dwg. no. 400-0016
7. Calibration Test Kit, dwg. no. 400-0014
8. Maintenance Kit, dwg. no. 400-0015
9. M400A Control Unit, dwg. no. 715-0055
10. M500 Control Unit, dwg. no. 400-0051
11. M700 Control Unit, dwg. no. 400-0052
12. M701 Control Unit, dwg. no. 400-0053
13. Data Cable, dwg. no. 400-0012
14. Mounting Flanges, dwg. no. 400-1003
15. Retro Alignment Tool, dwg. no. 400-0017
16. Purge Fail Assembly, dwg. no. 400-0042

2.1 BASIC TRANSMISSOMETER

The basic Transmissometer includes the Optical Head Assembly, Item 1, and either the Standard Retro Assembly, Item 2, the Long Range Retro Assembly (Figure 5), Item 3, or the Short Range Retro Assembly, Item 4. For stack diameters up to 24 feet (7.3 meters), the Standard Retro Assembly with a plastic or Scotchlite retroreflector should be used. For distances beyond 24 feet, the Long Range Retro Assembly must be used. A series of optional accessories, Item 5 through 20, is also offered and, together with the basic Transmissometer, comprise the total system.

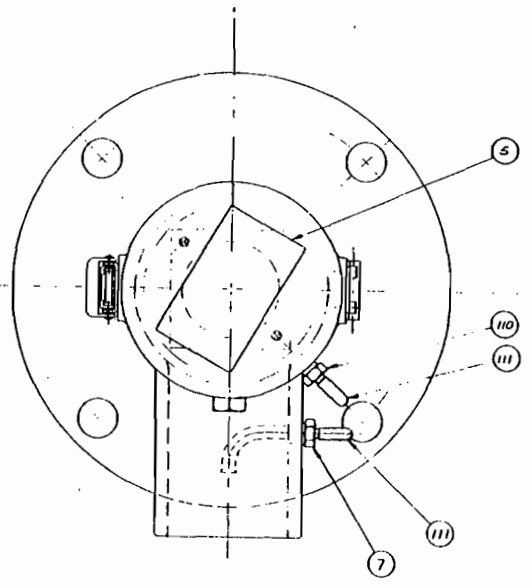
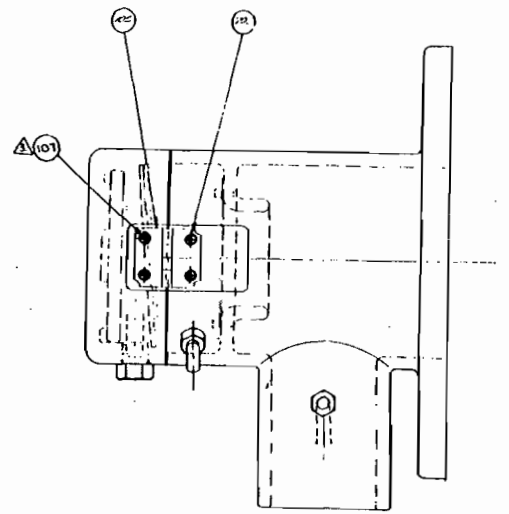
2.1.1 SPECIFICATIONS

The following specifications apply to the Optical Head and Retro Assemblies and include power requirements for the optional Blower Assemblies. These performance specifications meet or exceed those specified by the Environmental Protection Agency (EPA) as listed in the Federal Register concerning Transmissometer Systems for continuous measurement of stack effluent opacity.

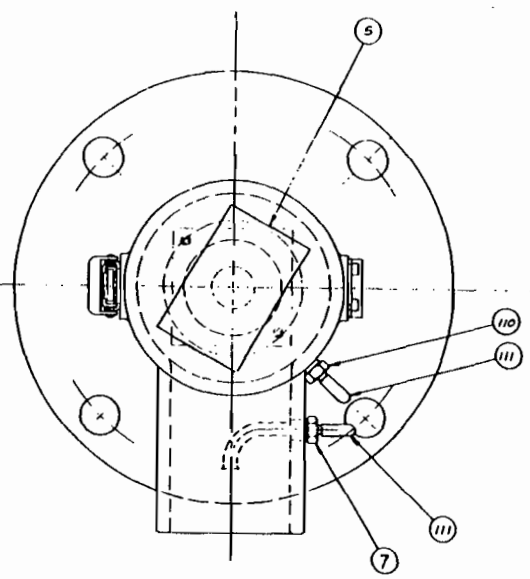
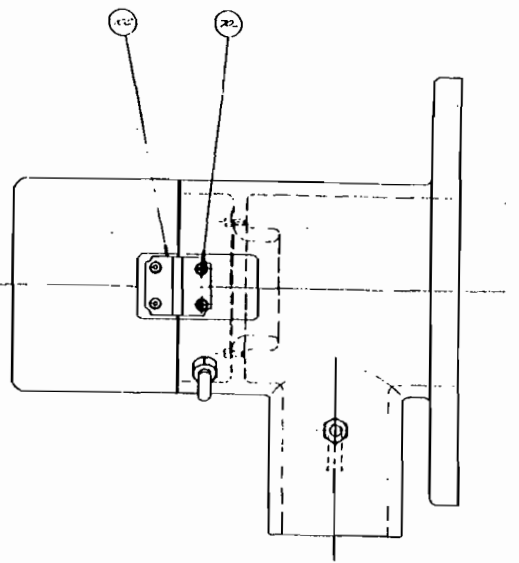


UNIT WITHOUT PURGE FAIL SENSORS

Figure 4
Transmissometer System



DASH 1 1/2



DASH 2

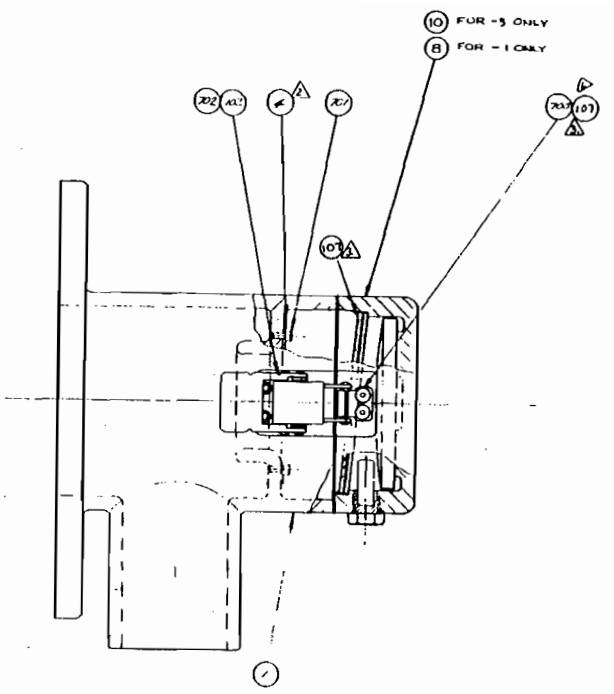
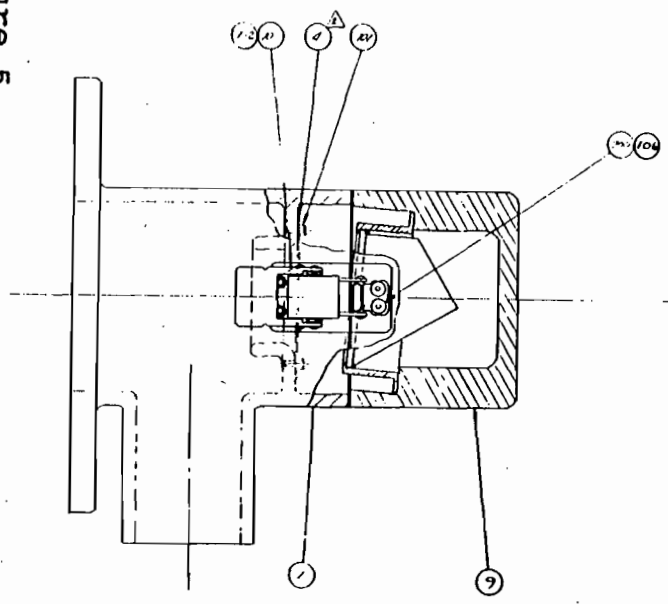


Figure 5



Retro Assembly

DIMENSIONS

Optical Head Assembly	16" L x 9.5 W x 9.5" D
Retroreflector Assembly	8.375" dia. x 8" L

WEIGHT

Optical Head	31 pounds
Retroreflector	6 pounds

ELECTRICAL REQUIREMENTS

Standard System	115/230V, 50/60 Hz, 35W single phase
Optional Blower (ea.)	115V (230V special order), single phase, 700W
Opacity Range	0 to 100%
Calibration Error	≤3% opacity
Zero Drift (24 Hours)	≤1% opacity
Calibration Drift (24 Hours)	≤1% opacity
Spectral Response	500 - 600 nm peak **
Angle of Projection	5 degrees, maximum
Angle of View	5 degrees, maximum
Optical System Aperture	1.5" diameter
Allowable Alignment Drift	+/-0.5 degree
Allowable Line Voltage Variation	105-130/210-260 VAC

RESPONSE TIMES

Normal	5 seconds (factory set)
Maximum	10 seconds
Minimum	1 second
Ambient Light Sensitivity	None

AUTOMATIC CALIBRATION CYCLES

Internal Calibration Data	~ 0.1 second
External Output "Zero" and "Span" Value	~ every 2 hours standard (other values by adjustment)
Ambient Temperature Range	-22 degrees to +125 degrees F
Operational Distance	0 to 50 feet (flange to flange)
Output (as $1 - t^2$)	0 to 10 mA at head or remote location or 4 to 20 mA from Remote Control Unit (t = transmittance)
Output Form	0 to 100% opacity (other expanded ranges available from special Remote Control Unit)
Lamp Life Expectance	30,000 + hours
Alignment	External, threaded with positive locking. Built-in optical alignment check included.
Loss of Transmission Detection	Window status detector is adjustable between 3 to 12% loss. Typically set at the Federal specified value of 4%.

* Expressed as sum of absolute mean value and the 95% confidence interval of a series of tests. Double-Pass.

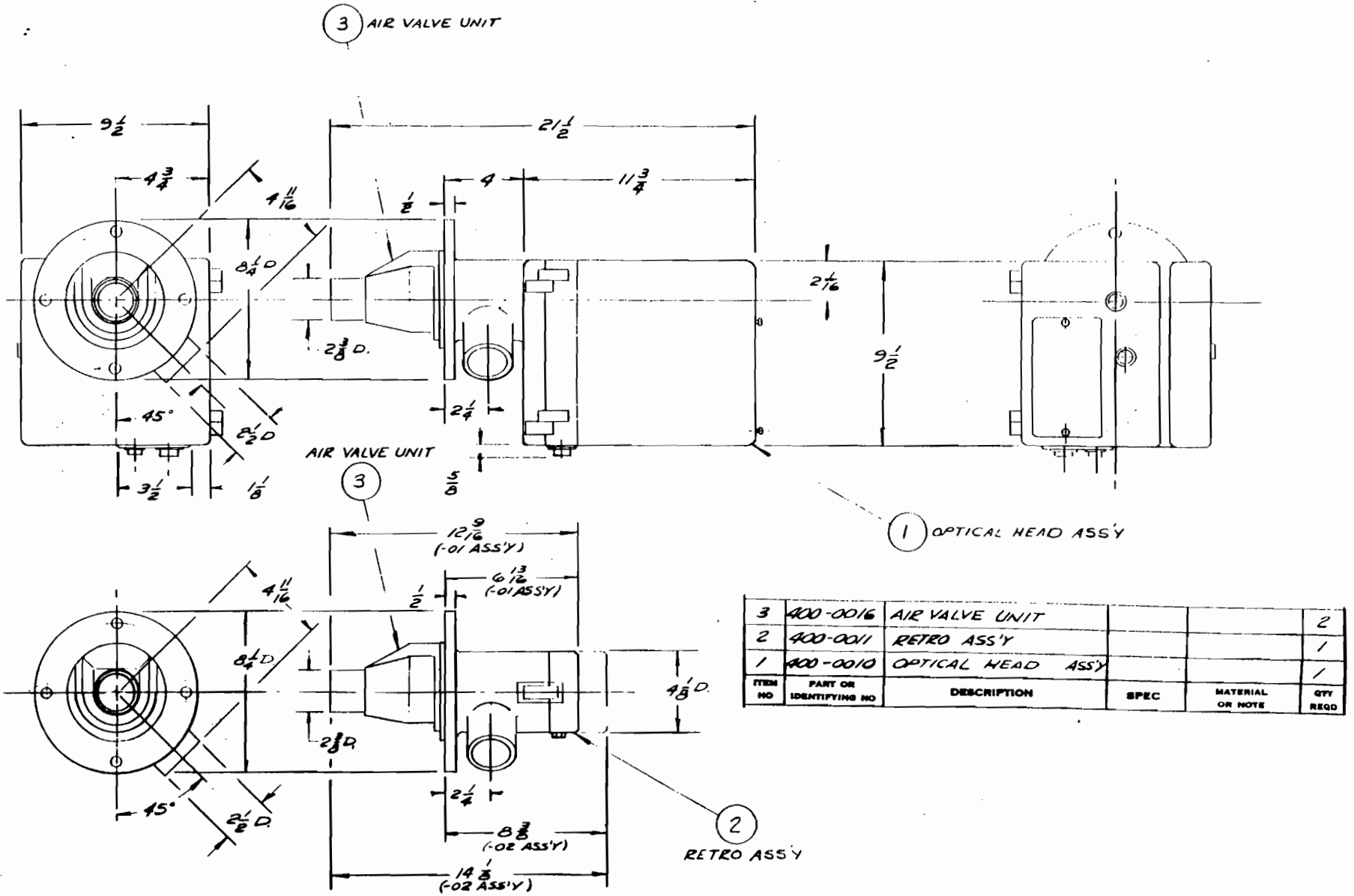
** Responses below 400 nm or above 700 nm shall be less than 10% of the peak response. The mean spectral response is 500 nm - 600 nm.

The physical dimensions of the Optical Head and Retro Assemblies are shown in Figure 6. Opening the captive door on the back of the Optical Head Assembly provides access to the controls on the meter panel which include an ON-OFF switch, percent opacity readout meter, and three-position MODE operation switch. (-1 through -4 units also have an ALARM SET switch and adjustment as part of the controls.) One quick release latch permits access to the front chopper and optical system window for cleaning as necessary. On the bottom of the unit are the input power and output data cable connectors. A 5 foot (1.5 meter) long power cord with mating connector for the Optical Head is standard equipment. This three-conductor cord is bare wire terminated for connection to customer supplied input power. A data cable with mating connector for the optical head is an optional accessory.

The Retro Assembly is a passive unit that requires no electrical connections except for the optional Blower System. A quick release latch located on the side of the unit permits easy access to the retroreflector protective window for cleaning, and for the initial installation or changing of aperture plates for different operating distances. The hexagonal threaded fitting on the bottom of the hinged reflector housing contains a replaceable desiccant cartridge for the Retroreflector cavity and is easily inspected through the protective window. The selection of the correct aperture plate and retroreflector (plastic, Scotchlite, or glass prism type) combination for any given stack flange to flange distance is discussed in Section 3.0, Basic Transmissometer Calibration and Checkout.

Optical Head, Retro, and Air Valve Unit Assemblies

Figure 6



2.1.2 OPTICAL SYSTEM DESCRIPTION

The Optical Head Assembly contains the optics and the signal processing electronics, while the Retro Assembly contains only a passive Retroreflector. The two units are mounted on opposite sides of an exhaust stack to monitor the opacity of the stack effluent. These items and their interior components are shown schematically in Figure 7.

The Optical Head projects a uniformly illuminated beam of light with a two degree angular width. The retroreflector unit is placed in the center of this projected image and intercepts a uniformly illuminated portion of the beam by means of a fixed optical aperture. (The apertures are selected as a function of the operating distance.) Because of the properties of the retroreflector, this uniformly illuminated portion of the projected light beam is returned directly to the main electro optical unit regardless of the retroreflectors angular orientation. The intensity of the returned beam is compared with a reference signal derived from the main beam before it traverses the stack.

The reference signal comes from one of the reflective portions of the large chopper mounted in front of the projection objective.

The intensity of the beam returned to the optical head is sensed by a silicon detector, filtered to approximate a photopic response. The color filter selected for this purpose limits the system response to the visible portion of the spectrum. A field stop and field lens are incorporated into the Detector Assembly. The field stop limits the detector field of view by 2 degrees and the field lens ensures that all the signal light that enters the objective within the allowable field of view is uniformly placed on the detector.

The return light is divided between the detector and the visual alignment optics, which consist of a cross hair reticle and an eyepiece. The alignment optics are used to precisely align the Optical head Assembly within the Retro Assembly across the stack and also provide a means of visually checking alignment during normal maintenance.

2.1.3 SYSTEM BLOCK DIAGRAM

The block diagram in Figure 8 illustrates how the Transmissometer electro-optical system functions. An output signal of 0 to 10 milliamperes is generated as a function of the measured opacity. The system light source is a quartz-halogen lamp of approximately 20 watts. The light produced by this lamp is modulated at 1000 Hz. This light is reflected off a beamsplitter through the objective lens and the front chopper, then is projected across the stack to the Retroreflector. The beam is returned through the stack, passes through the front chopper, objective lens, and beamsplitter, and is then reflected off a small beamsplitter into the detector.

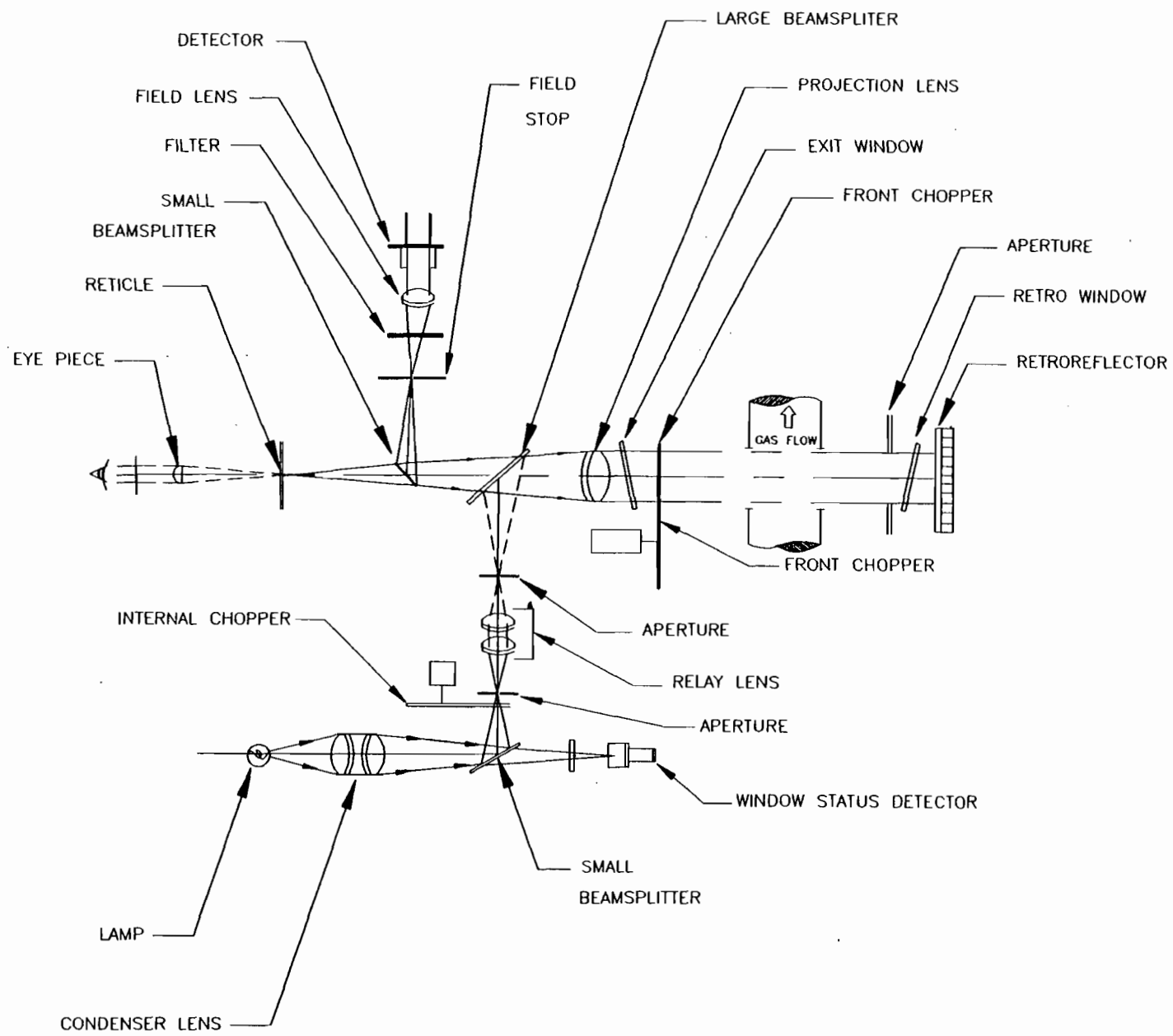


Figure 7

Optical System Schematic

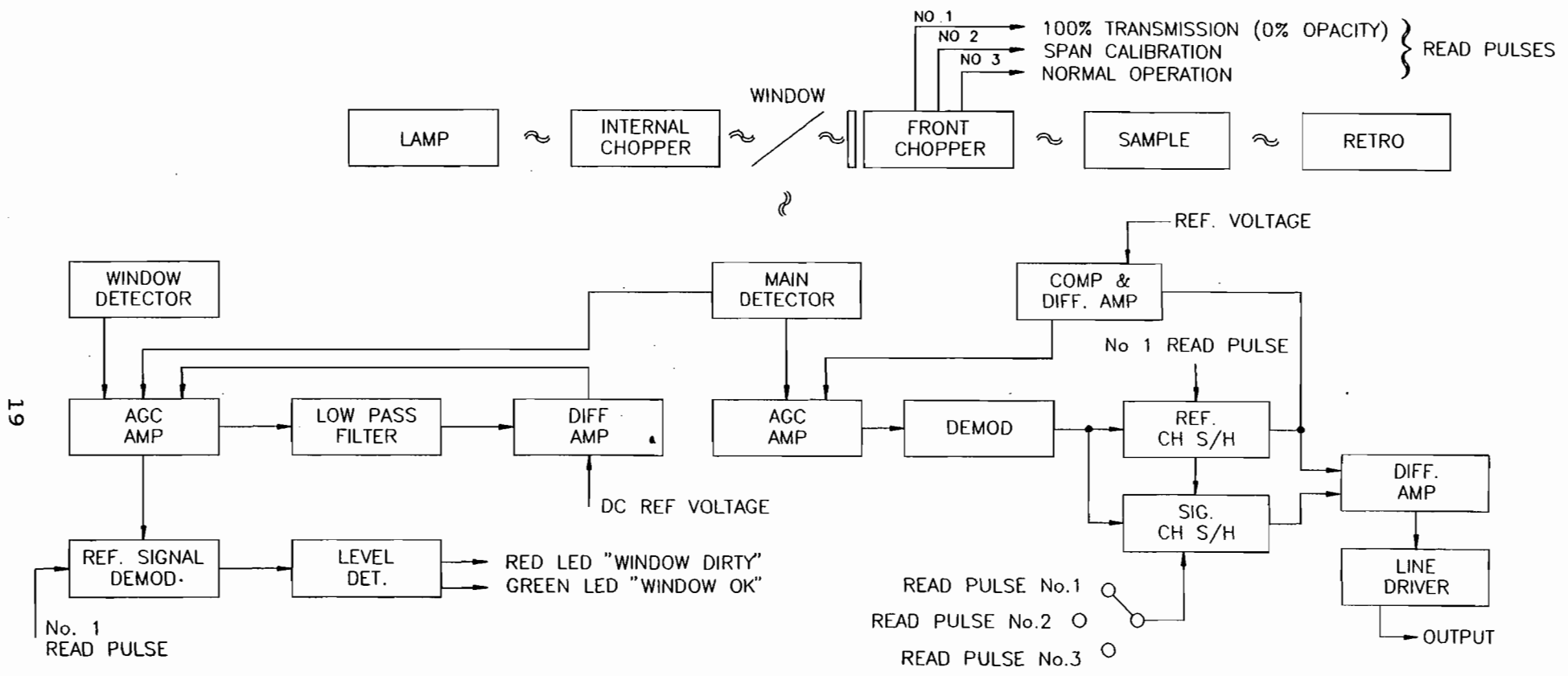


FIGURE 8
 TRANSMISSOMETER ELECTRO-OPTICAL SYSTEM BLOCK DIAGRAM

The reflecting side of the front chopper is shown in Figure 9. As the front chopper rotates, a reference section, a mid-span section, and then an open section alternately appear before the exit window. The light from the source is reflected from the reference and mid-span sections back through the optical system into the detector which generates the reference and mid-span signals. The electronics, using a feedback system combined with a subtraction process, compares the ratio of the stack signal returning from the Retroreflector to the signal received from the reference portion of the front chopper.

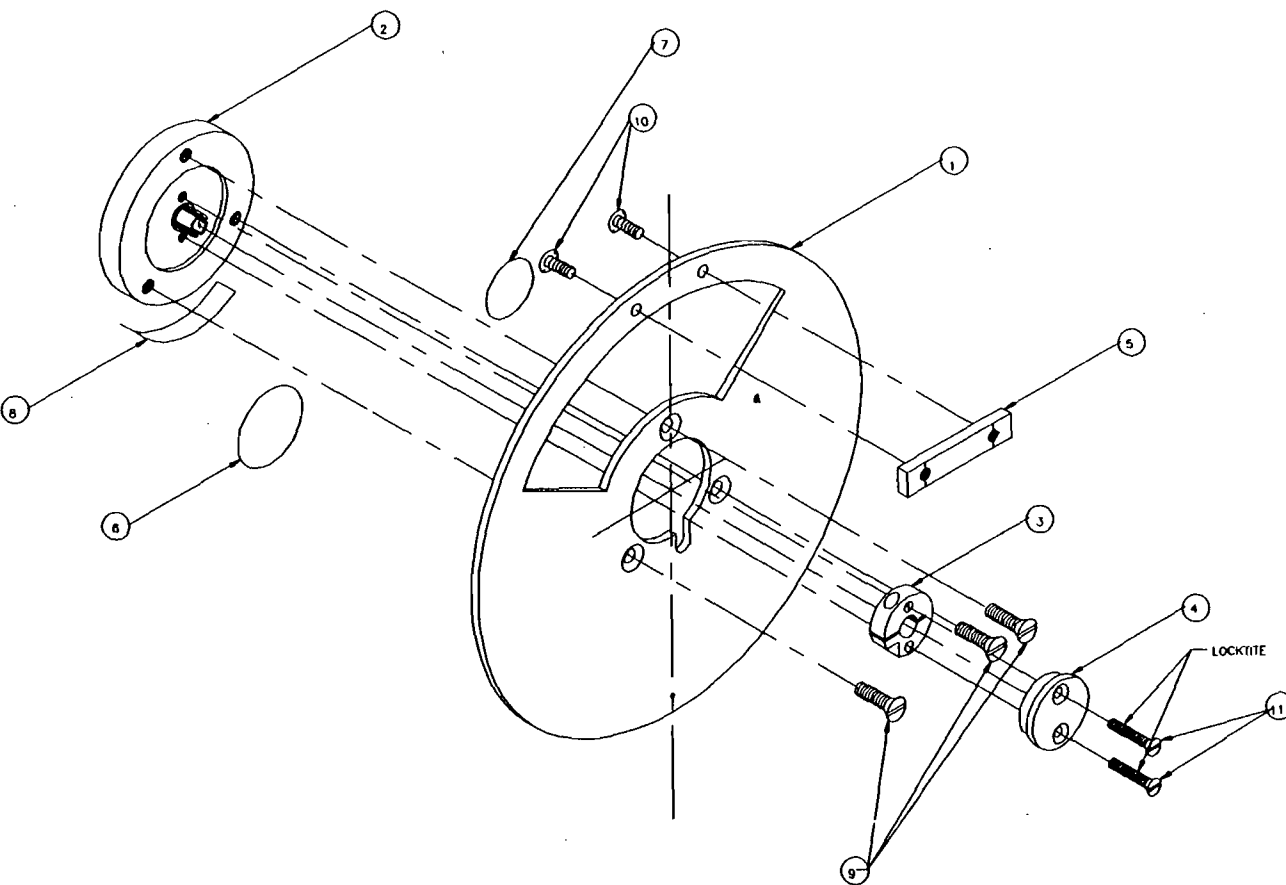
The signal that passes through the automatic gain control (AGC) amplifier is demodulated and then divided into two separate sample-and-hold channels, one for the reference and one for the stack signal. The signal in the reference sample-and-hold channel represents the amount of energy reflected from the zero opacity reference section of the front chopper. This signal is compared with a reference voltage and is fed back to the AGC amplifier which maintains the output of the reference channel at a constant level. The gain that is set by the zero reference channel is maintained for all subsequent portions of the stack signal that pass through the ACG amplifier and demodulator. Because of this feedback process, the signals from the two sample-and-hold circuits can be fed to the differential amplifier. This output, through the driver, becomes the ratio of the stack signal to the reference signal.

A measure of the amount of dirt accumulation on the Transmissometer window is achieved by comparing the light amplitude returned from the reference portion of the front chopper to a signal amplitude derived by observing the light source directly. The light source amplitude is sensed by the window reader detector. This detector is matched in characteristics with the main detector.

When the system is placed in the SPAN mode, either through its automatic timer or by manual operation, the system takes the ratio of the signal from the mid-span section of the front chopper to the signal from the reference section.

When the system is placed in the ZERO mode, both the reference channel sample-and-hold circuit and the signal channel sample-and-hold circuit sample simultaneously when the reference section of the front chopper is in front of the exit window. The electronics thus process two signals of the same level which results in a zero differential signal and represents 0% opacity on the output.

The output of the electronics for the SPAN, ZERO, and NORMAL modes is electronically connected to the Remote Control Unit through the Data Cable. The SPAN, ZERO, and NORMAL mode functions can also be activated from the Remote Control Unit.



MATERIAL LIST				
ITEM	PART NO.	DESCRIPTION		QTY.
1	1070	CHOPPER DISK		1
2	1071	CHOPPER HUB		1
3	1074	CLAMP		1
4	1075	CHOPPER END STOP		1
5	1073	BALANCE WEIGHT		1
6	1089	REFERENCE TAPE		1
7	1090	SPAN TAPE		1
8	1091	TIMING TAPE		1
9	5848	10-32 X 1/2 FLAT HD. S.S MACH. SET		3
10	8419	8-32 X 5/16 FLAT HD. S.S MACH. SET		2
11	8420	6-32 X 7/8 FLAT HD. S.S MACH. SET		2
12	5661	LOCKTITE		

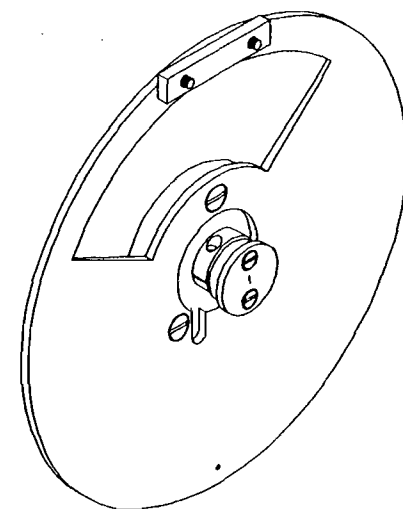


Figure 9. Front Chopper Assembly Reflecting Side

2.1.4 ELECTRICAL SYSTEM

The electrical system consists of the power supply board, the main electronics board, two motors, one quartz-halogen lamp, two silicon photodetectors, four connectors, and a Meter Panel Assembly. The electronic circuits perform the proper mathematical functions to develop an output current proportional to opacity. The system electrical schematic, including the power supply, is shown in Figures 10A and 10B.

B1, in Figures 10A and 10B is the high speed chopper motor which modulates the light at a carrier frequency of 1000 Hz. B2 is the low speed chopper motor which drives the three sectioned front chopper at approximately 600 rpm. The particular section that is in front of the light beam is determined through logic using phototransistors OT2 through OT4.

2.1.4.1 POWER SUPPLY BOARD

The Power Supply Board (Figure 11) uses prime power of 230/115 VAC, 50/60 Hz and establishes the following voltages at the listed pins of the board:

Pin C	+24 VDC Unregulated
Pin E	+15 VDC Regulated
Pin F	-15 VDC Regulated
Pin H	-24 VDC (held to -24 VDC max.)
Pin D	+9.1 VDC Regulated
Pins J, K, L, M	DC Common
Pin A	5 VAC
Pin B	5 VAC Return

The prime power is connected to Pins Z and U from the meter panel POWER ON-OFF switch and fuse. For 115 VAC operation, the jumper plugs on the power supply board are connected between jacks J1 and J2 and between jacks J3 and J4. For 230 VAC operation, only one jumper plug is used which connects jacks J2 and J3. This system of jumpers ensures 115 VAC on Pins S to V and Pins R to Y if the prime power is either 230 VAC or 115 VAC. The 115 VAC on these pins is used to drive the two chopper motors, B1 and B2.

Transformer T2 provides the 5 VAC that appears on Pins A and B of the connector and is used to power the quartz-halogen lamp, L1.

Diodes CR1 through CR4 form the full wave rectifiers for the positive supply voltages. Capacitor C1 is a coarse filter which reduces the ripple on the full wave voltage. The voltage at Pin C is therefore unregulated +24 VDC coming directly from the filter capacitor, C1.

CR5 is a constant current diode which supplies the base current for Q1. If the output voltage attempts to exceed the zener voltage of CR7, base current is allowed to flow through Q3 which turns Q3 "on", shunting away the base current from Q1. Thus, the output of the emitter of Q1 is a controlled voltage determined by the zener voltage of CR7 and the adjustable divider of R9 and R3. R7 controls the operating point of CR7 and ensures that it is in the proper conduction area. C3 is the output filter capacitor. The negative regulator works in a similar manner; however, both Q2 and Q4 transistors are of the PNP type to accommodate the negative voltages. Resistors R1 and R2 limit the current in the output and protect the series pass transistors Q1 and Q2, should there be an inadvertent short circuit of the output.

R9 prevents the voltage at Pin H from exceeding -24 volts. CR10 forms the positive voltage necessary for the field effect transistor operation.

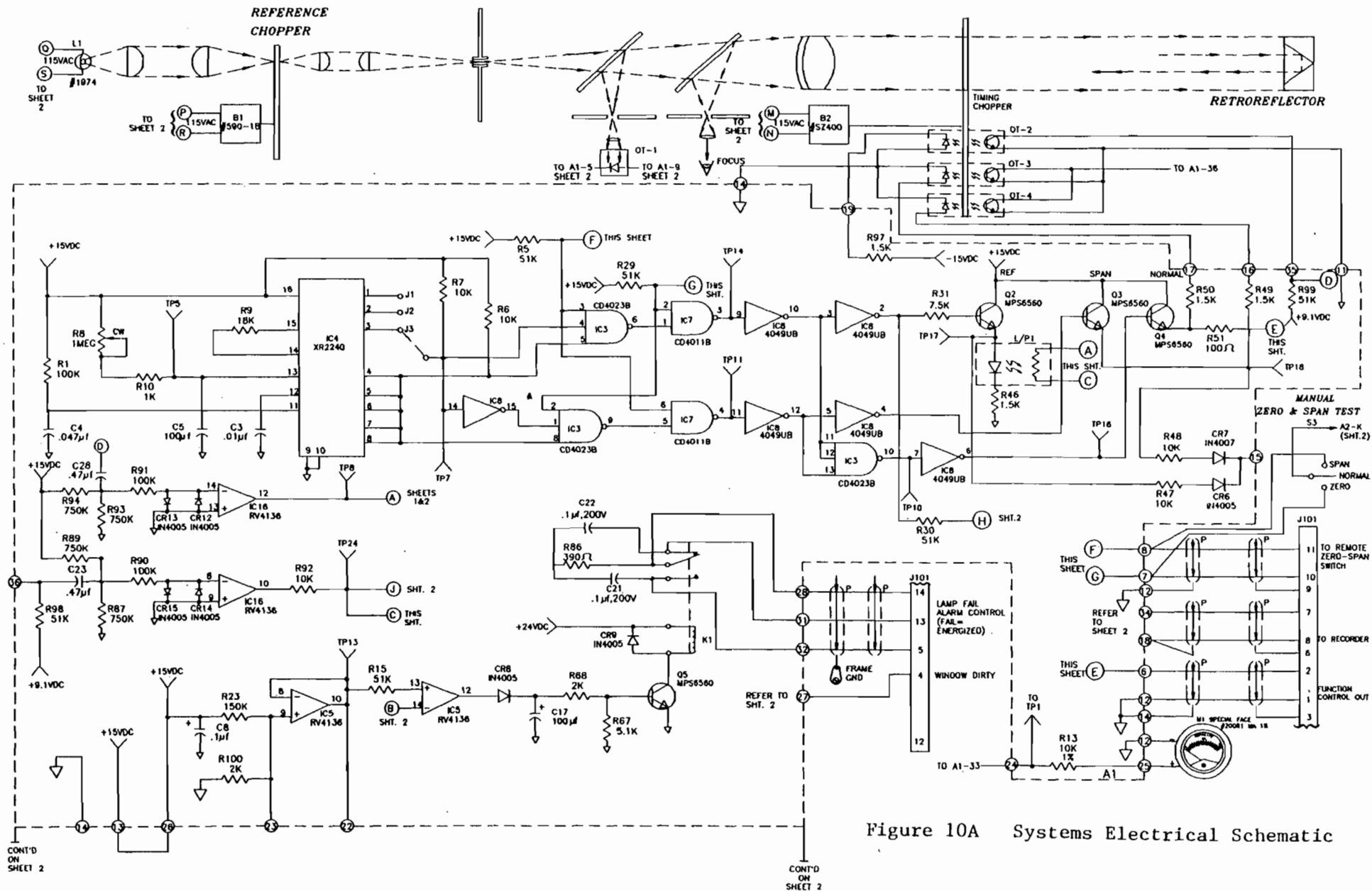


Figure 10A Systems Electrical Schematic

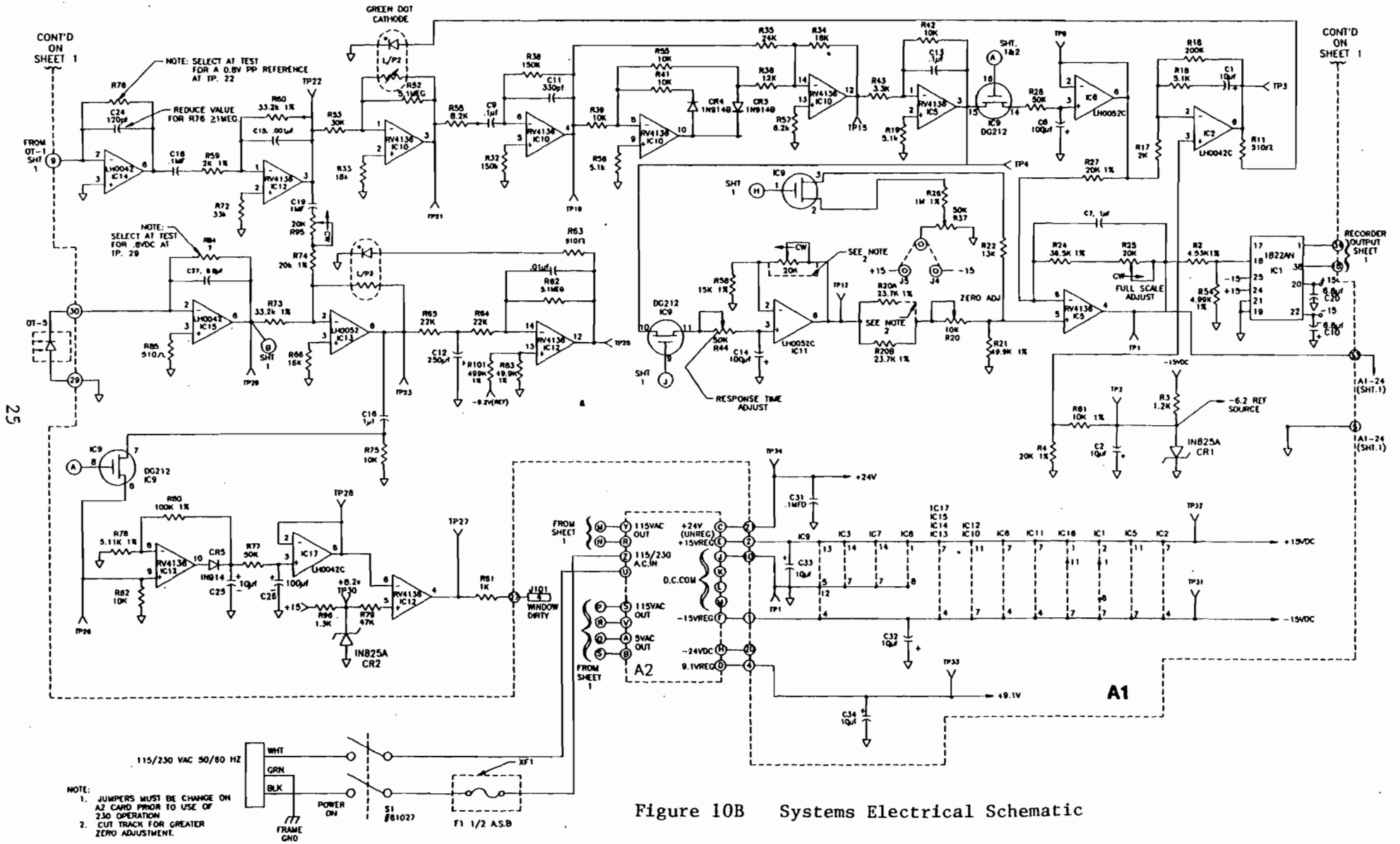
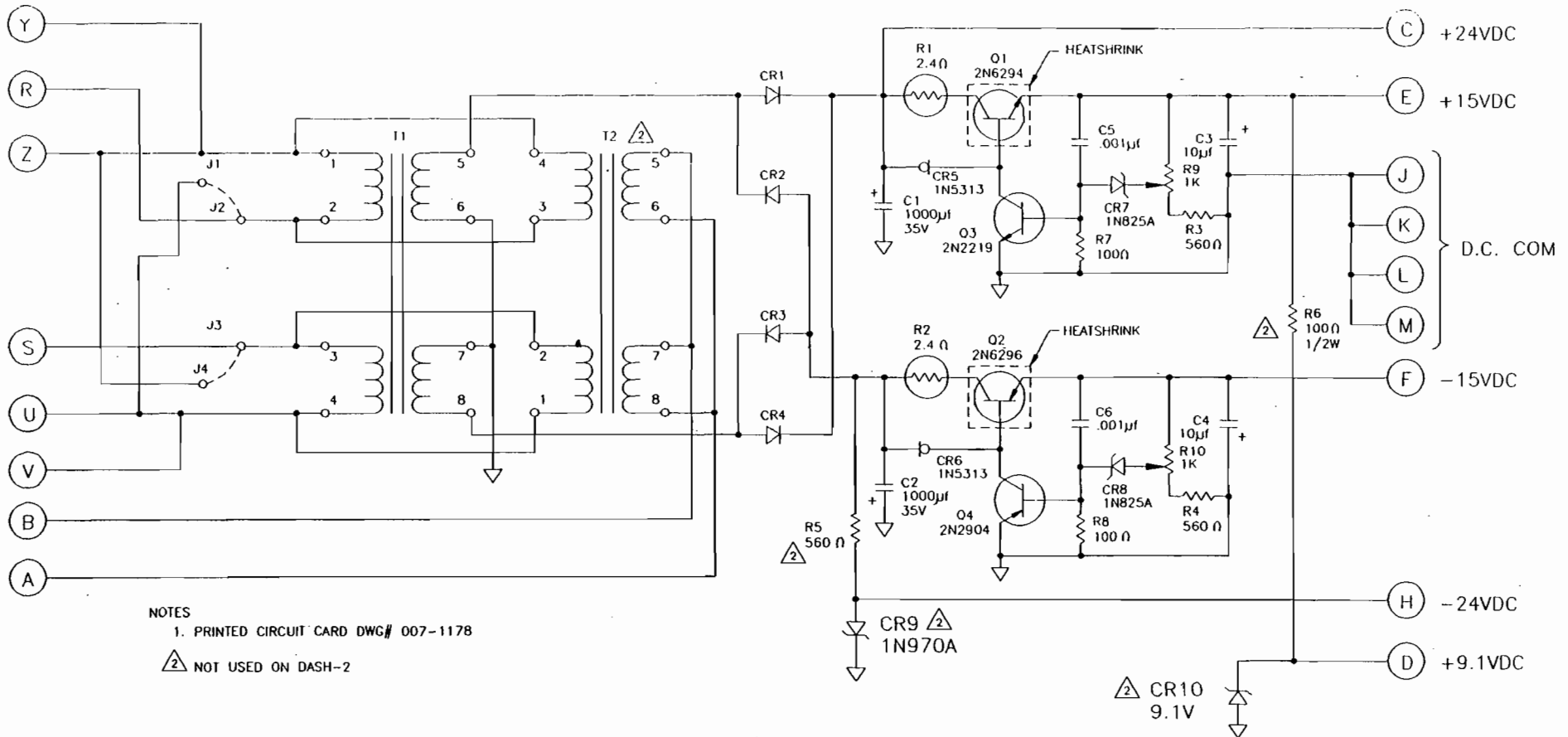


Figure 10B Systems Electrical Schematic



NOTES
 1. PRINTED CIRCUIT CARD DWG# 007-1178
 ⚠ NOT USED ON DASH-2

Figure 11
 POWER SUPPLY BOARD

2.1.4.2 MAIN ELECTRONICS BOARD

The Main Electronics Board is shown in Figures 10A, 10B, 12A, and 12B. The main signal path for the system begins with OT1, a silicon photodiode. The current produced in this diode is a function of the light received by the optical system. This current enters the board at Pin 9, is amplified in IC14, and then further amplified through the next two stages. Under normal operation, TP19 will show a 1000 Hz amplitude modulated waveform. The next four stages modify this waveform to produce a full wave rectified, signal that appears on TP15. The signal on TP4 is an inverted and filtered version of the signal that is seen on TP15.

At TP4 the signal is divided into a reference and a signal path. The reference path is through a field effect transistor portion of IC9, Pins 14, 15, and 16. The signal path goes through another field effect transistor portion of IC9, Pins 1, 2, and 3. The intensity of the reference section of the front chopper is measured at TP6. The reference signal is then compared with a reference voltage created by CR1 and voltage divider R4, R81. IC2 then amplifies the difference between the reference signal and the reference voltage and feeds this difference to L/P2 which modifies the gain of the second stage to maintain the signal on TP6 at a constant level. The signal field effect transistor portion of IC9 is turned on when the open section of the low speed chopper is in front of the exit window.

This signal, as seen at TP12, represents the energy level returning from the Retroreflector.

The control signals for the reference field effect transistor and the signal field effect transistor can be seen on TP8 and TP24, respectively. These signals are an amplified and level-shifted version of the signal present on OT2 through OT4. In normal operation, OT3 is used and OT4 is not. When the system is placed in the SPAN mode, OT4 is on and OT3 is off. The reference signal on TP6 is compared to the signal present on TP12 in the differential amplifier made up of 1/4 of IC5. The output of this amplifier is converted to an isolated current in voltage to current converter IC1. This current leaves the printed circuit board on Pins 34 and 38. It also leaves the system on Pins 7 and 8 of J101, through the Data Cable to the Remote Control Unit. (The output of the differential amplifier also leaves the board at Pin 33 and returns to the board on Pin 24). Here it passes through R13 and out to the opacity meter located on the front panel.

The Signal Processor Board also contains all the electronics required for automatic calibrate cycle (ZERO and SPAN operations). They are located in the upper left-hand corner of the printed circuit board section of the schematic in Figures 10A and 10B.

IC4 is a large scale integrated circuit which contains a multivibrator and a counter. The counter is decoded through IC7 and IC3 to turn on transistors Q2, Q3, and Q4 one at a time for the proper period. With a normal setting of resistor R8, the system will first turn on Q3 for two minutes, and then turn Q4 back on for normal operation. The system will go through this calibrate cycle approximately every two hours. These three transistors control the field effect transistor, Pins 9, 10, and 11 of IC9, and determine which signal is to be sampled: stack, mid-span, or reference.

The window status circuitry is shown in the lower left hand corner of Figures 10A and 10B. It is designed to give a status signal to the Remote Control Unit when the Transmissometer exit window requires cleaning. The chopper surfaces must be cleaned at the same time.

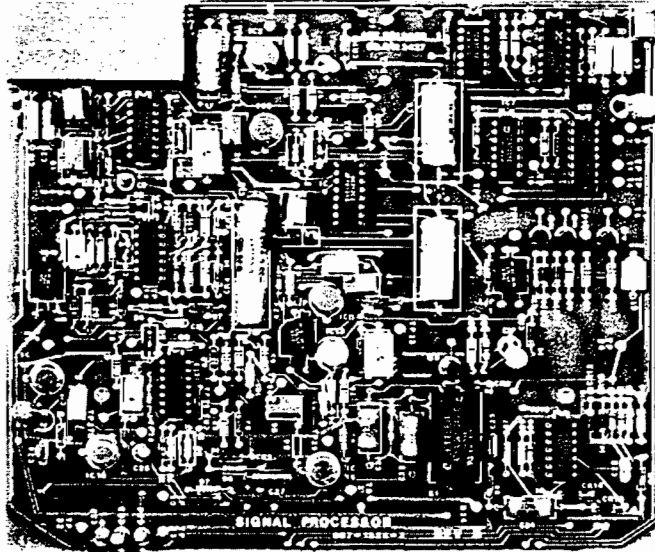


Figure 12A

Main Electronics Board (-1)

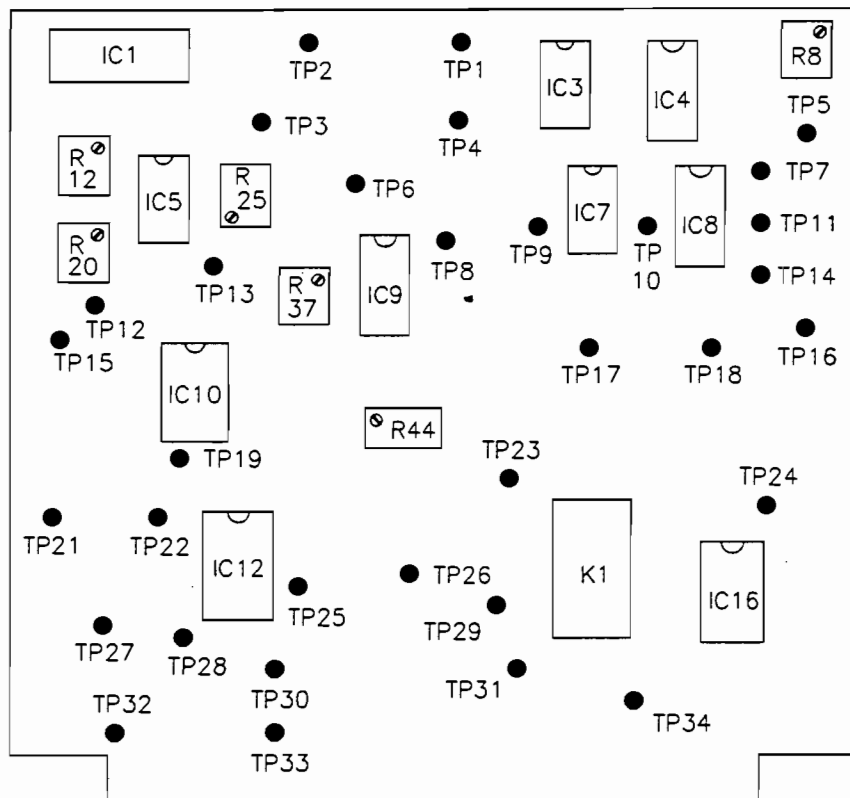


Figure 12B

Main Electronics Board, Test Point Locations

IC15 receives a DC signal from a silicon photodiode which is proportional to the lamp intensity. This DC level is used to vary the gain of IC13 by maintaining a constant level when compared to the reference at Pin 13 of IC12. The amplitude modulated signal from TP22, which also passes through IC13 is independent of lamp intensity variations at Pin 7 of IC9. IC9, Pins 6, 7, and 8 allows only the reference portion of the waveform to be applied to the detector circuit of IC12, Pins 8, 9, and 10 and associated components. TP28 shows a DC level proportional to the peak to peak value of the reference signal. This voltage is compared to the trip level signal at TP30 and produces a +15 volt signal at TP27 when the TP28 voltage falls below the TP30 voltage. As long as the TP28 signal exceeds the voltage at TP30, TP27 will produce a -15 volt status to the Remote Control Units.

Table 3 lists the test points and the approximate level that should be seen at these points. All test points noted with an * should not be changed without factory approval.

TABLE 3

TEST POINT CALIBRATION GUIDE

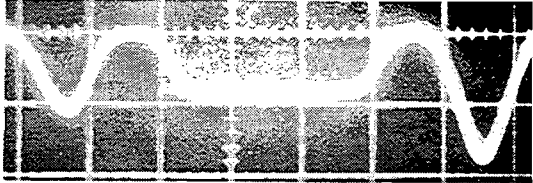
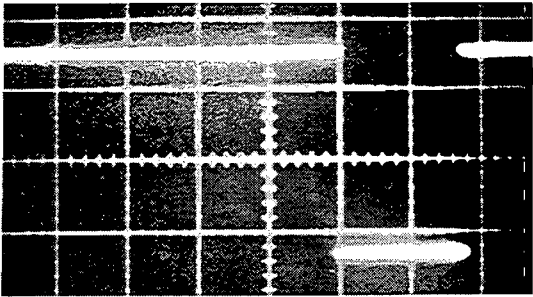
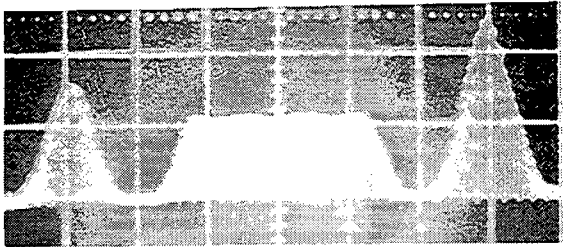
T.P.	APPROXIMATE SIGNAL LEVEL	SPECIAL NOTATION
1	0 - 10 VDC	Varies with opacity
2	-6.2 VDC reference	
3	~ 2 volts	
4		
5	0 to 11 VDC	Ramp
6	~ 4.1V	
7	0 or 15 VDC	
8		
9	ground	
10	0 or 15 VDC	0 = NORMAL mode, 15 = other mode
11	0 or 15 VDC	0 = NORMAL mode, 15 = SPAN mode
*12	0 or -10 VDC	Dependent on MODE switch position
13	Approx. 0.2 VDC	
14	0 or 15 VDC	0 = NORMAL mode, 15 = REF mode
15		
16	0 or 15 VDC	0 = other mode, 15 = NORMAL mode
17	0 or 15 VDC	0 = other mode, 15 = REF mode
18	0 or 15 VDC	0 = other mode, 15 = SPAN mode

TABLE 3
TEST POINT CALIBRATION GUIDE

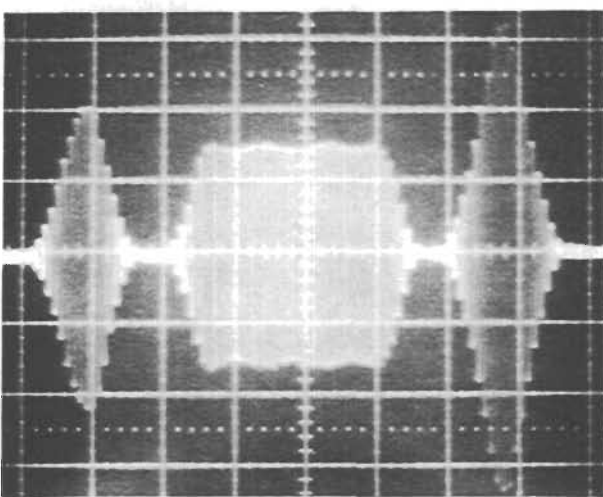
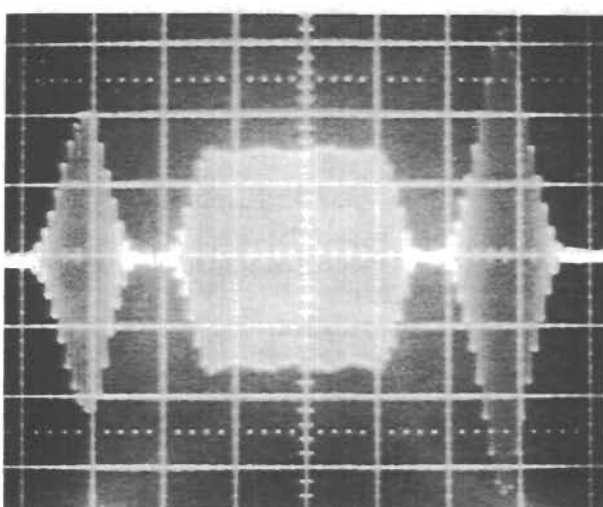
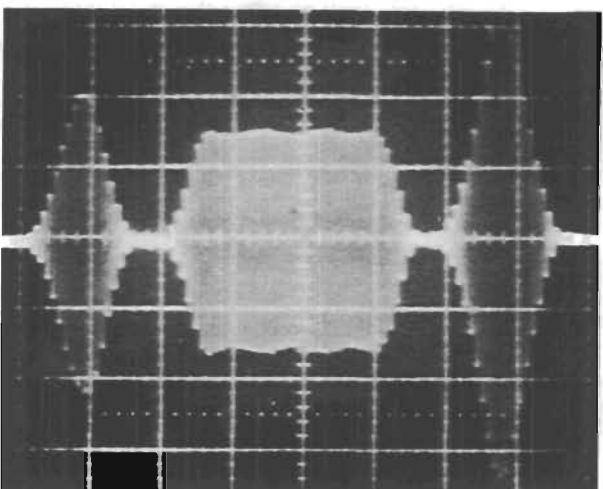
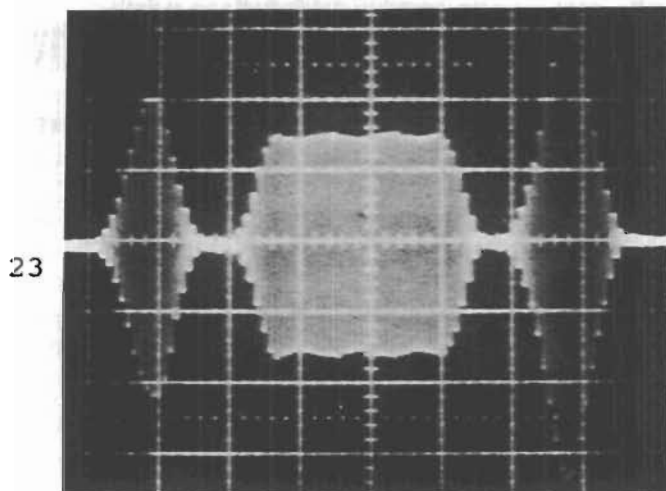
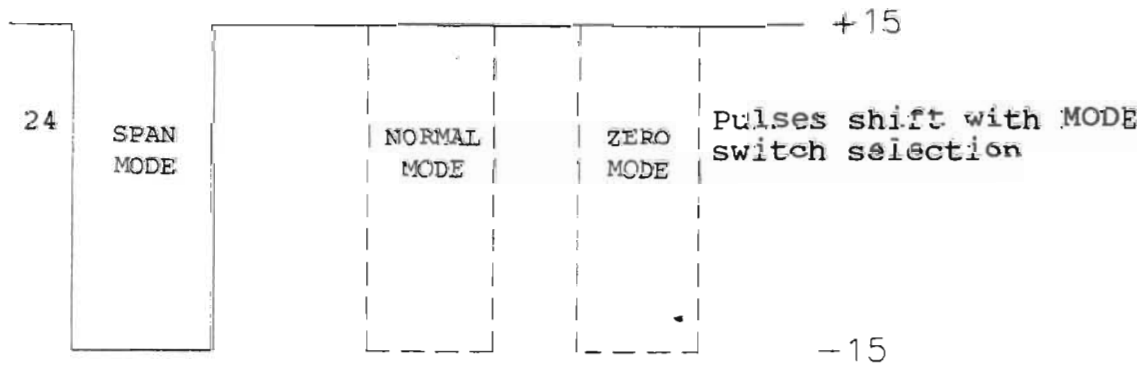
T.P.	APPROXIMATE SIGNAL LEVEL	SPECIAL NOTATION
19		Same as TP22 but filtered and amplified 20 times.
21		Same as TP19 but 20 times smaller
22		Approximately 0.8 Vp-p for reference section

TABLE 3
TEST POINT CALIBRATION GUIDE

T.P.	APPROXIMATE SIGNAL LEVEL	SPECIAL NOTATION
------	--------------------------	------------------



Approximately 0.8 Vp-p at reference on -.6 VDC level



25	≈ 2V DC
27	-15 to +15 VDC
28	1.15 x TP30
30	Approx. 6.5 V
31	-15 VDC
32	15 VDC
33	9.1 VDC

-15 = clean window
+15 = dirty window

2.2 MOUNTING FLANGES

Two mounting flanges are required to mount the Blower Assemblies, Optical Head, and Retro Assemblies to the stack. No other mechanical connections or mounting points are required to place the Transmissometer System in operating position. The flange is a steel ring with an eight hole mounting bolt pattern as shown in Figure 13. These flanges are welded to a 4 inch (10.16 cm) diameter section of Schedule 40 steel pipe, supplied by the customer, which is in turn fixed to the stack wall. Two basic mounting methods, one for a steel wall and one for a masonry wall, are shown in Figure 14. Larger diameter mounting pipe will be required whenever the distance between the stack inner wall and the Transmissometer flange exceeds one foot in total length. This is to prevent reflections from the pipe walls from affecting the Transmissometer readings. Consult the factory for details.

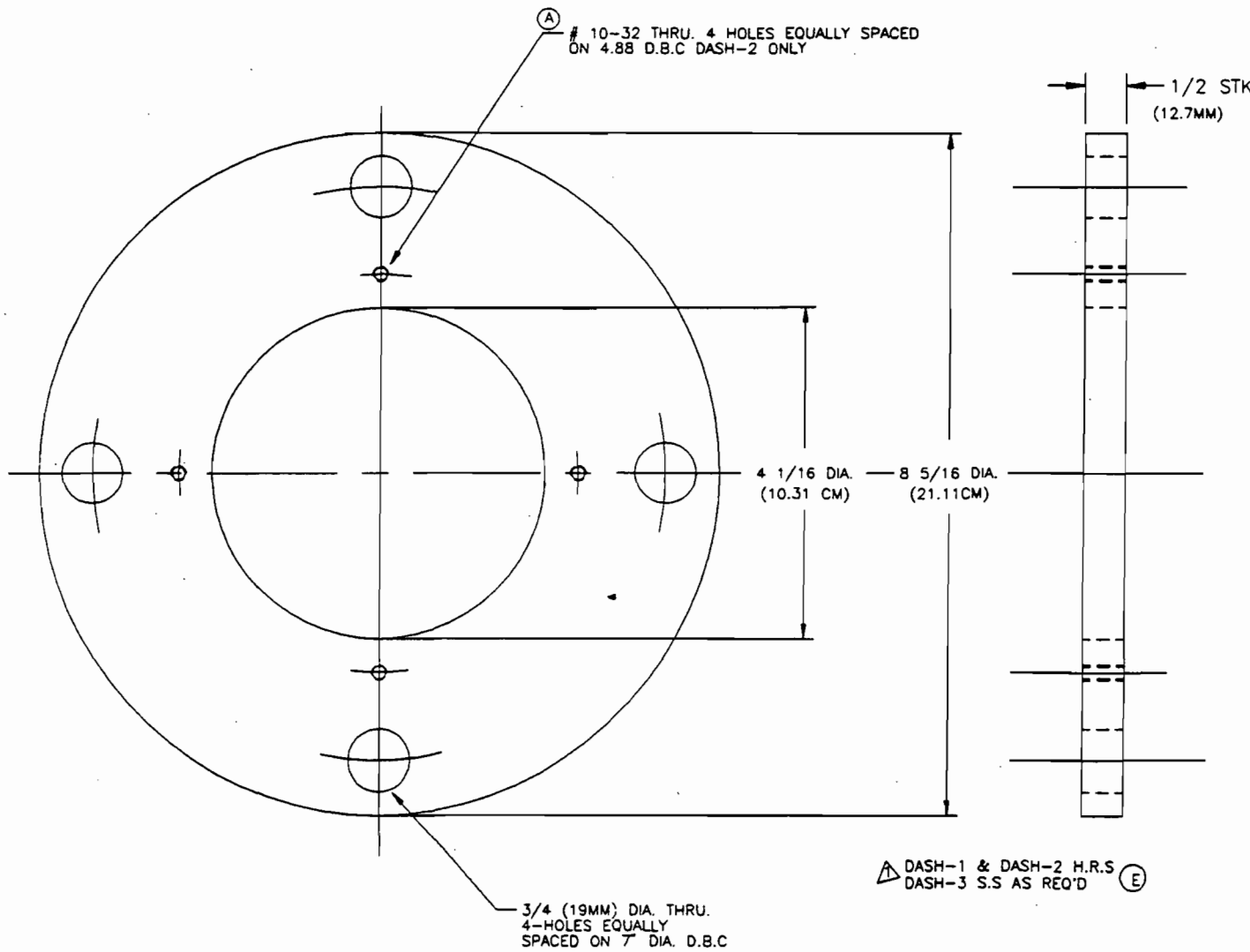
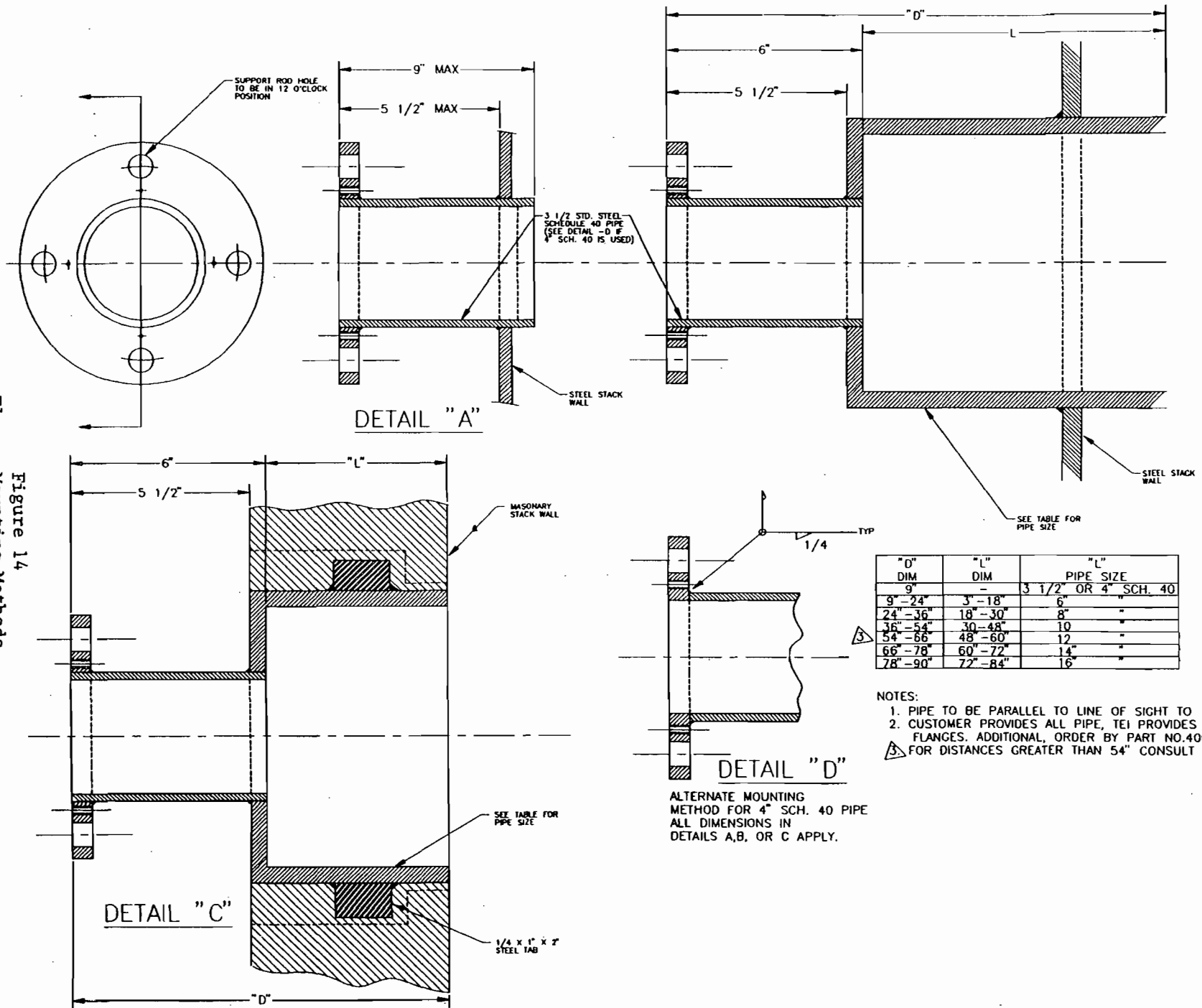


Figure 13
 Mounting Flanges

Figure 14
Flange Mounting Methods



2.3 BLOWER ASSEMBLY

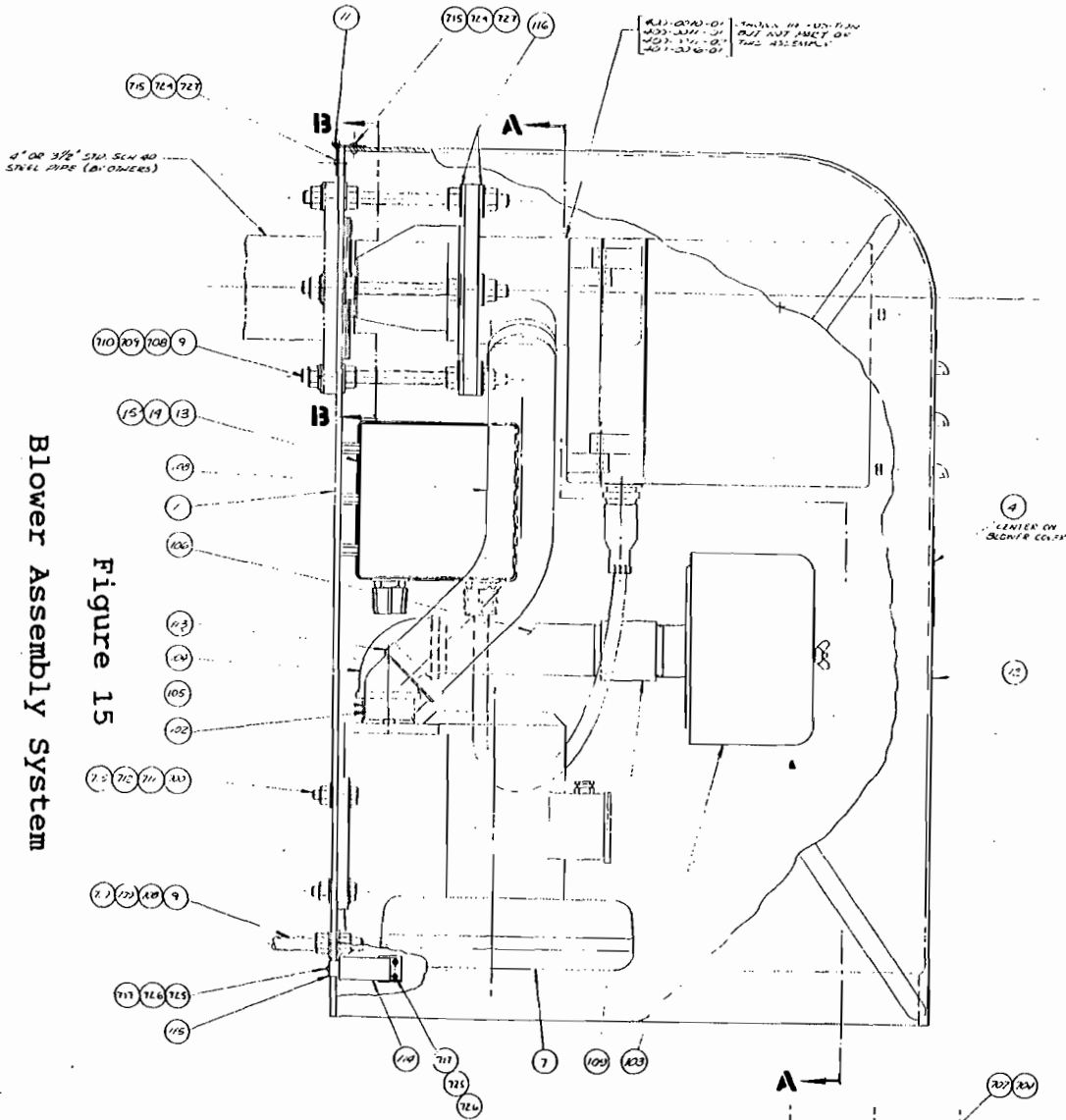
The Blower Assembly, shown in Figure 15, is recommended for use with both the Optical Head and Retro Assemblies even though the stack itself may normally have a negative pressure. Two units are required, one for the Optical Head Assembly and one for the Retro Assembly, and are fixed directly to the mounting flange. The blower itself is a regenerative centrifugal type capable of developing a maximum static pressure of 60 inches (152.4 cm) (H_2O). The input air is drawn through a filter system with approximately 130 square inches (840 square cm) of surface area. Filter cartridges are used which are easily replaced by removing a single wing nut and retainer hood. The output air is directed through a flexible hose to the inlet port of the Optical Head and Retro Assemblies, forming an air barrier in front of the optics, and then into the stack itself. The Blower Assembly will provide adequate purging of the Transmissometer for stack operating pressures of 8 to 10 inches H_2O .

A sturdy shield is provided to protect the Transmissometer System from the weather. This shield can be lifted and locked in place or completely removed, if desired, for access to the Optical Head, Retro Assemblies, or blower filter equipment. Two stand off rods are provided to brace the main plate against the stack wall. Other than the mounting flange, no other fixed mechanical connections to the stack are required.

2.4 AIR VALVE UNIT

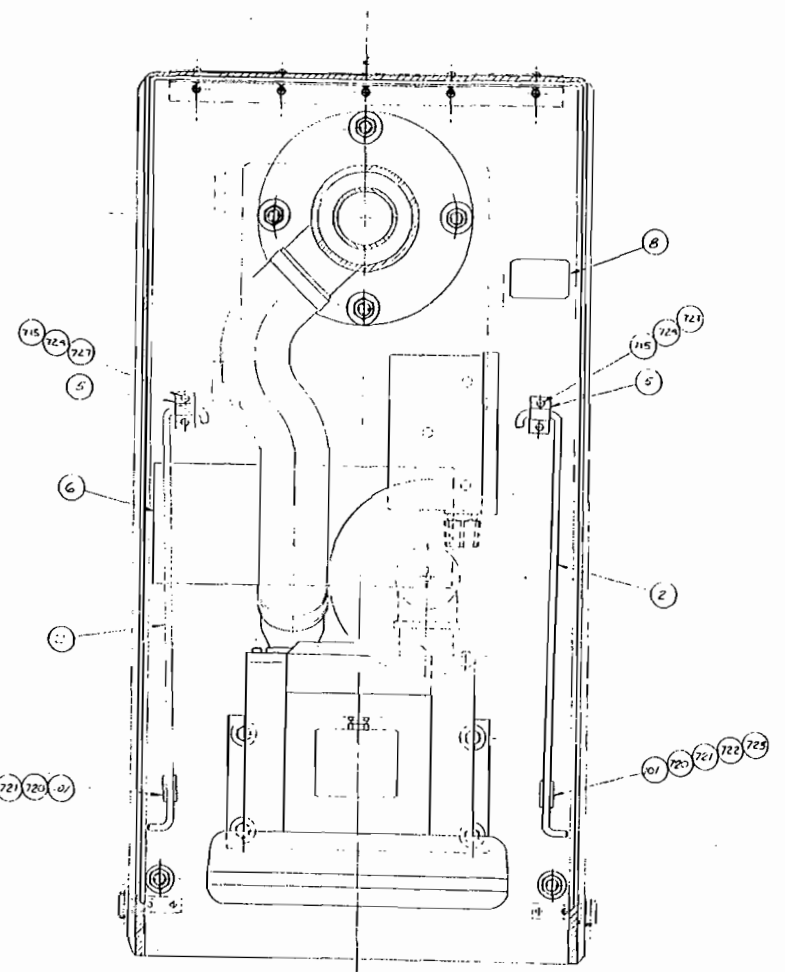
The Air Valve Unit, shown in Figure 16, is an all mechanical device engineered to respond to the lack of proper air flow from the Blower Assembly. Two valve units are required, one for the Optical Head Assembly and one for the Retro Assembly. The Air Valve Unit consists of a rugged, cast aluminum housing and flow duct assembly which contains a hinged valve plate. The valve plate is counter-balanced to remain open as long as there is flow into the stack. Should the air flow from the Blower Assembly stop for any reason, and a positive stack pressure (back flow) develop, the valve plate will immediately snap shut effectively stopping the stack gases from getting to the Transmissometer Optical System. Resumption of air flow by the Blower Assembly will again open the valve plate, and normal Transmissometer operation can continue.

ALL DIMENSIONS IN INCHES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS IN PARENTHESES ARE
FOR REFERENCE ONLY

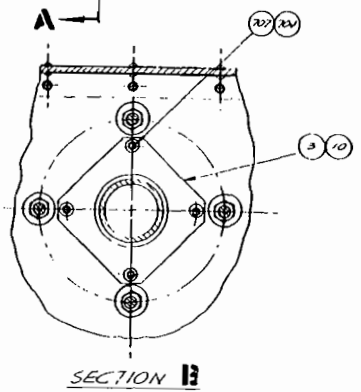


Blower Assembly System

Figure 15



SECTION A-A



It should be noted that the Air Valve Unit has been designed to protect the instrument only for short duration purge failures. The Air Valve Unit and Transmissometer should not be exposed to stack effluents for extended periods. Normal high opacity alarms will be activated whenever the Air Valve Unit closes.

On -5 and -6 units, the purge fail alarm option is available. This provides a contact closure to the control room from a differential pressure switch located on each of the Blower Plate Assemblies. Purge air failures must be returned to service as soon as possible or within 24 hours.

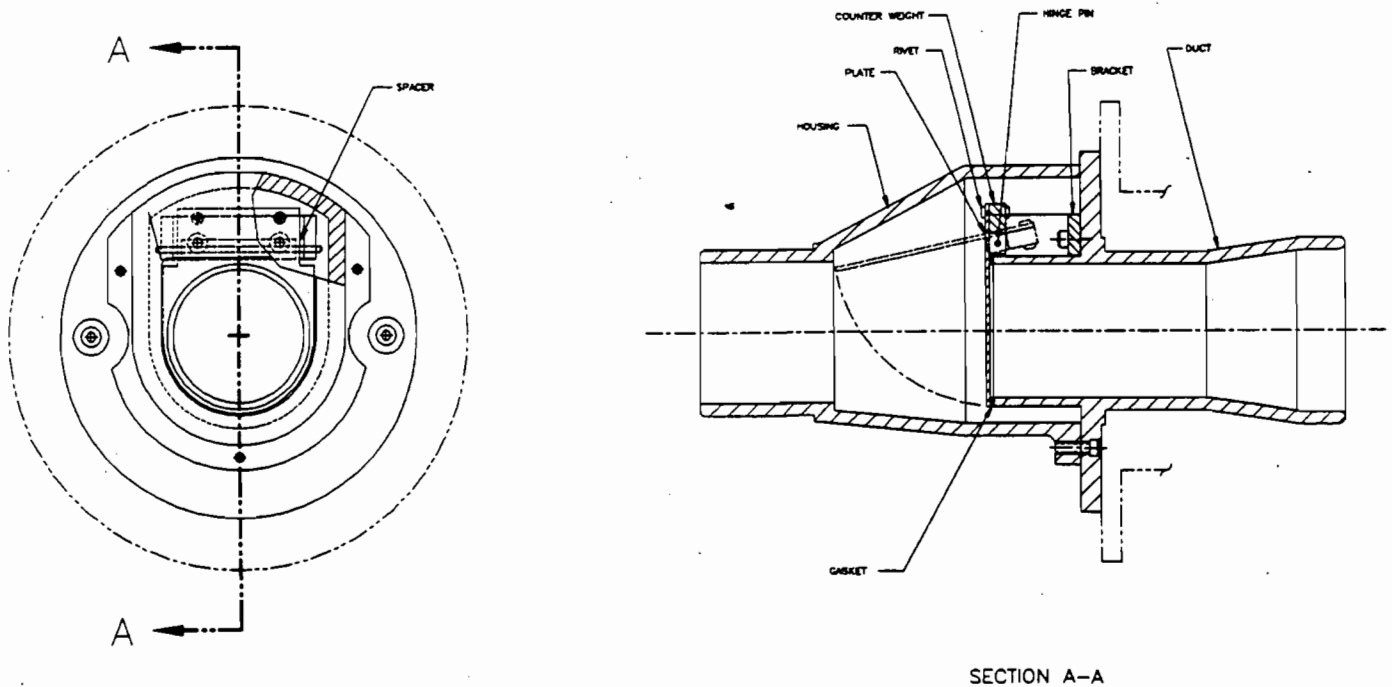


Figure 16
Air Valve Unit

2.5 CALIBRATION TEST KIT

The Calibration Test Kit, shown in Figure 17, is designed to serve two functions. The first is to verify that the performance of the Transmissometer Optical Head Assembly adheres to the basic instrument calibration curve. The second is to provide an on-stack zero point reference in lieu of a clear stack condition to check the adjustment of the electronics after replacement of electronic or optical components. The unit has a heavy cast aluminum mounting bracket that supports the filter and adjusting screw. When the Transmissometer is first adjusted and focussed for the correct stack flange to flange distance at initial system setup, the Calibration Test Kit is adjusted and locked at an equivalent zero opacity clear stack set point. It then becomes a zero reference available for subsequent on-stack system testing, should a clear stack condition be unattainable at the measurement site.

Note: Normal clear stack conditions are not truly clear because of draft induced dirt and dust flow within the stack.

Four neutral density filters are supplied with each Calibration Test Kit which establish fixed points on the basic operating range. The filter values are nominally 0.1, 0.2, 0.4, and 0.9 in neutral optical density, and are calibrated photopically in percent opacity to the third decimal place. These calibration figures are traceable to the National Bureau of Standards. With the Calibration Test Kit, the performance of the basic Transmissometer can be demonstrated in a quick and convenient manner.

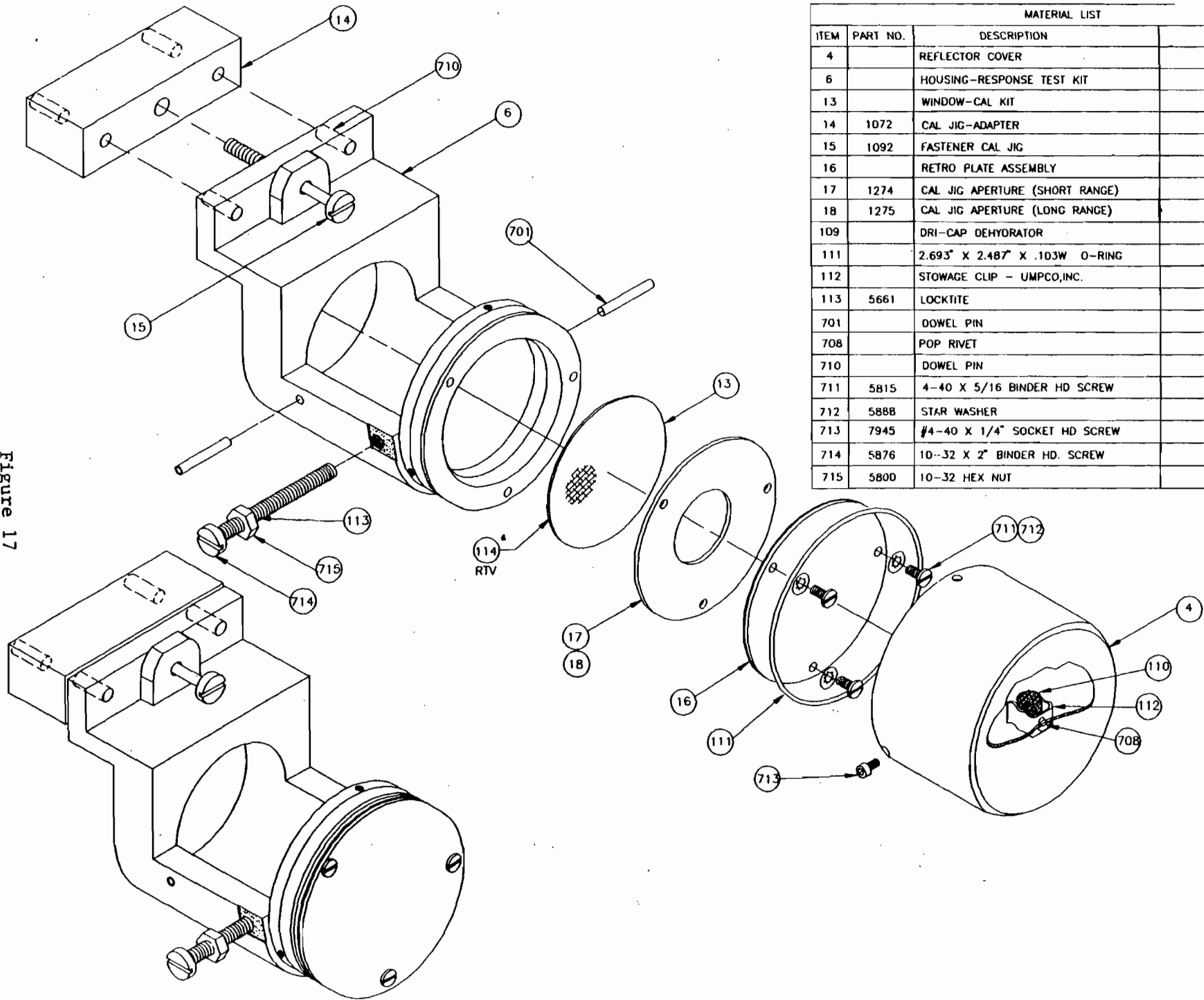
2.6 DATA CABLE

The data from the Transmissometer is terminated in a junction box attached to the blower plate assembly as shown in Figure 18. This wiring, done at the factory, uses 18 gauge shielded cable and a sealing technique to prevent moisture and dirt from contaminating the connector pins. The junction box with terminal boards provides the user with an easy method of continuing the cable to the control room. The junction box also allows the user to use heavier gauge wire for long conduit pulls.

It is recommended that the signal cable from the junction box be run through metal conduit to prevent adverse electrical noise from entering the signal cable. It also helps during electrical storms.

CAUTION

The factory should be consulted when cable runs greater than 5000 feet (1524 meters) are required.



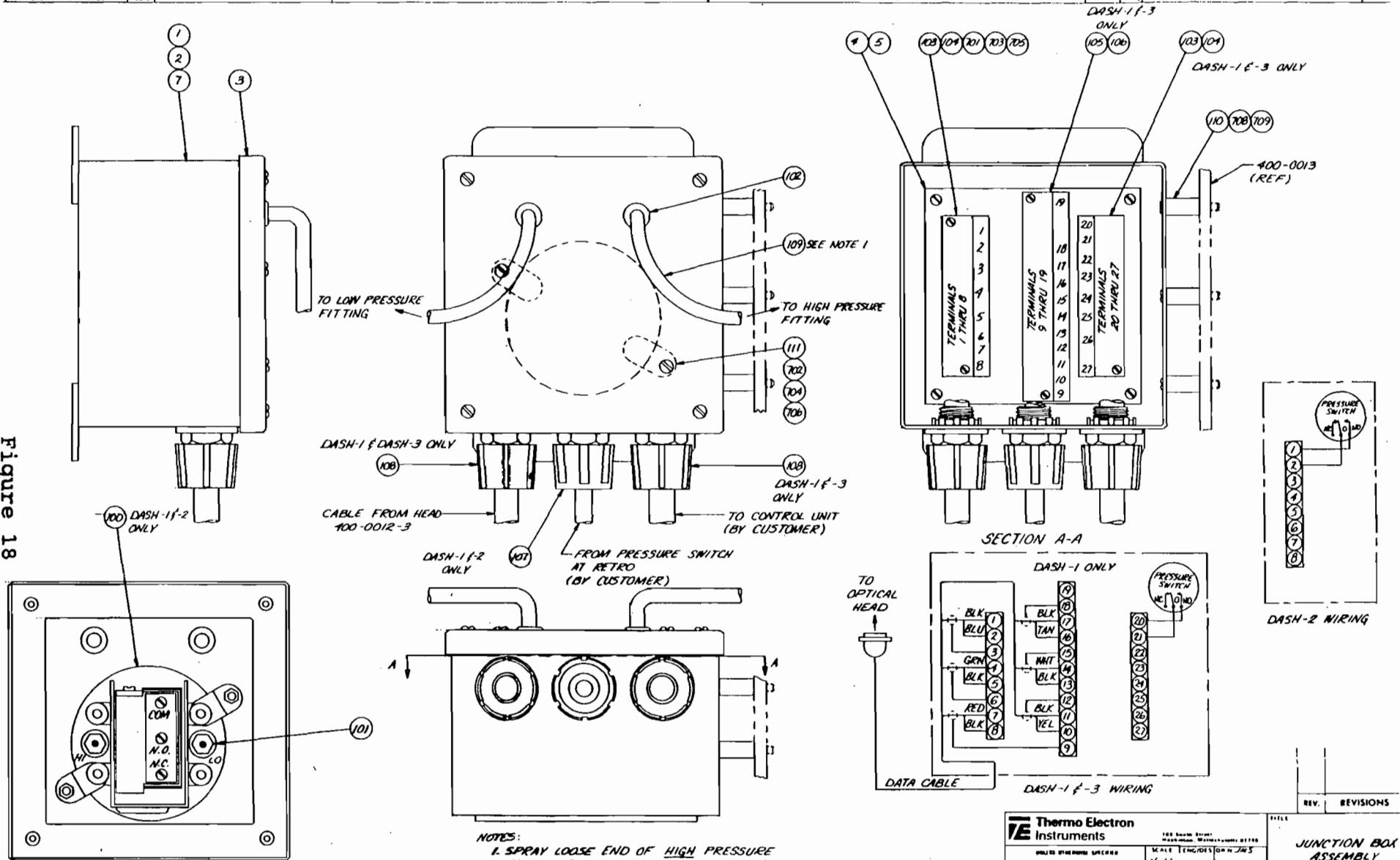
MATERIAL LIST				
ITEM	PART NO.	DESCRIPTION		QTY.
4		REFLECTOR COVER		1
6		HOUSING-RESPONSE TEST KIT		1
13		WINDOW-CAL KIT		1
14	1072	CAL JIG-ADAPTER		1
15	1092	FASTENER CAL JIG		1
16		RETRO PLATE ASSEMBLY		1
17	1274	CAL JIG APERTURE (SHORT RANGE)		1
18	1275	CAL JIG APERTURE (LONG RANGE)		3
109		DRI-CAP DEHYDRATOR		1
111		2.693" X 2.487" X .103W O-RING		1
112		STOWAGE CLIP - UMPCO,INC.		1
113	5661	LOCTITE		A/R
701		DOWEL PIN		2
708		POP RIVET		1
710		DOWEL PIN		2
711	5815	4-40 X 5/16 BINDER HD SCREW		3
712	5888	STAR WASHER		3
713	7945	#4-40 X 1/4" SOCKET HD SCREW		3
714	5876	10-32 X 2" BINDER HD. SCREW		1
715	5800	10-32 HEX NUT		1

Figure 17
 Calibration Test Kit
 41

Cable Assembly and Wiring Diagram

Figure 18

42



MOUNTING POSITION OF DIFFERENTIAL PRESSURE SWITCH ON INSIDE OF JUNCTION BOX COVER, FOR DASH-1 & -2 ONLY

NOTES:
1. SPRAY LOOSE END OF HIGH PRESSURE NOSE WITH RED PAINT (APPROX 1")

Thermo Electron Instruments 188 South Street Waltham, Massachusetts 01981		SCALE: INCHES TO INCHES NAME: _____ DATE: _____ DRAWN: _____ CHECKED: _____ APPROVED: _____ TITLE: _____	FILE: _____ REV. REVISIONS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
PROJECT: _____ ORDER: _____ QUANTITY: _____ DATE: _____ BY: _____ CHECKED: _____ APPROVED: _____ TITLE: _____		FINISH: _____ FIRST: _____ SECOND: _____ THIRD: _____ FOURTH: _____ FIFTH: _____ SIXTH: _____ SEVENTH: _____ EIGHTH: _____ NINTH: _____ TENTH: _____ ELEVENTH: _____ TWELFTH: _____ THIRTEENTH: _____ FOURTEENTH: _____ FIFTEENTH: _____ SIXTEENTH: _____ SEVENTEENTH: _____ EIGHTEENTH: _____ NINETEENTH: _____ TWENTIETH: _____ TWENTY-FIRST: _____ TWENTY-SECOND: _____ TWENTY-THIRD: _____ TWENTY-FOURTH: _____ TWENTY-FIFTH: _____ TWENTY-SIXTH: _____ TWENTY-SEVENTH: _____ TWENTY-EIGHTH: _____ TWENTY-NINTH: _____ THIRTIETH: _____	JUNCTION BOX ASSEMBLY (M400) SIZE: _____ DRAWING NUMBER: D 400-0042 DO NOT SCALE DWG.

2.7 RETRO ALIGNMENT TOOL

To reproduce the zero signal of the Transmissometer established during initial focussing and alignment, the Retro Assembly must be aligned on the stack with the plane of the Retroreflector perpendicular to the line of sight of the Transmissometer. The Retro Alignment Tool shown in Figure 19 is designed for this purpose and is easily used in the installation process. The unit consists of a small low-power telescope with a cross-hair reticle set in an adaptor block.

2.8 MAINTENANCE KIT

To properly maintain the Transmissometer system it is recommended that the proper items be on hand at the site. A spare parts and consumables list is provided in Section 6 of this manual. Optical lens cloths and solutions indicated in this section are the only ones recommended by the manufacturer.

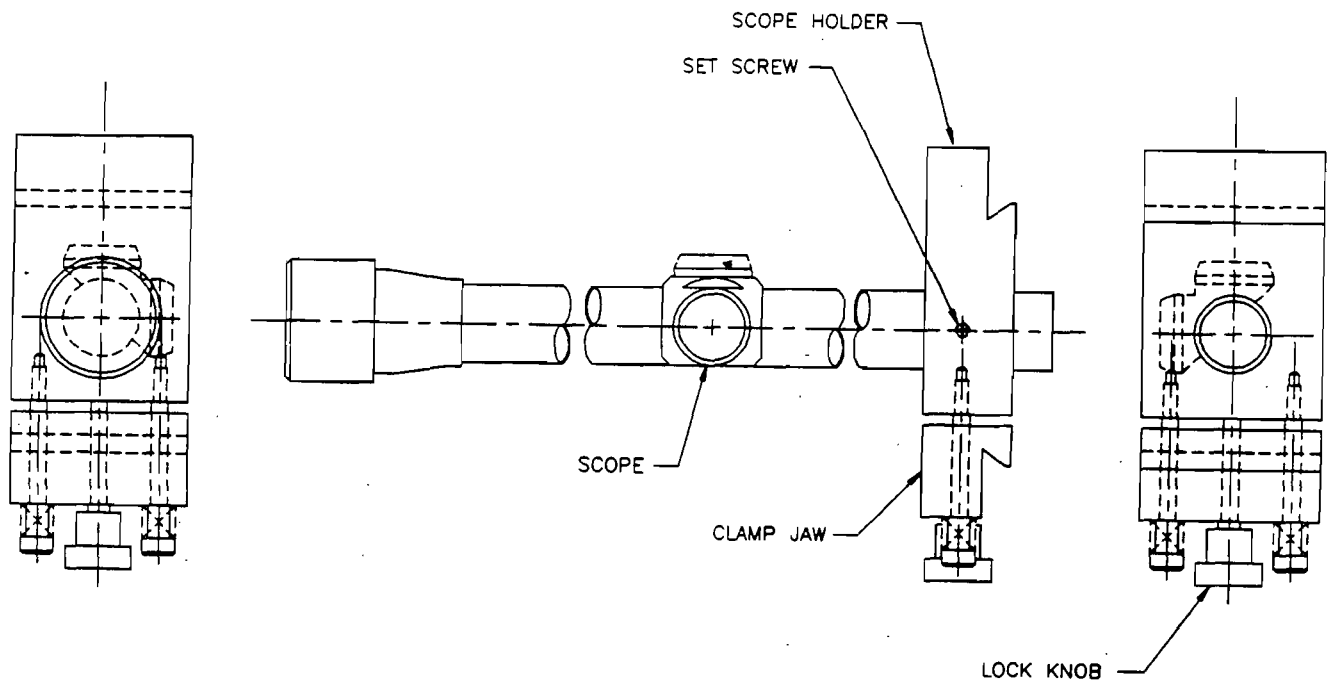


Figure 19

Retro Alignment Tool

2.9 RECORDER

The optional Remote Control Units can be supplied with either a single-pen or two-pen strip chart recorder to record the Transmissometer System output. The two-pen recorder may be used to record both the instantaneous and integrated stack information simultaneously. The recorders use a 10-cm wide Z-fold chart. The chart speed is selectable on the monitor front panel. On the low setting the chart speed is 3 cm/hr., while on the high setting the chart speed is 30 cm/hr. Chart speeds from 1.5 cm/hr. can be obtained if the factory is consulted prior to shipment.

The writing system uses a disposable cartridge pen which contains both the ink and stylus.

The recorder power requirement is 117 VAC, 50/60 Hz. 230 VAC, 50/60 Hz is optional but must normally be wired at the factory. The recorder is supplied with a complete operations manual. Optional scales are available in terms of nonlinear or linear opacity, and nonlinear or linear optical density.

3.0 BASIC TRANSMISSOMETER CALIBRATION AND CHECKOUT

Pre-installation calibration ensures precise operation of the Transmissometer when installed. This is normally done at the factory prior to shipment and when the true flange to flange mounting distance is known. It can also be performed on-site by the customer if a V.O.M. is available or by TEI Field Service personnel (see Section 7.3, Field Service). This calibration is conducted while duplicating the actual on stack conditions of instrument alignment and flange to flange separation for the Optical Head Assembly and the Retro Assembly. The flange to flange distance must be known accurately to within 1%. At this time the type of retroreflector, retroreflector aperture, and main field stop required for a given application are installed. The optical system is then focussed and the electronics adjusted to establish the zero opacity (clear stack) and upscale opacity points. The SPAN value, which is a function of the front chopper and the clear stack signal, is then determined and recorded.

Note: Clear stack conditions cannot be relied upon to give a true zero opacity value because of the presence of draft induced dirt and dust within the stack or duct.

3.1 INITIAL SETUP AND FOCUSING FOR RANGE

Mount the Optical Head Assembly and the Retro Assembly in any convenient supporting structure, or one such as shown in Figure 20, at a distance equal to the actual separation when mounted on the stack. Final system alignment hardware can be used for this purpose, as shown in Figures 21 through 24.

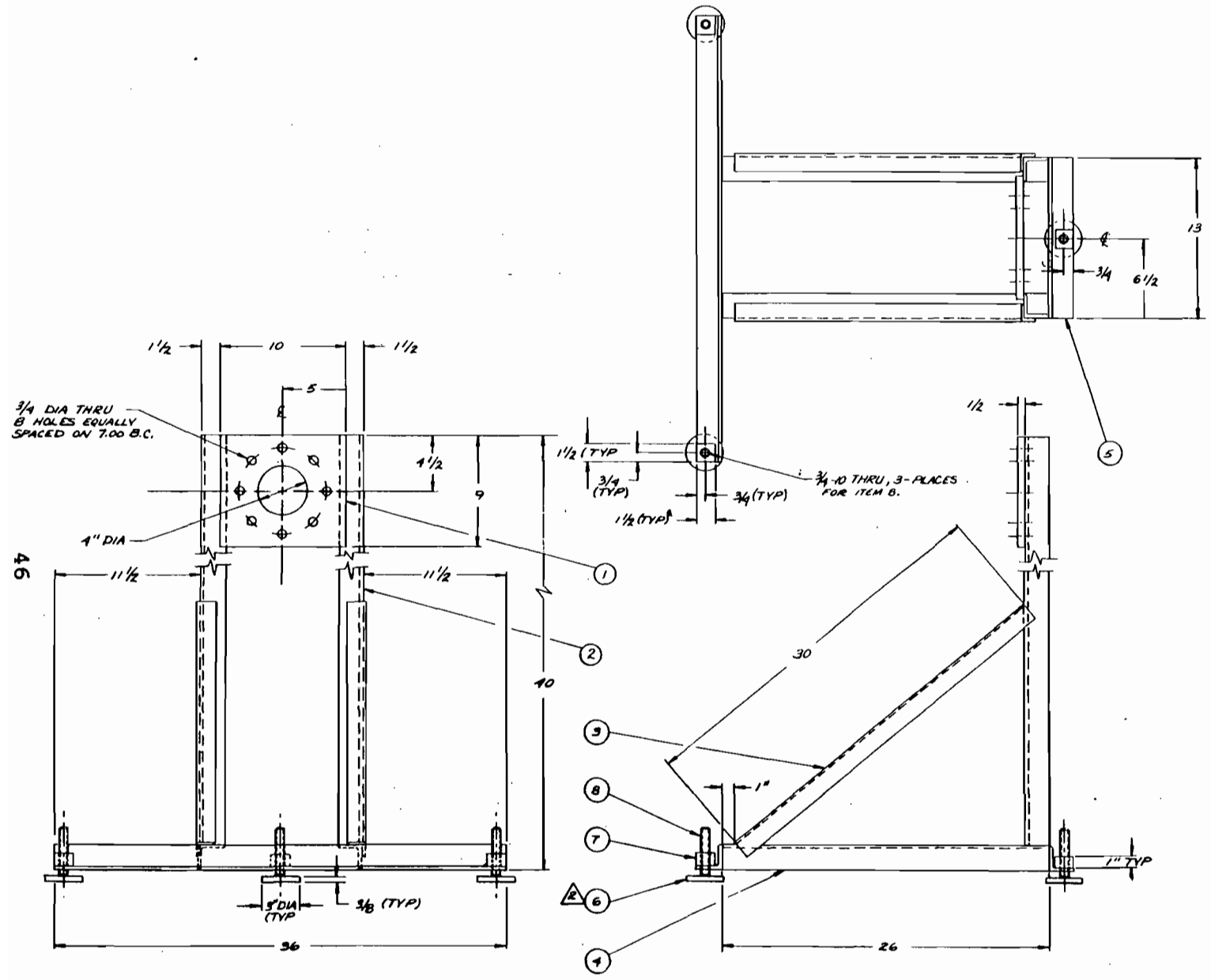
Threaded rods are firmly attached to the support with flat washers and hex nuts. The Optical Head Assembly and the Retro Assembly are then mounted on the rods with a pair of spherical washers on either side of the flanges for aiming and alignment adjustments. These adjustments are positively lockable.

Turn on the Optical Head Assembly to provide a bright target and coarsely aim the Retroreflector. Using the Retro Alignment Tool, as shown in Figure 25, sight through the alignment tool and adjust the Retroreflector mounting nuts and spherical washers to center the alignment tool cross-hair pattern onto the spot of light defined by the Optical Head Assembly aperture. Remove the Retro Alignment Tool.

Verify that the Retroreflector housing is equipped with the proper Retroreflector type and install the required aperture plate as defined in the system range schedule of Table 4. Be sure that the Retroreflector window is clean, then close the housing and secure the latch.

DESCRIPTION	DBC	NO. OF HOLES
-------------	-----	--------------

ITEM NO.	PART NO.	DESCRIPTION	SPEC.	MATERIAL OR ALIAS	QTY
1	400-1083-01	ADJUSTING PLATE		1/2" ALUM. PLATE	1
2	400-1083-02	VERTICAL SUPPORT		3/4" x 1/2" ALUM. ANGLE	2
3	400-1083-03	DIAGONAL BRACE		1/2" x 1/2" ALUM. ANGLE	2
4	400-1083-04	HORIZONTAL BRACE		1/2" x 1/2" ALUM. ANGLE	2
5	400-1083-05	TIE BAR		1/2" x 1/2" ALUM. ANGLE	1
6	400-1083-06	FOOT PLATE		1/2" ALUM. ANGLE	3
7	400-1083-07	3/4" x 10 x 1/2" LG. DRILL PT. S.S.		STEEL, CAP. PL.	3
8	400-1083-08	SET SCREW BLOCK		1/2" ALUM. BRG	3



NOTES:
 1. ITEMS 1 THRU 5, 7 ARE AN ALL WELDED ASSEMBLY.
 2. C-SINK ONE SIDE ITEM 6 120° TO .75 DIA. FOR ITEM B.
 3. DRAWING NO. WAS 400-1083

REDRAWN FROM E 400-1158 6/2/86

SCALE 1/4	ENVIRONMENTAL INSTRUMENTS DIVISION	DATE 5-2-66	DESIGNED
TEST ASSEMBLY	SECTION 100 SCALE 1:1	BY JMS	CHECKED
	UNLESS OTHERWISE SPECIFIED	TITLE	
	FINISH: 100	TEST STAND	
	DRILLING: 100		
	FILLET RADIUS: 100		
	THREADS: 100		
	ALL DIMENSIONS TO CENTER UNLESS OTHERWISE SPECIFIED		
	SURFACES TO BE PERPENDICULAR UNLESS OTHERWISE SPECIFIED		
	SURFACES TO BE PARALLEL UNLESS OTHERWISE SPECIFIED		
	HOLE ANGLES FOR TAPERS: 1.0°		
	ALL OTHER ANGULAR TOLERANCES TO BE 1.0° UNLESS OTHERWISE SPECIFIED		
	APPROVED BY: [Signature]	DATE: 5-2-66	
	400-1158	1	4

Figure 20. Te. Stand

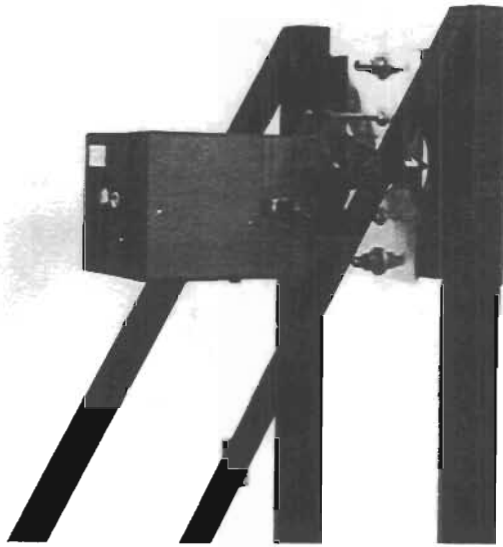


Figure 21. Optical Head Assembly in Test Stand

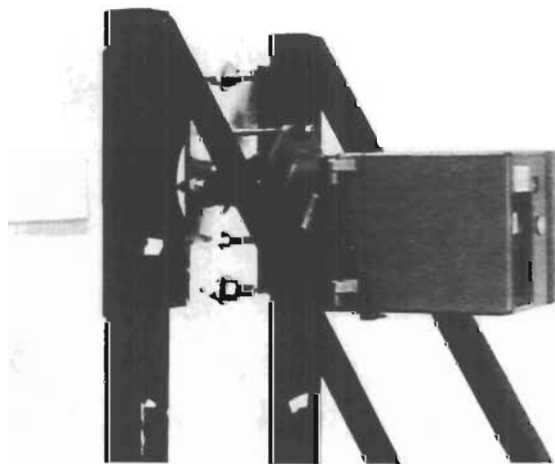


Figure 22. Optical Head Assembly in Test Stand

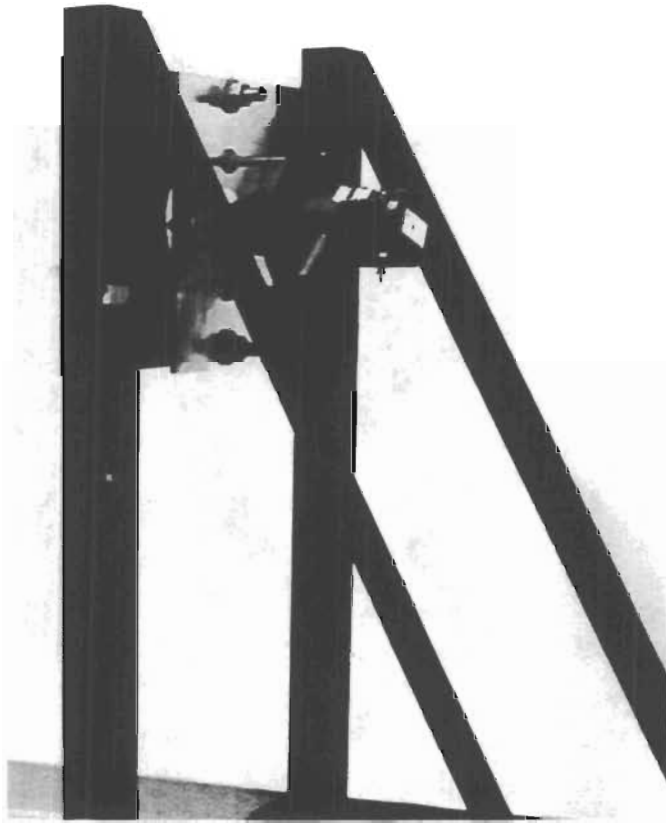


Figure 23. Retro Assembly in Test Stand

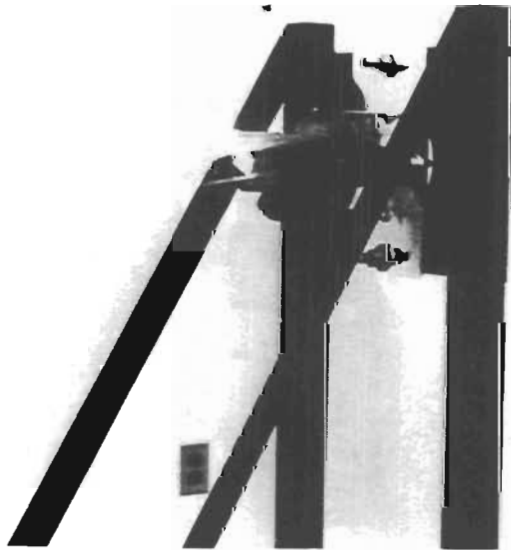


Figure 24. Retro Assembly in Test Stand

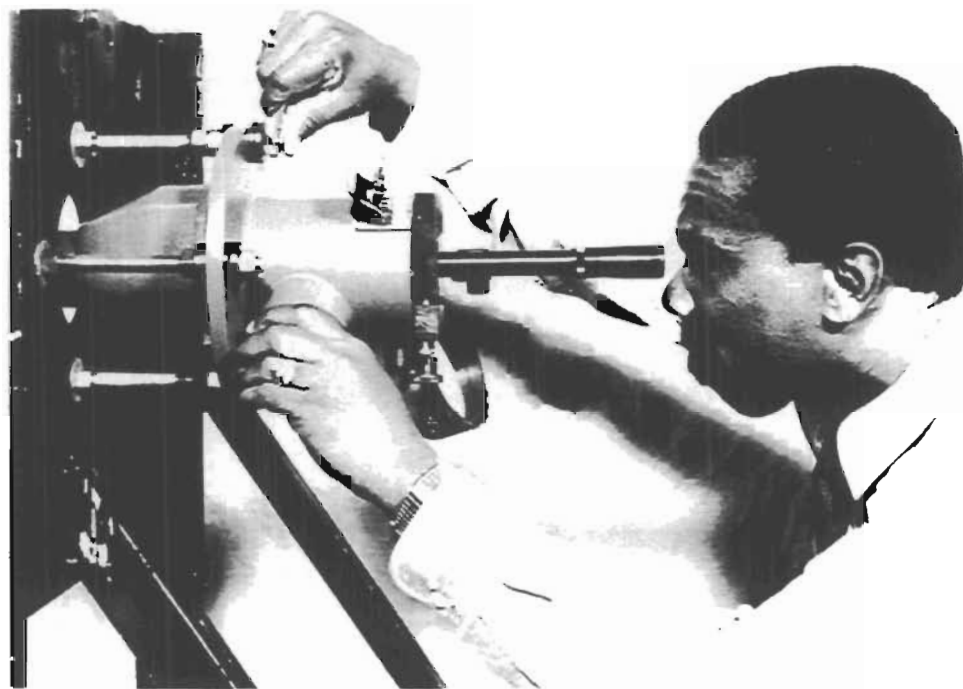


Figure 25
Using Alignment Tool

Table 4. SYSTEM RANGE SCHEDULE

Stack Flange to Flange Distance	Retro Assembly		Aperture Plate	
	Dash No.	Type	Dash No.	Size
0-10" (0-25cm)	03	Scotch Lite	01	3/8" (0.952cm)
10"-20" (25cm-50cm)	03	Scotch Lite	03	5/8" (1.59cm)
20"-30" (50cm-70cm)	03	Scotch Lite	04	7/8" (2.22cm)
30"-40" (70cm-95cm)	03	Scotch Lite	05	1-1/4" (3.18cm)
40"-50" (95cm-1.3m)	03	Scotch Lite	--	None Required
50"-70" (1.3m-1.8m)	01	Plastic	03	5/8" (1.59cm)
70"-90" (1.8m-2.3m)	01	Plastic	04	7/8" (2.22cm)
90"-10' (2.3m-3.0m)	01	Plastic	05	1-1/4" (3.18cm)
10'-13' (3.0m-3.2m)	01	Plastic	--	None Required
13'-18' (3.2m-5.6m)	01	Plastic	05	1-1/4" (3.18cm)
18'-24' (5.6m-7.3m)	01	Plastic	--	None Required
24'-32' (7.3m-10.7m)	02	Glass Prism	05	1-1/4" (3.18cm)
32'-40' (10.7m-12.2m)	02	Glass Prism	--	None Required

50'(15.3m) operation range achieved with reduced projection angle.

Table 4
System Range Schedule

At the Optical Head Assembly, open the hinged section and ensure that the objective window is clean. (The chopper blade may be removed, if required, by loosening the hub clamp screw and drawing the chopper hub forward to clear the motor shaft.)

Remove the large cover over the optics section as shown in Figures 26 and 27. Loosen the main objective clamping set screw as shown in Figure 28.



Figure 26. Removing Screws for Main Cover Removal

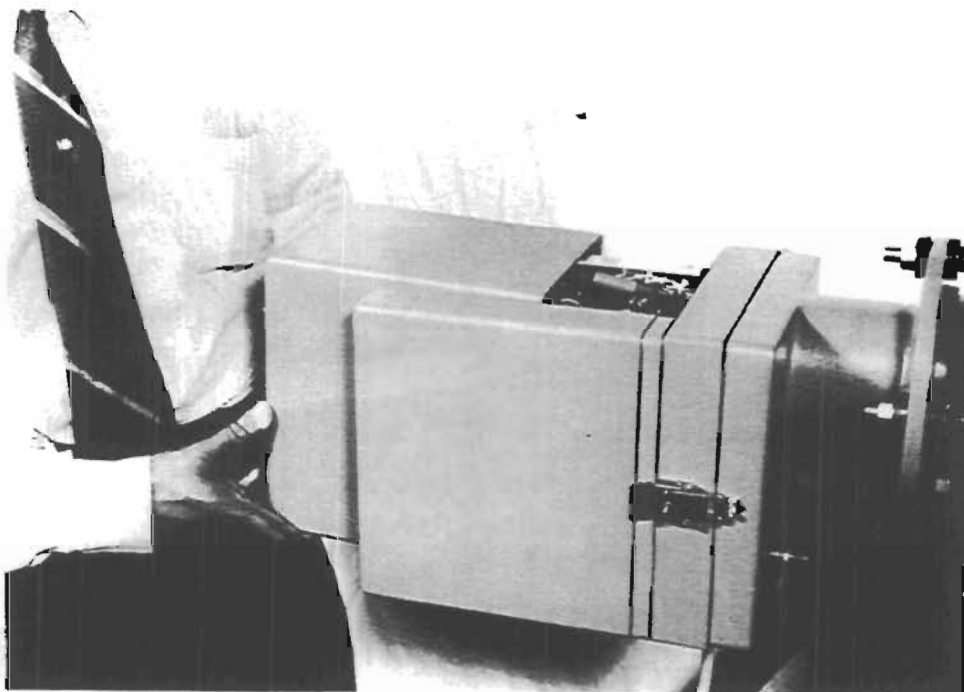


Figure 27. Removing Main Cover

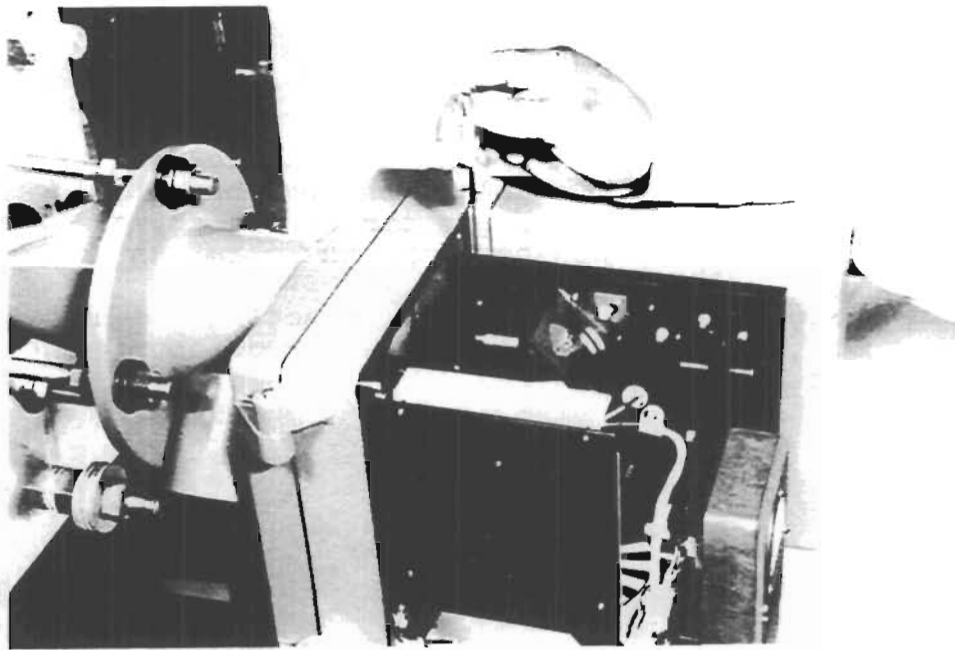
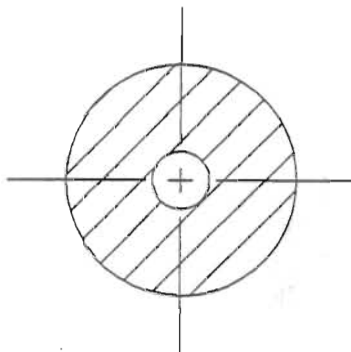


Figure 28. Loosening Objective Lens Clamping Set Screw

Looking through the sighting eyepiece, a bright spot of light from the Retroreflector will be seen. Using the eyepiece cross-hair pattern as a reference, focus the objective as shown in Figure 29 to obtain a sharply defined image of the Retroreflector spot. Once optimum focus has been achieved, carefully tighten the objective set screw and replace the large cover.

Note: Do not over tighten the set screw;
this could deform the lens cell.

The Transmissometer is now ready for electrical adjustments to set the 0% and 100% opacity points.



VIEW THROUGH MODEL 400
SIGHTING EYEPIECE

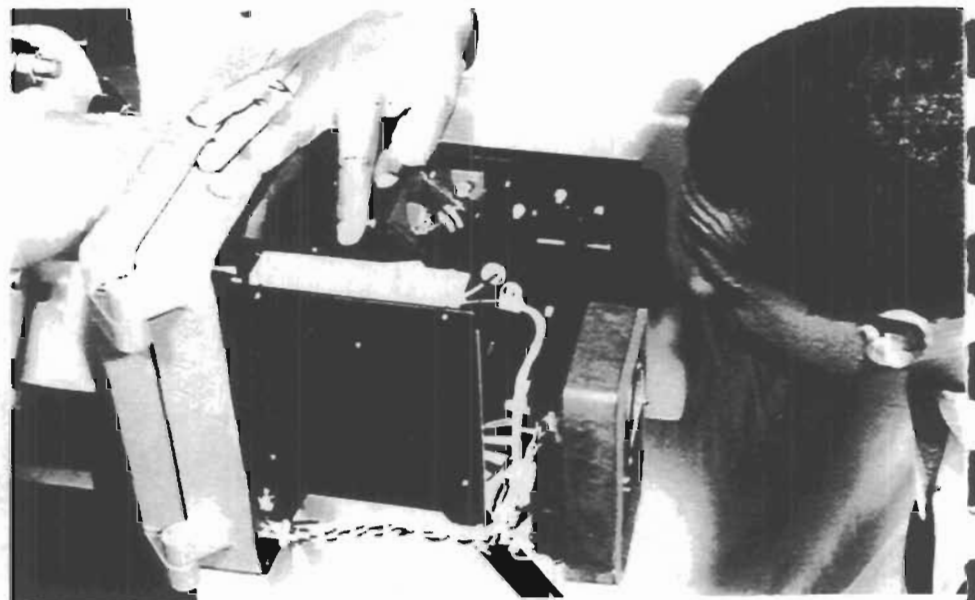


Figure 29. Adjusting Objective Lens

3.2 SETTING 0% AND 100% OPACITY POINTS

With the proper aperture placed in the Retro Assembly, and the Optical Head Assembly focussed for the correct stack diameter and aligned, the following procedure is required to set the system electronics for 0 and 100% opacity. (Refer to Figure 12B for the component side of the main electronics board.)

1. After the unit has been turned on and allowed to run for about 30 minutes, remove the jumper plug that places +/-15 volts on one side of R37.
2. Place a voltmeter on TP12. (The voltage will be negative.)
3. Turn the MODE switch to the NORMAL position.
4. Be sure that there is a clear stack condition (no obscuration of the Retroreflector) and adjust R20 for 0% opacity as read on the panel meter.
5. Completely obscure the output light beam with an opaque flat black material, placed in the light beam at an angle of at least 15 degrees, so that no reflection is seen by the detection system. An alternative is to open the optical head assembly at the interface housing thus directing the light beam to a non-reflective target.

Note: The Calibration Test Kit may be used for clean stack simulation, if available.

6. Adjust R25 until the meter reads 100% opacity.
7. Remove the opaque material and check the meter for 0% opacity reading. Readjust R20 if necessary until the meter reads 0%.
8. Replace the opaque material in front of the light beam and recheck the 100% opacity reading. Re-adjust R25 if required.
9. Turn the MODE switch to the ZERO position.
10. If the meter reads 0 or below, then reconnect the red jumper plug that will place +15 volts on one side of R37. If the meter reads above 0, place the jumper so that -15 volts is placed on one side of R37.
11. Adjust R37 so that the meter reads 0% opacity.
12. The unit should be allowed to run an additional 30 minutes before it is given final check or any further readjustment.

3.3 CHECKING AUTOMATIC CALIBRATION CYCLE AND SPAN POINT

The unit should first be checked for proper operation in the manual ZERO and SPAN modes before the automatic calibration cycle is checked. The timing for the automatic calibration cycle is controlled by the time constant created by R8 and C5. (This circuitry is used when using the 400A Control Panel. When using the other panels the timer IC is replaced with a header plug and the calibration is controlled at the panel.)

To check the automatic cycle, place a V.O.M. probe on TP5. As factory set, the voltage at TP5 should climb slowly positive then step toward zero at a rate of approximately one step every 30 seconds. The presence of this stepping function indicates that the multivibrator section of the automatic cycle circuit is operating properly. The remaining portion of the automatic cycle must be checked by placing a recorder on the output of the unit. The ZERO and SPAN cycles should appear approximately every 2 hours, with the Zero and Span points maintaining their values within +/-3%.

The actual SPAN value is a function of the diameter of the two Scotchlite patterns on the Optical Head Assembly front chopper.

It is also a function of the actual clear stack signal level for the operating distance of the Transmissometer and the type of Retroreflector Unit used. Consequently, the SPAN value is a fixed reference between 30 and 70% opacity that should not change.

Following initial setup as outlined in Sections 3.1 and 3.2, set the control switch in the SPAN position, Figure 30. Carefully read the Span value on the meter and record on the title page of this manual.

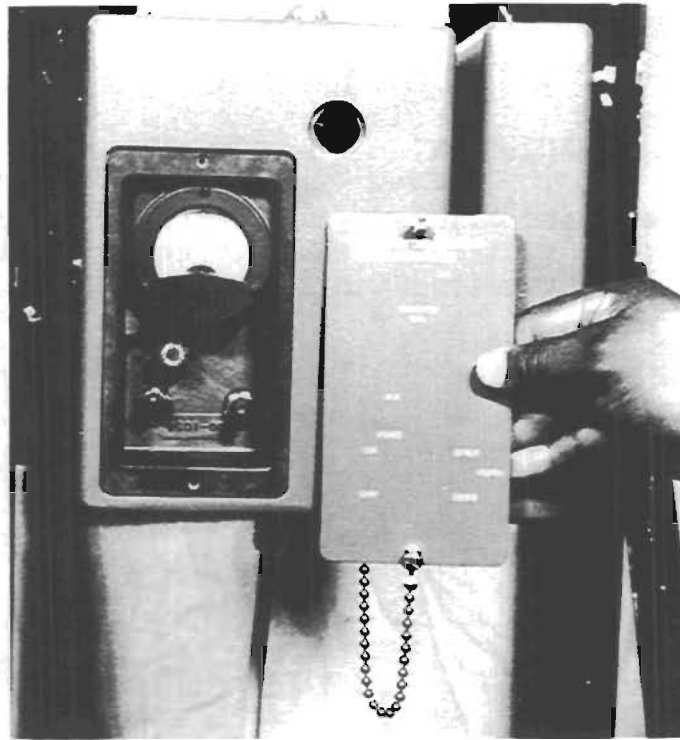


Figure 30. Meter Panel

3.4 ADJUSTING THE SYSTEM RESPONSE TIME

Potentiometer R44 adjusts the response time of the Transmissometer. A clockwise rotation will produce an increase in the response time to a maximum of approximately 30 seconds for the meter needle or recorder output to travel from 0% opacity to 70% opacity. The potentiometer may be rotated counterclockwise to a point where the system will appear extremely noisy. The response time is approximately 0.2 second for this setting. When checking for response times faster than 1 second, the effects of dampening in the front panel meter and the recorder must be considered. If the response time is varied substantially from the setting at the factory, normally set at 5 seconds, the 0% and 100% opacity should be checked for possible readjustment as described in Section 3.2.

3.5 WINDOW STATUS ADJUSTMENT

To set the window reader properly, attach a probe from TP30 and common to a digital voltmeter. The voltage at TP28 should be set to $1.15 \times$ TP30. Adjust this with R95 on the signal processor board.

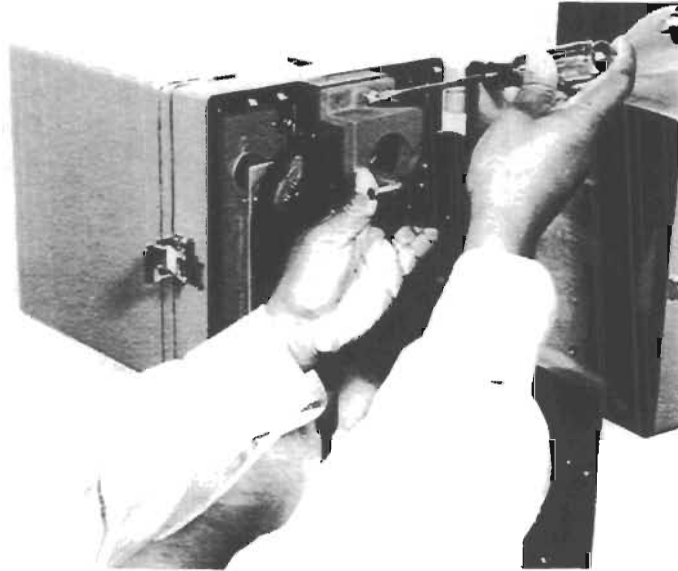


Figure 31. Installing Calibration Test Kit

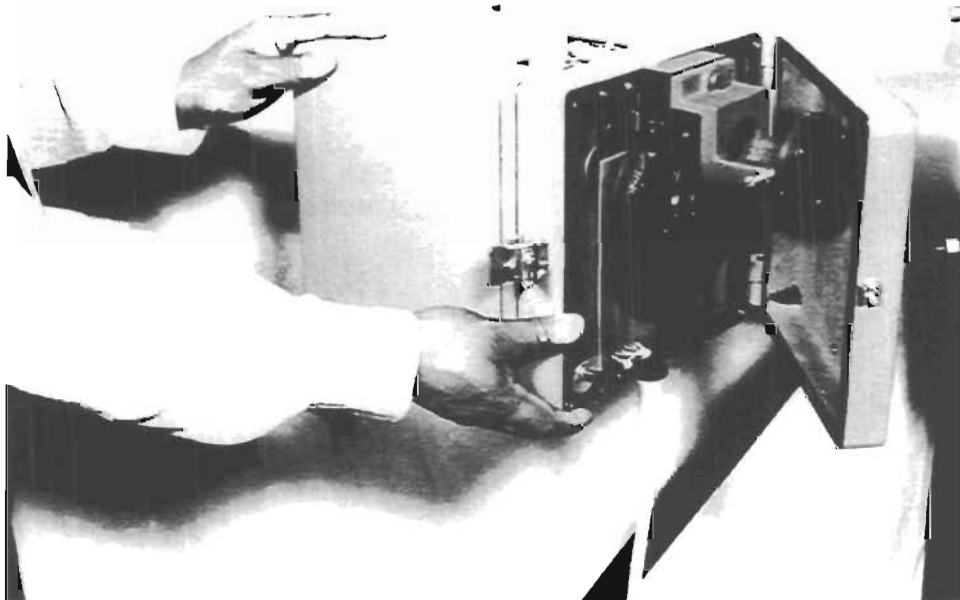


Figure 32. Installing Calibration Test Kit

3.6 CHECKING THE SYSTEM CALIBRATION

The calibration accuracy of the Transmissometer may be checked with any filter of known visual transmission, t , or opacity, $1-t$. This can be conveniently done with the optional Calibration Test Kit, and the set of filters included in the Calibration Test Kit described in Section 2.5. With this kit the Optical Head Assembly opacity readings can be checked at any time the system is in operation as shown in Figures 31 and 32. The Calibration Test Kit has been adjusted to give a 0% opacity reading and locked to preserve the 0% opacity reading for on-stack field checks should clear stack conditions be unattainable. At this point any filter of known photopic opacity can be inserted into the beam and the instrument response, as read on the meter, should correspond to these values.

4.0 INSTALLATION

These procedures are to be followed in the installation of the Transmissometer System after selection of the measurement site.

4.1 SITE PREPARATION

Prior to installation, certain information must be known to assure proper calibration, focussing, adjustment, and electrical connection of the system. These are given in the following checklist.

The required information should be recorded in the checklist and should be provided to the factory so that proper installation drawings can be prepared. This is normally done in the early stages of ordering the Transmissometer.

MODEL 400B TRANSMISSOMETER INSTALLATION CHECKLIST

1. Flange to flange distance, _____ ft.
accurate to 1% (see Figure 4,
Drawing no. 400-0000, Sht. 1)

2. Flange Mounting: _____ Yes
Support rod hole center must be _____ No
vertical (see Figure 14,
Drawing no. 400-1108)

3. Mounting Clearances _____ Yes
(see Figure 4, Drawing no. 400-0000, _____ No
Sht. 2)

4. Electrical Power:
(all power must be single phase)
 - a. Transmissometer and Blower _____ Volts
System - two 115 volt, 20 ampere
circuits or two 230 volt, 10
ampere circuits. Factory must
be notified if 230 volt power
is to be used.

 - b. Remote Monitor, 115 volt 15 W _____ Volts

5. Data Cable:
 - a. Length _____ ft.

 - b. Conduit Size _____ in.
(minimum 1" diameter)

6. Stack Taper Ratio
 - a. Stack inside diameter at _____ ft.
Transmissometer location _____ in.

 - b. Stack inside diameter at exit _____ ft.
_____ in.

4.1.1 TRANSMISSOMETER SYSTEM ON-STACK POWER

Power to the Transmissometer Optical Head Assembly should terminate at a point within easy reach of the 6 foot (1.83 meter) long power cord supplied with the unit. Two 115 volt, single phase, 50/60 Hz, 20.0 ampere circuits are required to properly operate the Transmissometer and both Blower Assemblies with sufficient overload protection, one circuit for each side. The Optical Head and one blower are powered by one circuit; the retro blower is powered by the second circuit.

The Transmissometer and Blower Assemblies can also operate on 230 volt power; however, this requirement must be known at the time the Transmissometer System is ordered from the factory. For this configuration, two 230 volt, single phase, 50/60 Hz, 10.0 ampere circuits are required to properly operate the Transmissometer and Blower Assemblies with sufficient overload protection.

CAUTION

Both sides must be hard wired or warranty will be voided. The Purge Blowers, when supplied as part of the system, must be installed and operating prior to mounting the Optical Head or Retro.

4.1.2 MOUNTING FLANGES

Two mounting flanges are required to mount the Blower Assemblies, Optical Head, and Retro Assemblies to the stack. No other mechanical connections or mounting points are required to place the Transmissometer System in operating position. The flange is a steel ring with an eight hole mounting bolt pattern as shown in Figure 13.

These flanges are welded to a 4 inch (10.16 cm) diameter section of Schedule 40 steel pipe, supplied by the customer, which is in turn welded or fixed to the stack wall. The flanges only need to be aligned visually so that there is an unobstructed view from either side.

Two basic mounting methods, one for a steel wall and one for a masonry wall, are shown in Figure 14. Larger diameter mounting pipe will be required whenever the distance between the stack inner wall and the Transmissometer flange exceeds one foot. This prevents reflections from the pipe walls from affecting the Transmissometer readings. Consult the factory for details.

4.1.3 FLANGE TO FLANGE DISTANCE

The stack outside diameter at the point of installation must be determined and the actual distance from the stack wall to the mounting surface of each flange measured. The sum of these three measurements is the flange to flange distance that must be known to properly select the Retroreflector type, the correct aperture size, and to focus the optical system for a given installation. (Refer to Figure 14 which illustrates typical mounting methods for metal stack and a masonry stack.)

4.1.4 STACK TAPER RATIO

If the stack is tapered and exit plume opacity is the governing parameter for regulatory compliance, the inside diameter of the stack at the point of measurement (l_m) and the inside diameter of the stack exit point (l_e) must be determined. The value of l_e/l_m (stack taper ratio) must be known to develop the proper stack exit point opacity curve for manual data correction or to properly adjust the Remote Control Unit.

4.1.5 DATA CABLE LENGTH AND CONTROL CENTER POWER

The distance from the Transmissometer site to a control center, if the Remote Control Unit is to be used, must be determined to properly select the length of the optional Data Cable. Power for the Remote Control Unit must be 115 volt, single phase, 50/60 Hz, 10 watts (230 volt special order).

The minimum recommended conduit size for housing the Data Cable is 1 inch.

4.1.6 INSTALLATION TOOLS

No special equipment or tools are needed to install the Transmissometer System other than the Retro Assembly Alignment Tool described in Section 2.7. However, for the convenience of installation personnel, the following basic hand tools are recommended and are sufficient for all installation and/or maintenance functions described in this manual.

- | | |
|--|--|
| a. Two 3/4" Open End Wrenches | g. One Large Phillips Screwdriver |
| b. Two 9/16" Open End Wrenches | h. One Small Phillips Screwdriver |
| c. One 5/16" Open End Wrench | i. A set of Allen Wrenches (ranging in size from 1/16" to 3/16") |
| d. One Large Type Screwdriver | j. Retro Alignment Tool |
| e. One Small Blade-Type Screwdriver | k. Calibration Test Kit (with filters) |
| f. One Instrument-Size, Blade-Type Screwdriver (for adjustment of electronics, potentiometers) | |

4.2 BLOWER ASSEMBLY

After the mounting flanges have been installed, the Blower Assembly is bolted directly to the face of the mounting flange with four 1" bolts complete with flat washers, lock washers, and hex nuts, and located at the 45 degree position holes. Four 1/2" - 13 x 8" long threaded rods are inserted in the remaining four mounting holes and locked in place with washers and hex nuts. These threaded rods should extend out from the face of the blower mounting plate approximately 6 1/2 inches (16.51 cm). Two other 1/2" - 12 threaded rods are inserted through the holes along the lower edges of the blower mounting plate and adjusted with washers and hex nuts to steady the assembly against the stack wall. The completed blower plate installation with the cover removed is shown in Figures 33 and 34. The installation for the Optical Head and Retro Assembly Blower Systems is identical and all hardware required is provide with the units.

CAUTION

The Purge Blowers, when supplied as part of the Transmissometer System, must be installed and operating prior to installing the Optical Head or Retro Assemblies. Failure to comply will void the warranty.

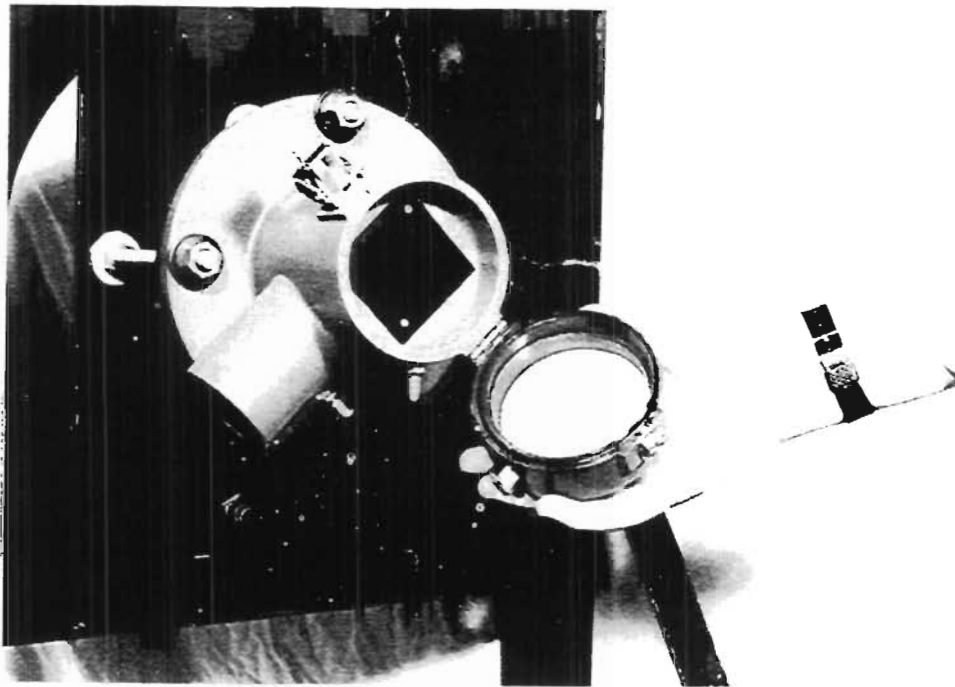


Figure 33. Installation Complete
(Retro Assembly without Cover)

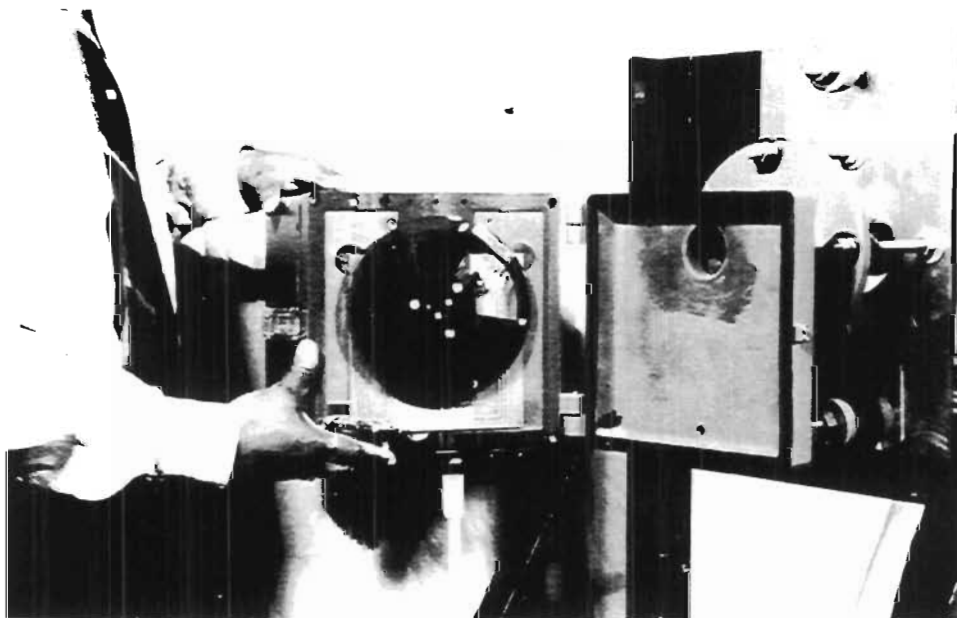


Figure 34. Installation Complete
(Optical Head Assembly without Cover)

4.3 AIR VALVE UNIT

The Air Valve Unit must be mounted to the flange of the Optical Head interface housing (Figure 35) and to the flange of the Retro Assembly housing (Figure 36) prior to installation of these units on the stack. The Air Valve Unit must be oriented with the bell shape of the housing upward to assure proper operation. All mounting hardware is provided with the unit. (If the unit is so equipped the purge fail hoses should be connected as color coded.)

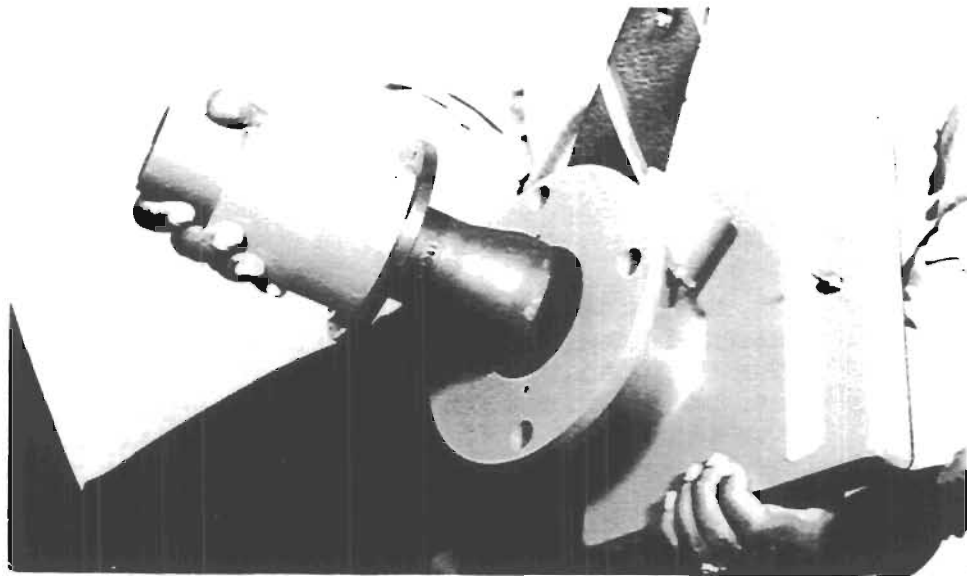


Figure 35. Installation of Air Valve Unit on Interface Housing

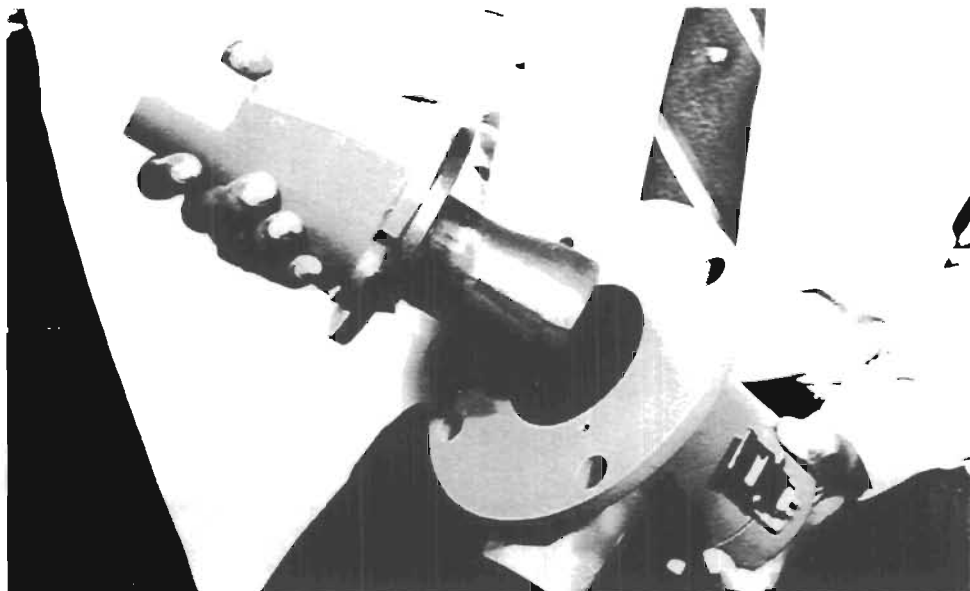


Figure 36. Installation of Air Valve Unit on Retro Housing

4.4 OPTICAL HEAD ASSEMBLY

The Optical Head Assembly is mounted to the stack in two stages. Loosen the hex screws that hold the gasket ring in place. Place a hex nut and one spherical washer set on each of the four threaded rods extending out from the blower mounting plate. Thread the nuts on far enough to allow the nozzle of the Air Valve Unit to be completely inserted into the gasket ring on the blower mounting plate and on the threaded rods as illustrated in Figure 37. Withdraw the Air Valve Interface Housing Assembly to set the interface housing flange 4 5/8" from the blower mounting plate. Place another spherical washer set and hex nut on each of the four threaded rods. Install the blower hose on the air inlet and tighten the hose clamp as shown in Figure 38.

CAUTION

At this point, power to the Blower Assemblies, when supplied as part of the Transmissometer System, must be turned on to assure air flow before the Optical Head main case is installed. Failure to comply will void the warranty.

The interface housing may now be coarse aligned by adjusting the hex nuts as shown in Figure 39. The opening on the far side of the stack must appear concentric with the opening through the interface housing.

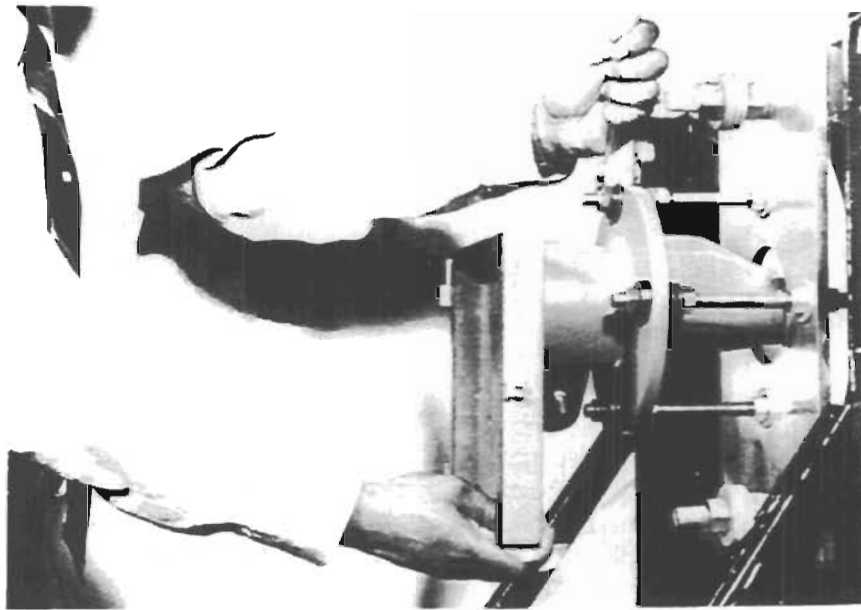


Figure 37. Inserting Air Valve Unit on Interface Housing

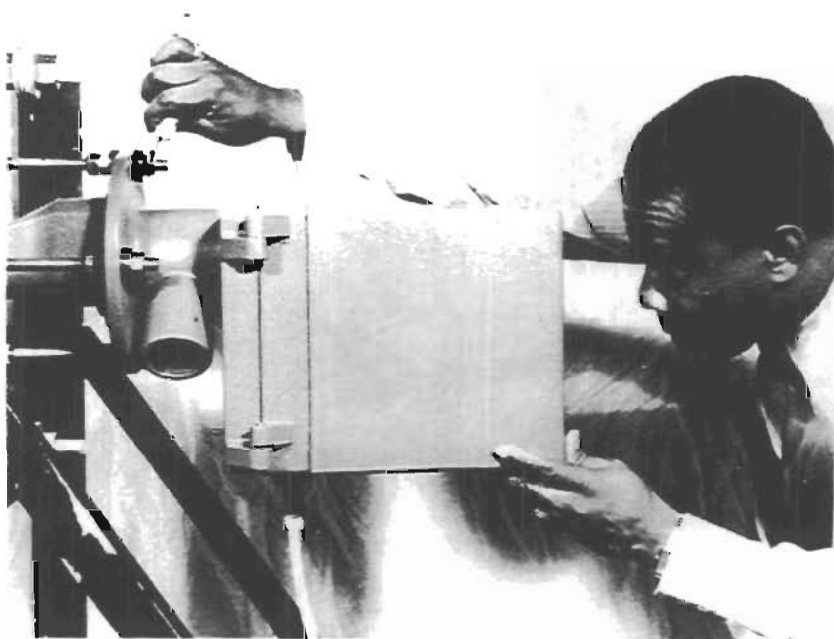


Figure 39
Adjusting Interface Housing

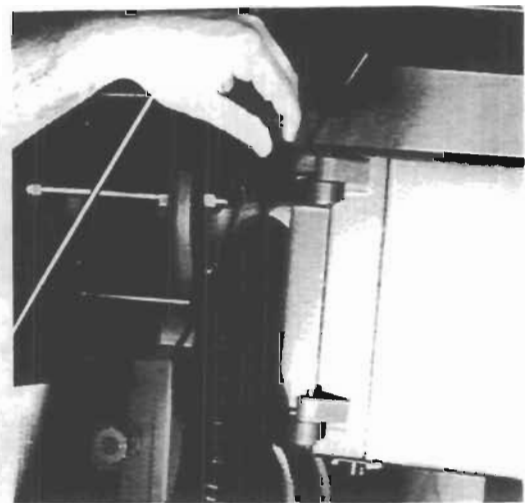


Figure 38
Tightening Hose Clamp

CAUTION

Be sure that the Optical Head Assembly power supply has been adjusted for the proper line voltage (see Section 2.1.4.1)

Place the Optical Head main case on the hinge pins of the interface housing as shown in Figure 40. Connect the Power and Data Cables to their respective connectors on the bottom of the main case, then close the unit and lock the fasteners. Open the access door on the back of the unit and turn on the POWER switch. The Optical Head is now installed but final alignment can only be carried out with the Retro Assembly in place.

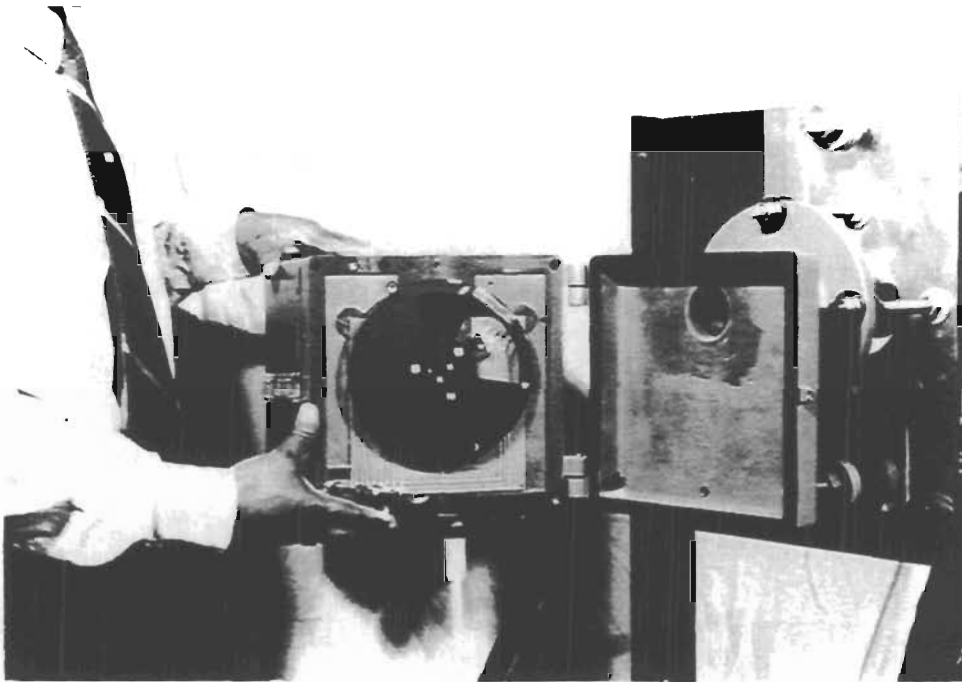


Figure 40. Optical Head Main Case on Hinges

4.5 RETRO ASSEMBLY FINAL ALIGNMENT

Place a hex nut and spherical washer set on each of the four threaded rods extending out from the blower mounting plate. Attach the blower hose to the inlet on the Retro Assembly housing and tighten the clamp in the same manner that it was done for the Optical Head interface housing.

CAUTION

At this point, power to the Blower Assemblies, when supplied as part of the Transmissometer System, must be turned on to assure air flow before the Retro Assembly is installed. Failure to comply will void the warranty.

Loosen the gasket ring hex head screws and insert the nozzle of the Air Valve Unit into the gasket ring with the flange on the threaded rods as shown in Figure 41. Withdraw the Air Valve Retro Housing Assembly to set the retro housing flange 4 5/8" from the blower mounting plate. Place another spherical washer set and hex nut on each of the four threaded rods finger-tight. Using the Alignment Tool as shown in Figure 42, adjust the hex nuts until the cross hair is centered on the bright objective lens aperture in the Optical Head Assembly across the stack. Tighten the nuts firmly for positive alignment. Tighten the gasket ring hex head screws, then attach the weather cover to the hinges on top of the blower mounting plate, close the cover, and fasten the latches.

Adjust the hex nuts on the Optical Head Assembly mounting flange as shown in Figure 43 until the cross hair in the eyepiece is centered on the bright image of the Retroreflector across the stack. Tighten the nuts firmly for positive alignment. Tighten the gasket ring hex head screws, then attach the weather cover to the hinges on top of the blower mounting plate, close the cover, and fasten the latches.

Figure 41
Mounting the Retro Assembly

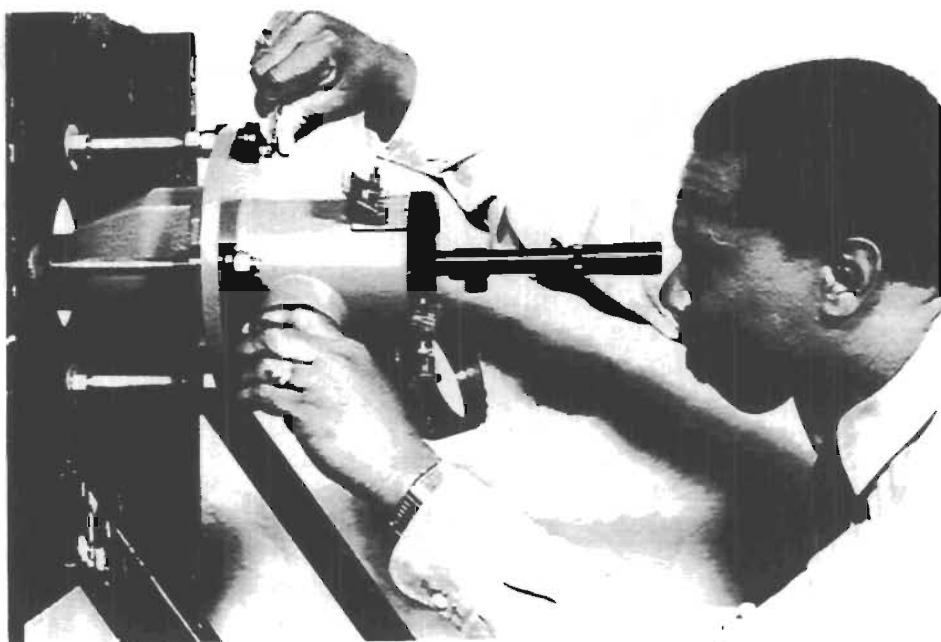
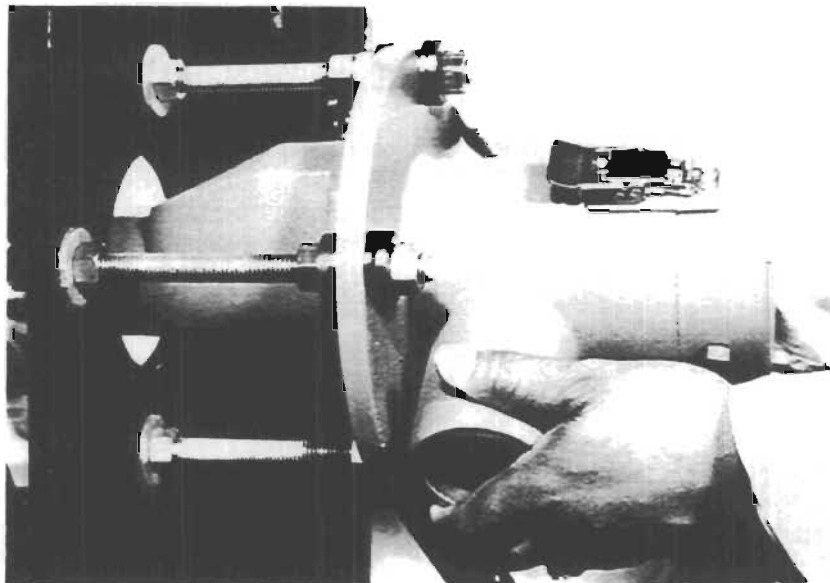
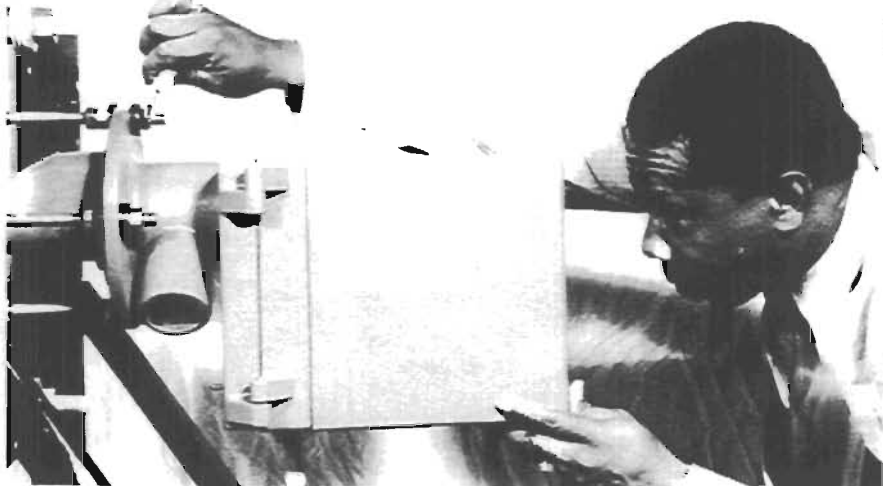


Figure 42
Using Alignment Tool

Figure 43
Final Adjustment of
Optical Head Assembly



5.0 MAINTENANCE

The basic Transmissometer, with Air Valve Units and Blower Assemblies, is designed to operate unattended for extended periods. Very little maintenance is required although it is suggested that a routine inspection schedule be adopted to monitor the condition of the system since the physical environment will vary from one installation site to another. As part of the inspection schedule, the following items should be checked for cleanliness or serviceability. After initial installation, there should be no need for adjustments to the system unless the physical alignment or electronic settings have been disturbed. A factory representative should be consulted for equipment and component failures, warranty repairs, and field service.

There are four levels of maintenance for the Transmissometer System:

- Level 1 - Routine Maintenance
- Level 2 - Parts Replacement with
no Adjustment
- Level 3 - Parts Replacement with
Adjustment or Recalibration
- Level 4 - Factory Repair

Level 1 - Routine Maintenance

This involves cleaning the external optical windows and the chopper. Replacing the desiccator cartridges in the Optical Head and Retro Assemblies, air filters in the Blower Assemblies, and the fuse in the meter panel of the Optical Head Assembly. At this level of maintenance, the system response can also be checked using the Calibration Test Kit. This level of maintenance is preventative and diagnostic in nature and should be conducted on a regular schedule determined by environmental conditions at the instrument site. This maintenance, however, should be conducted at least quarterly.

Level 2 - Parts Replacement With No Adjustment

At this level of maintenance, certain basic parts and system components can be replaced without adjusting or recalibrating the system. These include the Power Supply Board, the meter and switches from the meter panel, the chopper motors and their capacitors, the blower motors, the air hose and clamps, and other external hardware items. This level of maintenance is just one step beyond Routine Maintenance, Level 1, and does not require system readjustment or recalibration.

Level 3 - Parts Replacement With Adjustment or Recalibration

At this level of maintenance, the entire Main Electronics Board, the lamp, Detector Assembly, optical pickups for the front chopper, and plug-in or solderable components from the Main Electronics Board may be replaced. This must be done using the instructions and/or schematics of this manual.

Level 4 - Factory Repair

This level of maintenance covers all other phases of maintenance or repair where internal optical alignment has been disturbed or severe physical damage has been sustained by the Transmissometer Optical Head Assembly. Under these conditions, factory tooling and adjustment systems should be used to properly effect the repairs.

In this section replacement of the most common routine maintenance items are discussed together with the replacement of the lamp, which is a Level 3 maintenance item.

5.1 OPTICS

At each inspection period, the protective windows over the Optical Head objective lens and the Retro Assembly Retroreflector should be cleaned. Turn off the power switch on the meter panel, open the optical case at the hinge plate, and stop the front chopper to gain access to the objective window. Open the back cover on the Retro Housing to gain access to the Retroreflector window. Clean the exposed optical surfaces with the cleaning fluid and lens tissue supplied with the Maintenance Kit. The lens tissue should be discarded after being used once to avoid scratching optical surfaces with any embedded grit picked up in the cleaning process. The reflective side of the chopper blade must also be cleaned at this time. Use common liquid dish soap and water to clean the chopper. The Calibration Test Kit and its neutral density filters should also be cleaned and free of fingerprints, oil smudges, dirt, and other contaminants before being used.

5.2 AIR FILTERS

During the routine inspection period these units should be checked for cleanliness. The elements can be partially cleaned with compressed air as a temporary measure, but once contaminated should be changed. The cartridges are replaced by removing the wing nut and hood of the filter unit as shown in Figures 44 and 45.

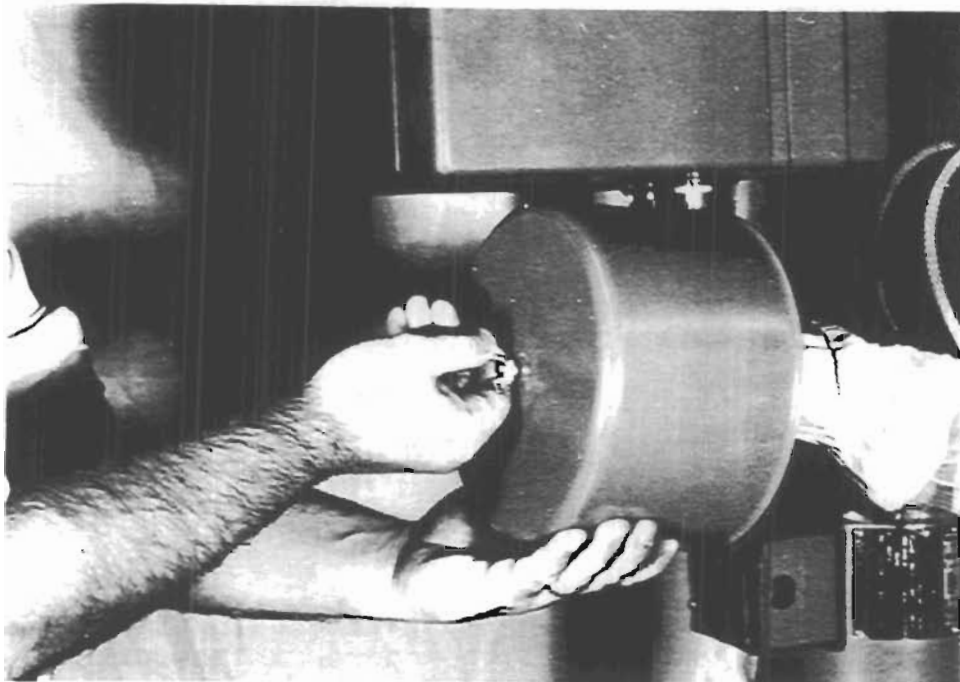


Figure 44. Loosening Filter Cover Wing Nut

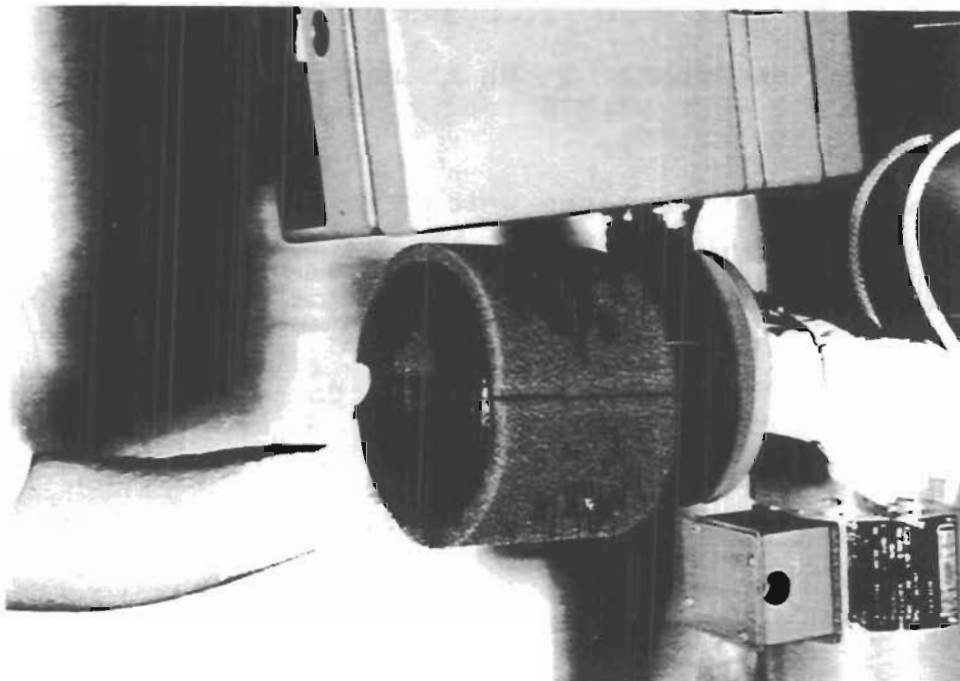


Figure 45. Removing Filter Cartridges

5.3 DESICCATORS

The desiccator unit located in the back surface of the cover plate of the Optical Head should be serviced when the indicating card is pink. The item should be removed from the cover, the end cap (opposite the indicator end) removed, and the desiccant cartridge replaced. The replaced desiccator material can be regenerated by drying with heat if desired.

The small desiccator cartridge in the Retro Assembly should be replaced when the material is pink in color. This cartridge and the silica gel can also be regenerated by heating if desired.

5.4 LAMP REPLACEMENT

A General Electric quartz-halogen lamp with a lifetime in excess of 30,000 hours is used as the light source in the Optical Head Assembly. Because of its long service life, the lamp should last about three years before replacement.

Replace the lamp as follows:

1. Remove the yellow power cord from the Optical Head.
2. Open the instrument at the hinge plate and remove the four 10-32 x 1 1/2" socket head cap screws as shown in Figure 26.
3. Remove the cover as shown in Figure 27.
4. Disconnect lamp power leads at the connector (Figure 26) and remove two 4-40 x 1/4" long socket head screws and washers (Figure 47).
5. Replace with new lamp and connector, ensuring that the leads are facing the front. Replace the 4-40 screws and washers and lightly tighten the two screws to seat the mounting pins, leaving an even exposure of the lamp base above its mounting structure.
6. Smoothly form the leads in the region adjacent to the meter support and reconnect the new lamp connector.

Note: To avoid early lamp failure, clean the envelope of the new lamp with a methanol and water solution. This is required to remove fingerprints and other dirt before turning on the power.

7. Reconnect the instrument power.



Figure 46. Disconnecting Lamp Power Plug

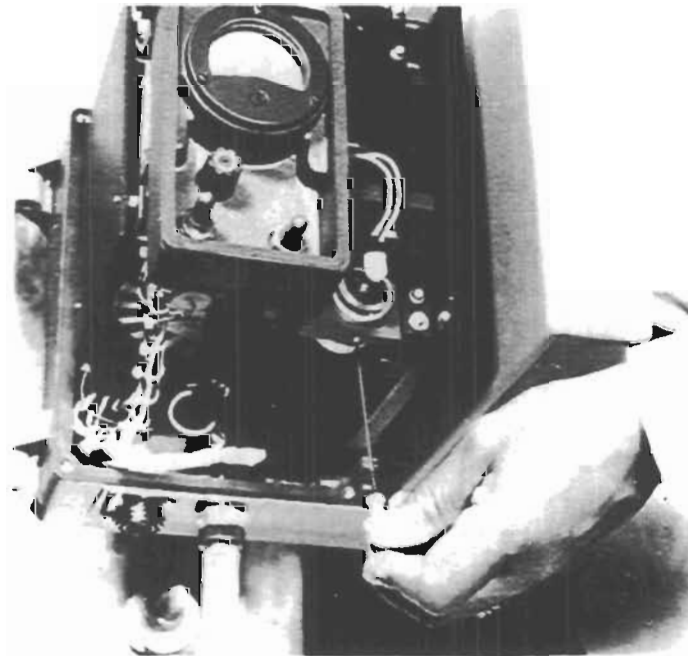


Figure 47. Removing the Lamp Screws

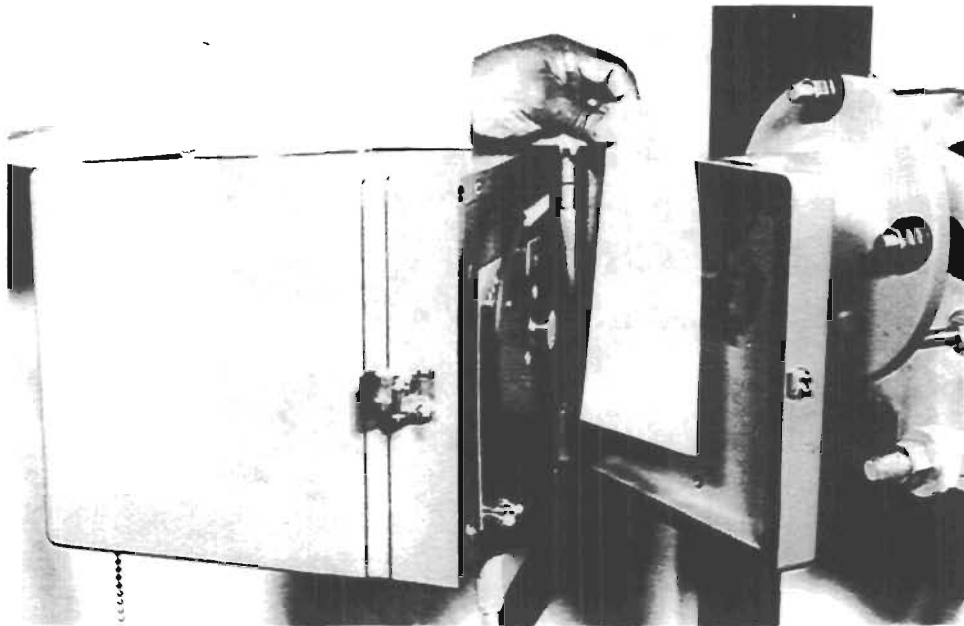


Figure 48. Centration of Filament Image

8. Place a small white card in front of the objective window as shown in Figure 48 and observe the image of the projected lamp. The lamp image must be centered both horizontally and vertically with respect to the objective aperture.

Note: If the lamp image at the front of the objective is not centered, it will be necessary to adjust the position of the lamp holding bracket per Steps 9 and 10 below.
9. Slightly loosen the two socket head cap screws holding the lamp bracket (Figure 49). Should any of the screws be removed, they must be coated with Loctite Type 222 or its equivalent prior to their reinstallation.
10. Carefully move the lamp bracket to center the lamp image, then retighten the two screws lightly and alternately while preserving the centration of the lamp image. Continue to tighten in increasing amounts until the lamp bracket is firmly locked in position.
11. Recalibrate the Model 400 with the procedures described in this manual. Use the calibration appliance supplied with the instrument.
12. Replace the main cover, then close and secure the instrument for manual operation.

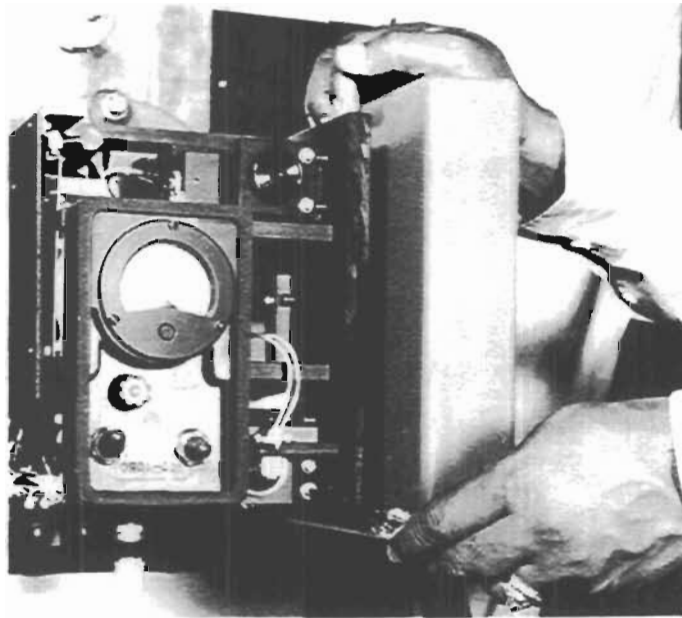


Figure 49. Loosening Lamp Bracket Screws

6.0 SPARE PARTS LIST

The following list, which is arranged by maintenance level category, covers major assemblies and parts that are normally replaced in accordance with routine maintenance procedures or in the case of equipment component failure. Field repairs by the customer should not be attempted without consulting a factory representative or the equipment warranty will be void. However, upon factory recommendation failed components should be immediately replaced, and the defective item, if salvageable, returned to the factory for repair or replacement.

Note: Items marked with an asterisk (*) are recommended spare parts which will probably require replacement during the normal course of equipment maintenance. The other items listed are recommended to minimize downtime in the event of unexpected component failure.

Level 1 - Routine Maintenance

<u>Part Number</u>	<u>Item</u>
* 400-0015 (100)	Fuse, #313-3AG, 1/2 Amp Slow-Blow
* 400-0015 (101)	Dri Cap Dehydrator Retro Assembly
* 400-0015 (102)	Indicating Desiccator, Optical Head Assembly
* 400-0015 (103/104)	Lens Cleaning Solution
* 400-0015 (105)	Lens Tissue
* 400-0015 (106)	Air Filter Blower Unit

Level 2 - Parts Replacement With No Adjustment

<u>Part Number</u>	<u>Item</u>
007-0178	Power Supply Board
400-0013 (100)	Blower Motor

Level 3 - Parts Replacement With Adjustment or Recalibration

<u>Part Number</u>	<u>Item</u>
007-0524-1, -2	Main Electronics Board
400-0010 (114)	Lamp

7.0 WARRANTY AND FIELD SERVICES

7.1 WARRANTY

All goods sold hereunder are warranted to be free from harmful defects in material and workmanship and to conform to the specifications, if any, agreed upon between the Purchaser and Thermo Environmental Instruments Inc. or in the absence of such specifications, to the cataloged description. This express warranty is in lieu of and excludes all other warranties, express or implied, by operation or law or otherwise. In no event shall Thermo Environmental Instruments Inc. be liable for consequential or special damages. Thermo Environmental Instruments Inc. agrees to rework or replace, at its option, any defective goods provided we are notified of such defects within ninety (90) days after receipt of the goods by the Purchaser or such other period as may be mutually agreed upon. Transportation charges on goods claimed to be defective will be allowed only in case defects are found by Thermo Environmental Instruments Inc. to exist, and not otherwise. All goods claimed to be defective should be returned to the point of manufacture unless otherwise advised.

7.2 FACTORY SERVICE

Defective equipment not covered by the warranty will be repaired at the factory on a time and material basis. Equipment received for repair will be inspected and the cost for all requested and/or necessary repairs will be quoted to the customer. No repair work will be initiated without the customer's written authorization to proceed. All shipping charges will be paid by the customer.

7.3 FIELD SERVICE

The costs of maintenance or repair of Thermo Environmental Instruments Inc. equipment not covered by the warranty and conducted on the customer's site will be charged on a time and material basis. The time charges will include travel time to and from the customer's facility and actual on-site service time. Premium labor rates will be charged for overtime and for Saturday and Sunday work. Material charges will include the cost of replacement parts not covered by the warranty and any additional parts or materials requested by the customer for that particular installation. Equipment not repairable on-site will be removed by Field Service personnel upon customer's authorization and returned to the factory for the required work. Repaired equipment will be returned to the customer for reinstallation. Assistance in reinstallation by Thermo Environmental Instruments Inc. Field Service personnel will be charged on a time and material basis. Additional on-site service of the repaired or replaced equipment within 30 days of the reinstallation will be provided at no extra charge, and will be considered as part of the original service call.

Calibration for a given installation is normally completed at the factory prior to shipment of the instrument. Should the instrument be required at a different location within the customer's facility, where the flange to flange distance is different than that at the initial installation, the instrument must be recalibrated. The instructions in Sections 3.0 and 4.0 of this manual are to be used to perform the calibration function and installation work. Assistance in this effort can be provided on a time and material basis. Two instrument support stands, as shown in Figure 20 are recommended as an aid in performing the calibration function. The mounting flanges, Thermo Environmental Instruments No. 400-1003 or equivalent, must be fixed in place by the customer prior to the arrival of Field Service personnel to avoid expending service time waiting for the completion of the flange installation. The site must also be wired for power. **FAILURE TO DO THIS WILL RESULT IN ADDITIONAL CHARGES.** Factory personnel should be consulted in the case of unusual installation requirements, such as stack or duct offsets greater than 1 foot each side, and Data Cable lengths longer than 5,000 feet.

7.4 MAINTENANCE SERVICE

A maintenance contract is also offered by Thermo Environmental Instruments Inc. for the inspection and service of installed Transmissometer equipment. Due to the individual nature of each installation, the maintenance contract cost is based on the amount, location, and type of equipment at each site and any local labor requirement conditions. The service includes periodic visits to the installation site to perform all routine maintenance required, to make any system adjustments considered necessary, and to replace or repair faulty or failed parts that are still under warranty. Equipment under warranty that must be returned to the factory will be repaired and failed parts replaced at no charge.

Equipment or parts failed or damaged that are not under warranty will be replaced with only a material charge to the customer, provided the repairs can be made on-site. Equipment that must be removed from the site and returned to the factory for repair will be subject to the normal factory service time and material charges. Reinstallation and any further service work on-site will be considered covered under the maintenance contract currently in force.



Lawton Chiles
Governor

Florida Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

October 7, 1993

Ms. Jewell Harper, Chief
Air Enforcement Branch
United States Environmental
Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30065

Re: Amendment of Permit No. PSD-FL-151

Dear Ms. Harper:

Ogden Martin Systems, Inc. has requested that the referenced permit for the Lee County Solid Waste Energy Recovery Project be amended to authorize a higher air-to-cloth ratio for the ash handling building dust collection and ventilation system. The amendment will not allow an increase in permitted annual emissions of any air pollutant.

The Department finds their proposal acceptable and has drafted the enclosed amendment to permit No. PSD-FL-151. Because this facility is subject to Florida's Power Plant Certification regulations, we request EPA review and approval of the enclosed draft amendment.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. H. Fancy".

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/TH/bjb

Enclosure

cc: J. Kerons
D. Knowles
D. Sessler

October 7, 1993

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Joseph R. Treshler
Vice President
Ogden Martin Systems, Inc.
P. O. Box 709
Brandon, Florida 23509-0709

RE: Lee County Solid Waste Energy Recovery Facility
PSD-FL-151

Dear Mr. Treshler:

The review of your September 17, 1993 letter requesting an administrative change to the conditions of the Prevention of Significant Deterioration permit (PSD-FL-151) issued to Lee County Utilities on July 20, 1992, for the waste to energy recovery facility has been completed. You requested that Specific Conditions 4e. of the permit be revised to authorize a higher air-to-cloth ratio for the ash handling building dust collection and ventilation system.

The basis of your request is that the 0.010 grains/dscf is achievable using a standard industrial HVAC baghouse having an air-to-cloth ratio within the range of 8:1 to 10:1.

Based on the foregoing, it is determined that the proposed revision to the Specific Conditions 4e. of PSD-FL-151 is acceptable and will not result in an increase in permitted annual emissions of any pollutant subject to the PSD regulations. As an administrative change, this revision will not require additional public participation procedures.

Authority to construct a stationary source was granted for the Lee County Solid Waste Energy Recovery Facility project, subject to the conditions in the permit to construct on July 20, 1992. This administrative change to PSD-FL-151 does not alter the commence construction deadline for this facility. This authority to construct is based solely on the requirements of 40 CFR 52.21, the federal regulations governing significant deterioration of air quality, and in no way affects the approvals under other federal or State regulatory authorities. Please be advised that a violation

Mr. Joseph R. Treshler
October 7, 1993
Page Two

of any condition issued as part of this approval, as well as any construction which proceeds in material variance with information submitted in your application, may subject Lee County Solid Waste Energy Recovery Facility project to an enforcement action.

Any questions concerning this administrative permit revision may be directed to Mr. Winston A. Smith, Director; Air, Pesticides, and Toxics Management Division at (404) 347-3043.

Sincerely,

Patrick M. Tobin
Acting Regional Administrator

Enclosure

cc: C. H. Fancy, FDEP

The Specific Conditions of federal permit PSD-FL-151 shall be modified as follows:

Specific Condition No. 4e

FROM:

4.e Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

TO:

4.e Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Extra bags shall be maintained at the site for emergency purposes. Baghouse (combustion units) shall have a maximum to cloth ratio of 4:1. Baghouse (ash handling building dust collection system) shall have a maximum air-to-cloth ratio of 10:1.

OGDEN MARTIN SYSTEMS OF LEE, INC.

40 LANE ROAD
CN 2615
FAIRFIELD, NJ 07007-2615
(201) 882-9000



July 7, 1993

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C. H. Fancy, P.E.

Florida Department of Environmental Regulation
South District Office
2295 Victoria Avenue
Suite 364
Ft. Myers, FL 33901

Attention: Philip Barbaccia

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, FL
Project C-1033

Subject: Information of the Continuous Emission Monitoring Devices
Power Plant Site Certification No. 90-3942 EPP (PPSC)
PSD Permit No. PSD-FL-151 (PSD)

Gentlemen:

On behalf of Lee County, the permittee of the above reference PPSC and PSD, Ogden Martin Systems of Lee, Inc. has prepared and herewith submits to the Bureau of Air Regulation and to the South District Office of the Florida Department of Environmental Regulation four (4) copies of information covering the continuous emissions monitoring (CEM) devices for the Lee County Solid Waste Resource Recover Facility in accordance with the subject PPSC and PSD.

The Specific Conditions in the PPSC and the PSD that specifically require the submittal of the information provided herein are as follow:

PPSC: Sections XIV.A, XIV.A.2(b), and XIV.A.2(d)

PSD: Sections 3.b and 3.d

The information and plans provided herein are consistent with approved design concepts, regulations, and the Conditions of Certification.

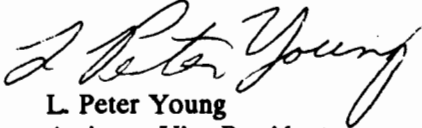
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JUL 13 1993
Division of Air
Resources Management

Letter to C. H. Fancy and Philip Barbaccia
Page 2
July 6, 1993

This completes the submittals required to satisfy the above listed Sections of the PPSC and PSD.

Do not hesitate to call at (201) 882-7246 if you have any questions or further needs.

Very truly yours,



L. Peter Young
Assistant Vice President
Project Management

LPY:rj
02LeeCo.Ltr

Encl.

cc: D. Cerrato - Malcolm Pirnie (w/1 set)
D. Markley - Malcolm Pirnie (w/1 set)
L. Sampson - Lee County (w/1 set)
J. Kowal - OMSL (w/1 set)
L. Ware - UE&C (w/1 set)
pf 5.1 FDER

G. Harper, EPA
B. Owen
D. Knowles

OGDEN MARTIN SYSTEMS OF LEE, INC.

40 LANE ROAD, CN 2615
FAIRFIELD, NJ 07007-2615

TEL: (201) 882-9000
FAX: (201) 882-4199



VIA FIRST CLASS MAIL

June 15, 1993

RECEIVED

JUN 17 1993

Division of Air
Resources Management

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Attention: **C.H. Fancy, P.E.**

Florida Department of Environmental Regulation
South District Office
2295 Victoria Avenue
Suite 364
Ft. Myers, Florida 33901
Attention: Philip Barbaccia

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE0709L

Subject: SAMPLING PORT LOCATIONS
POWER PLANT SITE CERTIFICATION NO. 90-3942 EPP (PPSC)
PSD PERMIT NO. PSD-FL-151 (PSD)

Gentlemen,

On behalf of Lee County, the Permittee of the above referenced PPSC and PSD, OMSL has had prepared and herewith submits to the Bureau of Air Regulation and to the South District Office of the Florida Department of Environmental Regulation four (4) prints of the Facility's stack general arrangement drawing No. 92-188-1 revision 1, dated 5/10/93 and the flue gas cleaning system general arrangement drawing no. 726-GA-02, revision 1, dated 5/10/93 in accordance with the subject PPSC and PSD.

pja/2901

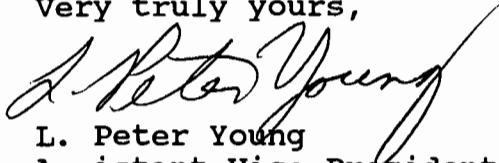
The Specific Conditions in the PPSC and PSD that specifically require the submittal of the information provided herein are as follows:

<u>Specific Condition</u>		<u>Subject</u>
<u>PPSC</u>	<u>PSD</u>	
XIV.A (page 8)	3.d (page 11)	Stack and air pollution control equipment outlet duct drawings showing sampling locations.
XIV.A.2.b & d (page 12)	3.b (page 10)	Continuous emissions monitoring and test sampling port locations.

The plan provided herein is consistent with approved design concepts, regulations, and the Conditions of Certification. Monitoring equipment specifications will be submitted shortly and the operation and maintenance manuals and calibration procedures shall be submitted prior to installation.

Do not hesitate to call at (201) 882-7246 if you have any questions or further needs.

Very truly yours,



L. Peter Young
Assistant Vice President -
Project Management

cc: L. Sampson - Lee County (w/1 set)
D. Cerrato - Malcolm Pirnie (w/1 set)
D. Markley - Malcolm Pirnie (w/1 set)
L. Ware - UE&C w/1 set)

W. Knowles, SF Dist
D. Harper, EPA
B. Owen

**OGDEN MARTIN SYSTEMS
OF LEE, INC.**

40 LANE ROAD
P.O. BOX 2615
FAIRFIELD, NJ 07007-2615
(201) 882-9000

RECEIVED

MAR 12 1993

**Bureau of
Air Regulation**



AN OGDEN
PROJECTS COMPANY

REDISTRIBUTED 3-10-93 WITH ATTACHMENTS

VIA FIRST CLASS MAIL

March 4, 1993

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C.H. Fancy, P.E.

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE0329L

Subject: AIR POLLUTION CONTROL SPECIFICATION
POWER PLANT SITE CERTIFICATION (PPSC) NO. 90-3942EPP

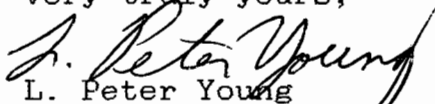
Dear Mr. Fancy,

On behalf of Lee County, the permittee, Ogden Martin Systems of Lee, Inc. hereby submits four (4) copies of complete specification information for the Air Pollution Control System for the referenced project. This information is being submitted pursuant to the Power Plant Site Certification for the Lee County Solid Waste Resource Recovery Facility, Case No. 90-3942EPP, Appendix A, Item XIV.A.

This specification titled "TECHNICAL SPECIFICATION FOR AIR POLLUTION CONTROL SYSTEM" SPEC NO. SM-105, ISSUE 006, DATE 12-06-91, REVISION 6, DATED 2/5/93" effectively provides the make and model number information as required.

Please contact me at (201) 882-7246 if you have any questions or require further information. Please note that the specification for the Municipal Waste Combusters was transmitted to your office on February 12, 1993 and the specification for continuous emissions monitoring system and stack drawings will be submitted at a later date.

Very truly yours,

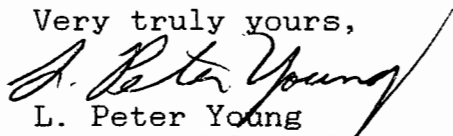


L. Peter Young
Assist. V.P. - Project Management

cc: P. Barbaccia/D. Knowles (w/att.) - South District
L. Sampson (w/att.) - Lee County
D. Markley (w/att.) - Malcolm Pirnie
D. Cerrato (w/att.) - Malcolm Pirnie
L. Ware (w/att.) - UE&C
J. Kowal
J. Treshler (w/att.)
pf 5.1 FDER
J. Harper, EPA
D. Bunyak, NPS
B. Owen

Please contact me at (201) 882-7246 if you have any questions or require further information. Please note that the specification for the Municipal Waste Combusters was transmitted to your office on February 12, 1993 and the specification for continuous emissions monitoring system and stack drawings will be submitted at a later date.

Very truly yours,



L. Peter Young
Assist. V.P. - Project Management

cc: P. Barbaccia/D. Knowles (w/att.) - South District
L. Sampson (w/att.) - Lee County
D. Markley (w/att.) - Malcolm Pirnie
D. Cerrato (w/att.) - Malcolm Pirnie
L. Ware (w/att.) - UE&C
J. Kowal
J. Treshler (w/att.)
pf 5.1 FDER

OGDEN MARTIN SYSTEMS OF LEE, INC.

40 LANE ROAD
P.O. BOX 2615
FAIRFIELD, NJ 07007-2615
(201) 882-9000



AN OGDEN
PROJECTS COMPANY

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MAR 09 1993

Division of Air
Resources Management

VIA FIRST CLASS MAIL

March 4, 1993

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C.H. Fancy, P.E.

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE0329L

Subject: AIR POLLUTION CONTROL SPECIFICATION
POWER PLANT SITE CERTIFICATION (PPSC) NO. 90-3942EPP

Dear Mr. Fancy,

On behalf of Lee County, the permittee, Ogden Martin Systems of Lee, Inc. hereby submits four (4) copies of complete specification information for the Air Pollution Control System for the referenced project. This information is being submitted pursuant to the Power Plant Site Certification for the Lee County Solid Waste Resource Recovery Facility, Case No. 90-3942EPP, Appendix A, Item XIV.A.

This specification titled "TECHNICAL SPECIFICATION FOR AIR POLLUTION CONTROL SYSTEM" SPEC NO. SM-105, ISSUE 006, DATE 12-06-91, REVISION 6, DATED 2/5/93" effectively provides the make and model number information as required.

pja/2709

OGDEN MARTIN SYSTEMS
of LEE, Inc.

SPEC NO. SM-105
ISSUE 006
DATE 12/06/91

TECHNICAL SPECIFICATION
FOR
AIR POLLUTION CONTROL SYSTEM

Facility Name: LEE COUNTY RESOURCE RECOVERY FACILITY
Location: LEE COUNTY, FLORIDA

This document and all information contained herein are the property of Ogden Martin Systems of LEE, Inc., and are not to be used except as expressly authorized in writing by said company.

Specification Prepared By: Name: OGDEN MARTIN SYSTEMS
Address: FAIRFIELD, NJ
Telephone: 201-882-9000

Approved for Release:

	Printed Name	Signature	Date
1.	<u>R. TERRAMOCCIA</u>		<u>1/23/91</u>
2.	<u>R. TERRAMOCCIA</u>		<u>11/15/91</u>
3.	<u>R. TERRAMOCCIA</u>	<u>R. Terramocchia</u>	<u>1/16/92</u>
4.	<u>R. TERRAMOCCIA</u>		<u>9/3/92</u>
5.	<u>R. TERRAMOCCIA</u>		<u>11/9/92</u>
6.	<u>R. TERRAMOCCIA</u>		<u>11/20/92</u>
7.	<u>R. TERRAMOCCIA</u>	<u>R. Terramocchia</u>	<u>2/25/93</u>

REVISIONS

001	Initial Issue	1/01/87
002	Revision	7/24/87
003	Revision	10/28/87
004	Revision	8/05/88
005	Revision	12/28/90
006	Revision	12/06/91

OGDEN PROJECTS INC.
 TECHNICAL SPECIFICATION
 FOR
 AIR POLLUTION CONTROL SYSTEM

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1.0 GENERAL

This Specification details the technical requirements for the design, fabrication, shop testing, delivery, erection, field testing, start-up, and initial operation of the Air Pollution Control (APC) System for a municipal waste-to-energy facility. Where a conflict exists within this Document (this includes all the attachments listed in the Table of Contents, the more stringent requirement shall apply; if the conflict is not a case of more or less stringent, then the order of priority shall be 1) Air Permit (Attachment 9), 2) Service Agreement (Attachment 12), and 3) remainder of the Specification. All conflicts shall be brought to the attention of the Purchaser.

In general, the APC system shall include one or more trains of experience-proven equipment, complete with all ductwork and accessories. Each train shall be sized for the Design gas flow of one refuse fired boiler, reference Attachment 2. The equipment provided shall include a system complete in every detail except as specifically excluded herein.

System configuration shall be as indicated in Attachment 1. If multiple configurations are indicated in Attachment 1, separate proposals shall be provided for each required configuration.

It is the intent of this Specification that the Seller provide and install a complete "stand-alone" system. All Purchaser-supplied utilities, foundations, erection support, etc must be clearly defined by the Seller.

NOTE THAT PROJECT SPECIFIC REQUIREMENTS ARE INCLUDED IN SECTION 4.4.

1.1 Scope

The scope of Seller's supply for the Air Pollution Control equipment begins at the outlet flanges of the Purchaser's economizer and extends through the scrubber vessel (spray dryer), baghouse (or precipitator), and I.D. fans to the inlet flange at the stack. The scope of Seller's equipment supply for the reagent preparation system begins at the truck connection to the lime storage silo and extends to the dry scrubber. Lime will be delivered by trucks with pneumatic unloading systems.

1.2 Work to be Provided

The Seller shall furnish the following equipment, material, and services. The listing below is not intended to be complete. The Seller shall furnish all equipment, material, erection, and services required to provide a complete, readily maintained, and properly operating APC system, which satisfies the performance guarantees and requirements of this Specification.

1.2.1 Acid Gas Removal System

Scrubber complete with atomization equipment, gas distribution devices, external stiffeners, access door, and hopper.

Scrubber vessel atomizer/nozzle enclosure complete with heating and ventilation system, spare atomizer/motor assembly stand, an overhead monorail/trolley/hoist system for systems with removable components weighing in excess of 40 pounds, atomizer or nozzle maintenance area, hoist area, and eye wash facility.

All access platforms, stairs and/or ladders for the reagent preparation system, the scrubber vessel, the baghouse or precipitator and auxiliaries.

Truck unloading equipment including fill pipe and quick disconnect truck fittings.

Lime silo complete with prime/finish paint, relief valves, pneumatic filling connection, dust collection equipment, hopper(s), vibrators, isolation gate(s), level probes, hoist and caged ladder to roof (unless accessed from scrubber platform). Volumetric feeder(s) complete with automatic controls.

Slaker-classifier system including grit removal equipment, feed water preheaters for slaker start-up, if required, and vapor and dust venting and collection equipment. Vibrating screen to screen the slurry return from the atomizer, if required.

Lime slurry storage tank, and all other tanks required in the reagent preparation system. Slurry tanks shall be complete with baffles and top mounted agitators to prevent settling of solids. All slurry and water pumps required in the APC system.

Slurry piping and valves and all water, and air piping within the APC system (including thermal and anti-sweat insulation, heat tracing, pipe supports and hangers).

Water flushing system to clear all slurry piping, valves, pumps, tanks, atomizer and other equipment in the APC system which carries slurry.

Reagent preparation equipment enclosure complete with heating and ventilation system, and emergency shower and eye wash facilities.

Complete control system for scrubber, lime storage and slurry preparation system to control acid gas emissions, monitor slurry atomization, monitor and control lime preparation and interface with Purchasers controls.

1.2.2 Baghouse

Baghouse shall be either high ratio (pulse jet) or low ratio (reverse air) design consisting of multiple independent modules. Baghouses of the structural design (i.e., adjacent modules share a common wall) may be furnished for reverse air baghouses. The baghouse shall include steel plate pyramidal hoppers and all

necessary auxiliaries such as access platforms, doors and ladders, structural steel supports, flow distribution devices, flue gas bypass, all dampers with operators, bags, bag cages, etc. Reverse air or pulse-jet cleaning system including reverse gas fan, ductwork, dampers and controls.

Complete baghouse control system to monitor pressure drop, initiate and perform baghouse cleaning, interlock with Purchaser's controls, and bypass baghouse under emergency conditions.

1.2.3 Precipitator

Multiple (4 minimum) field electrostatic precipitator with appropriate gas distribution devices to provide a uniform flow across all flow passages. The precipitator shall include a pressurized walk-in penthouse including pressurization system, rigid discharge electrodes, impact type rapping system, steel plate troughed hoppers and key interlocked access doors.

Complete precipitator control system including automatic programmable controller system for optimum precipitator energization, independent rapper controls for each field, ground detection and interlocks with the purchaser's control system.

Portable grounding cables with insulated extension handles for use during internal inspection to ensure proper grounding of the high voltage system.

Transformer/rectifier power supplies with high-voltage bus and bus ducts between the transformer/rectifiers and discharge electrodes.

1.2.4 Ductwork

All ductwork from the Purchaser's economizer outlet flange to the absorber vessel, all ductwork from the scrubber vessel to the baghouse or precipitator, all baghouse or precipitator compartment inlet and outlet ductwork, all baghouse bypass ductwork, ductwork from the baghouse or precipitator outlet to the I.D. fan and ductwork from the I.D. fan to the stack. The ductwork shall be complete with external stiffeners, baffles, gas distribution plates, turning vanes and vane stiffeners for all turns, expansion joints, test ports, instrument connections, access doors and structural supports.

Particulate fallout hoppers with hopper heaters as required including those determined necessary by the model study, if required by paragraph 4.4.2.

1.2.5 Structural

All structural supporting steel from top of concrete foundations required to support the scrubber vessel, baghouse or precipitator, screw conveyors, and ductwork. All structural steel from top of foundations for equipment enclosures and the complete reagent preparation system including all steel required for the reagent preparation building and lime bin.

Platforms, walkways, grating, stairs, ladders/cages, safety chains, and handrails from top of foundations for access to all areas requiring maintenance, inspection, and cleanout: including the scrubber vessel penthouse, baghouse or precipitator roof, all access doors in the scrubber vessel, baghouse or precipitator, instrument connections and ductwork test ports, and all other required access locations. The Seller shall supply all platforms, walkways, grating, stairs, ladders/cages, safety chains and handrails for the complete reagent preparation system. Hopper access platforming is not required.

All framing and girts required for all enclosures. All architectural materials including floor forms, roof decks, roofing and accessories, wall panels, masonry walls, insulated siding and roofing, personnel and equipment access doors and door hardware, louvers, vent stacks, windows, flashing, seals, and weatherstripping. Exterior and interior architectural finishes.

1.2.6 Electrical

Electrical equipment to be supplied by Seller shall include but not necessarily be limited to 480 Volt power switchboards, 480 volt motor control centers, control panels, motors, above grade grounding system, cable tray and conduit, wire and cable, interior lighting system, 480V power receptacles and 120V convenience outlets, heat tracing. See Attachment No. 4 for typical power distribution.

1.2.7 Controls and Instrumentation

A complete control system for remote control and monitoring of the acid gas removal system, reagent preparation system, and baghouse or precipitator in accordance with Attachment 10.

All primary and final control devices required for the complete APC system including control valves, dampers, and drives. All local controls including transmitters, control panels necessary for the reagent preparation system and atomizer/nozzle assemblies. Hopper heater and vibrator controls, motor controls, and ductwork instrumentation.

1.2.8 ID Fans

The supply of ID Fans (if required in Paragraph 4.4.3) as specified in SM-104 and the complete erection of the fan including insulation and lagging, mounting all fan controls and instruments (damper drives, vibration and temperature instruments, etc.), instrument air, cooling water (if required) and connecting external ductwork.

1.2.9 Erection and Start Up

The complete erection and start up of the system.

1.2.10 Engineering

The complete design and specification of all components of the system. All specification and design data shall be provided to the purchaser.

1.2.11 Miscellaneous Services

Air compressors for slurry atomization including receivers.

Insulation and lagging for all surfaces subject to elevated temperatures.

All buildings to house the quoted equipment (i.e., lime slurry preparation/feed system, air compressors, MCC's, controls, etc.). Buildings to include heating, ventilation, lighting, 120V receptacle, siding to match facility, gutters/downspouts sized for a 25 yr/5 minute rainfall.

Site training program for Purchaser's personnel.

Emergency shower and eyewash stations.

Service air piping and hose stations throughout APC system.

Construction of optional flow model and performance of model studies if required in Paragraph 4.4.2.

Shop cleaning, surface preparation, and painting as described in attached Specification SA-550.

Shimming of all structural steel base plates and equipment.

All facilities and personnel necessary to perform all shop tests and inspections as specified herein.

Instrument connections for Purchaser's instruments on the scrubber and I.D. fan inlet ducts (see Section 2.6.1). Test ports on scrubber inlet and I.D. fan inlet and outlet ducts (see Section 2.6.1).

Installation, Start-up Operating and Maintenance Manuals covering the overall system as well as the individual components. Final record ("As-Built") drawings and reproducibles (Mylars), as required per attachment 13, showing all field changes and modifications.

1.3 Work by Others

The following work will be provided by others:

Foundations for structures and equipment, complete with anchor bolts.

Grouting of all structural steel base plates and equipment.

Ash removal system from scrubber/precipitator or baghouse hopper discharge flanges to disposal. However, Seller shall coordinate design with ash handling system for required conveyor rights-of-way, structural support, clearances and maintenance space.

Permanent outdoor area lighting on and about the installation.

Electrical power supply to Seller's switchgear/MCC as specified herein, and wiring from Seller's junction box to Seller's control panel in the control room (Ref. Attachment 10).

I.D. fan foundations, anchor bolts, power feed from Purchaser's MCC and instrument/control wiring.

Service, Instrument and pulse-jet air (if required) and water supplies to single terminal locations.

Underground electrical grounding loop for equipment.

APC system outlet and inlet (if required by air permit) flue gas monitors.

Touch-up and finish painting of uninsulated external ferritic steel.

2.0 TECHNICAL REQUIREMENTS

2.1 Basis of Design

2.1.1 General

The APC system shall use lime reagent to remove SO₂, HCl and HF from the flue gas. The waste formed in the acid gas removal process shall be dry and be capable of being readily collected in the baghouse or precipitator.

Seller shall design the APC system in accordance with the following requirements. Establishment of Expected Operating and Design values in this specification does not relieve the Seller of its responsibility to design equipment that will meet or exceed all performance requirements. If the Seller's design dictates that these design parameters are insufficient to meet the specified performance required under all conditions of operation while providing a safe, reliable operating unit, it is the Seller's responsibility to use other design parameters, as approved by the Purchaser, required to meet the specified performance.

The APC system shall be capable of continuously producing a dry, free flowing waste product that will flow out of the scrubber vessel and baghouse or precipitator hoppers without plugging while meeting all of the requirements of the specification and the air permit (Attachment 9).

The APC system shall be capable of continuous boiler load following from minimum to maximum load while meeting all of the requirements of the Specification.

The structural design temperature range for the APC system including all ductwork, expansion joints, scrubber vessel, and baghouse or precipitator shall be 19°F to 600°F.

The structural design pressure range for the APC system including all ductwork, expansion joints, scrubber vessel and baghouse or precipitator shall be ±25 inches water.

Structural steel design for the APC system equipment shall be in accordance with SS-410, Structural Steel Specification. Stresses for normal operating temperatures, pressures, and ash loadings shall be considered in the design. Equipment transient pressures will be considered similar to wind in that a one-third increase in allowable stresses will be permitted and transient pressures will not be combined with the design wind or seismic loading. These transient pressures will, however, be combined with ash loading.

Except as allowed below, products which contain asbestos are prohibited. This prohibition includes items such as packings and gaskets even though the item is encapsulated or the asbestos fibers are impregnated with binder material. Asbestos products are acceptable only in exceptional cases where the Seller states in writing that no suitable substitute material exists, and, in addition, the Seller furnishes to the Purchaser a copy of U.S. Department of Labor "Material Safety Data Sheet" (Form No. OSHA 20) completed by the asbestos product manufacturer stating that the product is not an asbestos health hazard.

This Specification provides spare equipment with the intent of maximizing system availability. The Seller shall follow this philosophy in the detailed design of the equipment. The Seller's design shall incorporate features, both mechanically and electrically, such that a single component failure will not shut down more than one Air Pollution Control train.

The entire APC system shall be designed to allow ready operation and maintenance of all components. Sufficient area around all components shall be provided for operation and maintenance laydown (2'-6" clear as a minimum unless approved by the Purchaser) and clearly indicated on the Seller's drawings.

All equipment requiring filling, internal inspection, repair or removal of internals, and/or cleaning shall be furnished with hinged access doors, manholes with lids, or other suitable openings accessibly located and clear of all obstructions.

The APC system shall be designed to ensure that equipment which has been idled can be restarted without damage caused by solids settling or buildup. All equipment within the APC system shall be designed to eliminate solids buildup, erosion and corrosion at any point over the entire range of operating conditions. Selection of materials of construction is the responsibility of the Seller.

All ductwork and other equipment covered by this Specification shall be supported independently except that the support of scrubber inlet duct may be from boiler steel (first support only for bottom entering scrubbers).

The Seller shall design the system to fit within the boundaries shown on the attached general arrangement drawing(s), Attachment 8. It is the Seller's responsibility to provide a cost-effective system configuration that will allow Purchaser access for operation and maintenance. Where possible the Seller shall locate the gas cleaning trains close together to minimize platforming and area paving requirements.

The APC system is an extension of the major Facility building. The external lagging, siding and other finishes provided by the Seller shall match the color, form and texture of the main building. The Seller shall submit panel samples, color boards, paint chips, etc. to Ogden Martin Systems for their approval.

2.1.2 Codes and Standards

The Seller shall provide the APC system conforming with the applicable requirements of the latest edition (including addenda) in effect at the time of bidding of the following codes and standards. If there is, or seems to be, a conflict between this Specification and a referenced document, the matter shall be referred to the Purchaser.

- AFBMA - American Friction Bearing Manufacturers Association
- AGMA - American Gear Manufacturers Association
- AISC - American Institute of Steel Construction

AMCA - Air Movement and Control Association
ANSI - American National Standards Institute
ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME - American Society of Mechanical Engineers
ASTM - American Society for Testing and Materials
AWS - American Welding Society
AWWA - American Water Works Association
HIS - Hydraulic Institute Standards
IEEE - Institute of Electrical and Electronic Engineers
IGCI - Industrial Gas Cleaning Institute, Inc.
IPCEA - Insulated Power Cable Engineers Association
ISA - Instrument Society of America
MGI - Metal Grating Institute
MPTA - Mechanical Power Transmission Association
NAAMM - National Association of Architectural Metal Manufacturers
NBFU - National Board of Fire Underwriters
NEC - National Electric Code
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
OSHA - Occupational Safety and Health Act
PFIS - Pipe Fabricator's Institute Standards
RMA - Rubber Manufacturers Association
SMACNA - Sheet Metal and Air Conditioning Manufacturers National Association
SSPC - Steel Structures Paint Council
UL - Underwriters Laboratories

Further, the equipment and materials shall comply with all laws and regulations applicable in the state and locality of the refuse-to-energy facility installation.

2.1.3 Flue Gas Conditions

The range of flue gas conditions and flow rates at the economizer outlet, are specified in Attachment 2 and Figure 1 of Attachment 3. The entire APC system shall be capable of continuously cleaning 100 percent of the flue gas produced by the boiler for the entire range of operating conditions specified in Attachment 2 including Minimum operation (see note 2 of Att. 2). Acid gas constituents in the flue gas may be considerably lower than shown in Attachment 2. The Seller's equipment shall be capable of satisfactory operation, while meeting guarantee requirements with low acid gas concentrations.

2.1.4 Water Supplies

Scrubber/dilution water, slaking water, potable water and cooling water supply/return will be supplied by Purchaser at the terminal point identified in Section 2.1.7. Page A5-1 of Attachment 5 shows the expected water quality for the scrubber/dilution and slaking waters as well as the temperature, pressure and GPM available for the scrubber/dilution, slaking and potable waters.

The Seller shall recommend the most effective feed point(s) to use this water. The Seller shall also specifically state in his proposal any limitations or adverse operating conditions that may occur by using this water supply.

2.1.5 Lime

A commercial supply of pebble lime will be provided to the system. The Seller's equipment shall be designed to handle the full range of particle size distribution.

The following analysis is on a dry basis for lime normally available at the plant site.

3/4 in. Minus High Calcium Lime

Composition (percent by weight)

	<u>Range</u>	<u>Average</u>
Available CaO	85 - 94	90
Total CaO	87 - 98	91
MgO	1 - 5	2
Inerts	1 - 16	7

2.1.6 Compressed Air

Service air and instrument quality (-40°F dewpoint) air will be available at 80-120 psig. Purchaser supplied compressed air shall be used for pulse-jet and lime bin vent filter cleaning and for control purposes. Seller shall provide the complete process air system (if needed for atomization) for the APC system. The system should include air compressors, receiver, silencers, piping and controls required for the spray dryer nozzles, maintenance, and other uses. The air compressors shall include provisions to prevent the leakage and spillage of lubricating oil to grade or surrounding equipment. The Seller shall provide one standby compressor. This equipment shall be enclosed in a heated and ventilated building with filtered external air supply to the compressor intake.

2.1.7 Terminal Points

The interfaces between Seller's and Purchaser's equipment, material, and services are as specified below.

- . Unless specified in Attachment 1, Seller to assume the outlet flange at each boiler economizer to be approximately 8 ft. inside the column line of the boiler building, and 25 to 35 ft. (center line) above grade and 4' high by the width of the stoker (see Attachment 1). Seller is responsible for matching the boiler economizer outlet flange dimensions and location.
- . The stack breeching flange (approximately 1'-0" from stack shell and in the vertical plane). Duct to stack breeching flange to be at a 45 degree angle. Seller is responsible for matching stack breeching flange dimensions and location.
- . Scrubber vessel hopper or delumper, baghouse or precipitator and ductwork hopper flanges, located 10 ft. above finished grade. Hopper flanges shall be fitted with studs tack-welded in place so as to allow insulation of the entire hopper.
- . The Purchaser-supplied ash handling system will run beneath the hopper outlet along the axis of the scrubber/baghouse. The Seller shall maintain a clear, three foot wide, aisle along this axis and the hopper shall be capable of supporting Purchaser's screw conveyors and/or rotary or double dump valves hanging from the hopper flange and/or Seller's steel.
- . All APC system equipment and materials structural supports at grade level on Purchaser's concrete foundations (6" above grade) and/or pedestals.
- . Lime receiving system at the truck unloading station.
- . All process drains at grade level at Purchaser's U-drain or catch basin.
- . Downspouts at grade level outside APC area perimeter

A single point of supply for the following utilities will be furnished by Purchaser to the APC system at the boiler house rear column line at grade. All of these utilities will be provided at a common supply location:

Service Air

Instrument/pulse-jet air

Water supplies, as applicable (scrubber/dilution water, slaking water, potable water, cooling water supply and return)

Seller to furnish instrument air piping to purchaser's CEM building(s).

One source of above grade 480V power per APC train will be supplied by the Purchaser and terminated at the Seller's switchgear/MCC. Control Wiring shall terminate at common junction box and/or control cabinet (Ref. Attachment 10) in Seller's electrical equipment building. Power wiring for the I.D. Fans will be terminated at the motor by the Purchaser. Control and instrument wiring for I.D. fans will be terminated at the fan by the Purchaser (fan to be provided with a common terminal box for these terminations).

2.2 Acid Gas Removal System

The Expected Continuous and Design lime consumption rates, mentioned in the sections that follow, shall be defined as the consumption of lime (as guaranteed in Section 3) required to achieve the guaranteed acid gas removal with the "Expected Continuous and Design" flue gas conditions (as specified in Section 2.1.3) present at the economizer outlet.

2.2.1 Scrubber Vessel

The scrubber vessel shall be of the "dry" scrubbing, spray dryer type. The metal thickness for the roof, walls, and hopper of the scrubber vessel shall be 1/4 in. minimum carbon steel (A-36) or other suitable material as recommended by Seller to withstand the flue gas conditions shown in Attachment 2. The scrubber vessel sections shall be gas-tight and seal welded internally and shall be structurally reinforced with external stiffeners, ribs and supports. No internal structural supports shall be allowed.

Bolted, hinged and gasketed access doors shall be provided where necessary to enable proper inspection, cleaning, and maintenance of the interior of the scrubber. Doors shall have two pinned connections at each hinge. As a minimum, an access door shall be provided in the side of the scrubber vessel and near the bottom of the scrubber vessel hopper.

No bypass of the scrubber shall be provided. However provisions shall be made for removal and cleaning of the spray atomizer(s) while flue gas flows through the scrubber.

Abrasion resistant gas distribution plates shall be provided at the flue gas inlet to the scrubber vessel, if required. The deflector plates shall be designed to give good gas and particulate distribution to the scrubber, to

minimize abrasive impingement of the fly ash on the scrubber equipment, and to prevent short circuiting of the flue gas around the lime slurry spray across the operating range of the scrubber.

The scrubber vessel shall have a solids collection hopper with vibrator, high level switch to indicate abnormal solids build-up, two rod out ports, hinged access door and two strike plates. The high level switch should be located at an elevation equal to that of the bottom of the hopper access door. The valley angle of the hopper shall not be less than 55 degrees with the horizontal. The outlet of the hopper shall be fitted with a flanged transition piece which can easily be replaced by a delumper, if necessary. The outlet of the transition piece shall be a 12 inch square flanged connection 10 feet above finished grade for connection to the Purchaser's ash handling system. The hopper's ash outlet flange shall be capable of supporting 2000 lbs of Purchaser's ash handling equipment. The lower 1/3 of the hopper plus all transition pieces, flanges and other heat sinks shall be heated to eliminate any cold spots that may cause plugging. The Seller shall supply and install a lump breaker, if required to insure that plugging will not occur. If provided, the lump breaker outlet shall be a 12" square flanged connection 10 feet above finished grade for connection to Purchaser's Ash Handling System.

As a minimum, the scrubber vessel shall be designed to support the mass of the vessel if the vessel hopper becomes filled with solids to the point that the scrubber outlet is plugged, all other horizontal surfaces have 2.5 ft buildup and all vertical surfaces have a 6 inch building simultaneously with a density of 120 lb per cu. ft.

The ash/scrubber waste shall be assumed to weigh 45 lb per cu ft for capacity purposes and 120 lb per cu ft for structural design purposes. The Design lime consumption rate shall be used as a basis for calculating the maximum ash/scrubber waste collection rate.

2.2.2 Scrubber Vessel Atomizer/Nozzle Enclosure, Platforms and Stairways

A weather tight enclosure shall be furnished to enclose the scrubber vessel atomizer or dual-fluid nozzles and control valves, etc. located at the scrubber. Roof areas of weather enclosure and scrubber vessel roof (if different from weather enclosure roof) shall be sloped to drain to gutters and downspouts running to grade at a point just outside the APC area perimeter (but not near future train). Gutters & downspouts shall be sized to accommodate a 25 year/5 minute rainfall. The enclosure shall be insulated, heated and ventilated to allow maintenance throughout the year. Enclosure material, color (manufacturer's standard) and texture shall meet the aesthetic requirements the of project. Adequate area shall be provided within the enclosure for atomizer or nozzle maintenance and cleaning. The operating floor shall be checker plate with kickplate around perimeter or a Purchaser-approved alternate, sloped to a floor drain which is to be piped to grade with seals around perimeter and at penetrations (or six inch high curbs) to prevent lime or water from running down to lower elevations. Handrailing shall be supplied by Seller to prevent personnel from walking on areas not covered with plate or grating.

The seller shall provide water and compressed air in the enclosure for maintenance purposes. Liner panels of coated steel shall be provided to protect wall insulation from washdown water spray.

An overhead monorail/trolley/electric hoist system shall be provided for rotary atomizer designs capable of removing the complete atomizer assembly from its operational position and moving it to a spare atomizer stand and lowered to, and raised from, the Purchaser's maintenance trucks for maintenance or replacement.

The Seller shall provide one centrally located stairtower together with walkways to access all scrubber vessels as well as baghouses or precipitators. The scrubber vessel and its inlet and outlet duct access doors and instrumentation shall be accessible from these walkways.

For APC systems where slurry atomization takes place in the top of the scrubber vessel, the Seller shall provide one centrally located access walkway (including any stairs to accommodate any differences between the boiler and scrubber penthouse platform elevations) from the boiler building rear wall to the access walkway connecting the scrubber vessels. Subsequently, the above-mentioned stairtower need not extend to the scrubber penthouse; instead a ladder may be furnished from the top of the scrubber vessel to grade or to the top of the stairtower, thus providing the penthouse with two means of egress.

2.2.3 Rotary Atomizers or Dual-Fluid Nozzles

Slurry spraying equipment shall be designed to withstand all conditions occurring in the spray dryer. All spraying components within atomizers or nozzles shall be designed to avoid plugging, erosion, corrosion, slurry solid buildup, scaling, acid attack, vibration fatigue, chloride corrosion and cracking. The design and materials of construction choice shall be supported by successful commercial experience with the selected design and material in similar service.

Seller shall provide one complete spare rotary atomizer and/or dual fluid nozzle assembly. The spare rotary atomizer and drive system shall be complete with motor, gear, shaft, wheel, and other required components. The spare dual fluid nozzle assembly shall be complete with piping, valve, nozzle, instruments, and other required components. The Seller's design shall allow the removal and replacement of a complete atomizer or nozzle assembly within 30 minutes.

For dual-fluid nozzle designs, Seller to provide a low air flow alarm for each nozzle. For rotary atomizer designs, Seller to provide a fully automatic forced lubrication system with oil pump and a vibration and bearing temperature detection system for each atomizer. Low air flow, high bearing temperature (including motor bearings) and high vibration shall be alarmed in the main control room. The rotary atomizer shall also be fitted with an elapsed time meter in the main control room.

2.2.4 Reagent Preparation System

The reagent preparation system shall consist of a truck unloading station, lime storage silo, lime feeders, lime slaker-classifier system, slurry storage tank and pumps, dilutions tanks (if required), piping, valves and fittings to feed dilute lime slurry to the spray dryer atomizer. The Seller shall provide the

arrangement and design of the complete system. The arrangement shall recognize that this is a high maintenance area subject to line plugging, lime spills and frequent maintenance of pumps, agitators and other equipment. Provisions shall be provided for washdown of operating levels. Such provisions shall include floors sloped to drains with cleanout provisions and liner panels of coated steel to protect wall insulation from water spray. Electrical equipment in these areas shall be suitable located and protected. Elevated floors shall be solid flooring sloped to downcomers extending to drains at grade and include seals at penetrations or six inch high curbs to prevent lime or water from running down to lower elevations. Access shall be provided for disassembly and normal maintenance of equipment without interfering with the operation of the system. If an elevated level in the lime silo is used to house the slakers, access to this area shall be by a stair tower and landing exterior to the silo and provisions shall be made for the removal and replacement of all major equipment enclosed in the silo. Pumps shall be located in a separate building along with the purchaser supplied grit bin. The building shall be heated and ventilated and fitted with a roll-up door for fork-lift access to the grit bin. Seller to furnish a preliminary arrangement of the equipment housed within the silo's skirted area with his proposal. Final detailed arrangement of this equipment must be approved by Purchaser.

The reagent preparation system shall accept delivery of lime from trucks and produce a slurry of a controlled density and solids content. This slurry shall be fed to the scrubber vessel at a controlled rate to meet the specified acid gas removal and outlet gas temperature. A common reagent preparation system with separate reagent injection pumps including an installed common spare pump or two 100% pumps, or three 50% pumps shall be provided.

The reagent preparation system shall be designed to handle the composition and size ranges of the Purchaser's lime as specified in Section 2.1.5. For any equipment which comes into contact with pebble lime, the lime shall be assumed to weigh 55 lb per cu ft for capacity purposes and 80 lb per cu. ft. for structural design purposes. The entire reagent preparation system shall be designed to prevent dusty, humid, and maintenance intensive conditions external to the equipment.

The lime storage and handling system shall be based on a mass flow design (first-in-first-out material flow) and shall be designed to minimize segregation problems.

2.2.4.1 Lime Silo

The lime bin shall have a minimum seven (7) days of storage capacity at the Expected Continuous lime consumption rate.

The Purchaser's lime will arrive on site in differential pressure, pneumatic truck trailers. Normal shipment size will be 20-32 tons of lime. The lime silo shall be designed such that the truck mounted blower shall be capable of unloading the lime directly into the lime silo by means of a positive pressure airstream in a fill pipe to the top of the silo. The conveying air will be

exhausted from the bin through a silo vent type dust collector. Exhaust air shall have less than the smaller of 0.02 gr/DSCF of particulate or the requirements of the air permit (Ref. Attachment 9). Interlocks are required between the fill connection and vent filter.

Truck attachment fitting shall be a standard quick disconnect 4-in. female fitting. The fill pipe shall be schedule 80 seamless steel and conform to ASTM A53, Grade B. Bends and elbows shall be flanged Fuller 450 Iron, or purchaser approved equal. Long radius bends and elbows shall be used with a minimum centerline radius of 4 ft. The combined vertical and horizontal run of fill pipe shall not be greater than 150 ft. with the vertical rise limited to 100 ft. maximum. The run of fill pipe, from the truck fill connection, located at the truck access road to the silo, should be vertical first (with the inlet approximately 4 ft. above grade) followed by horizontal and arranged to minimize the bending of the flexible hose which will be attached to it.

The silo shall be designed to have a minimum freeboard of 4 ft. The design of the silo shall allow surges from the pneumatic unloading system and still provide a constant flow of lime to the volumetric feeder.

The lime silo shall be constructed of ASTM A36 steel plate and structural supports. The roof pitch shall be 1/4 in. per ft minimum. Minimum plate thicknesses shall be 1/4 in. The storage section of the silo shall be of all welded construction. As an option, Seller may offer a price deduct for a bolted silo. Bolted silos shall be leak tested using a high pressure water spray in accordance with the manufacturer's recommendations. The roof shall be constructed of checkered plate with an access manhole, pressure and vacuum relief valve, and necessary flanged piping connections for fill piping and level instrumentation (high, low and low-low). Handrail and curb plate shall be provided at the perimeter of the silo roof. A jib boom shall be mounted on the silo roof and located so that it can be used to repair or replace the fill pipe, the dust collector, bags, and any other roof mounted equipment. The hoist capacity shall be capable of lifting the heaviest piece of equipment mounted on the silo roof. Access to the top of the silo and any instrumentation mounted on the silo shall be by cage ladder and platforms complete with handrailing and toeboard meeting the requirements of OSHA.

All steel plates, supports, handrails, etc., shall be prime painted in accordance with Specification SA-550 attached hereto.

The silo shall be furnished with two vibrators or a vibrating bin activator at least 1/3 the diameter of the silo to maintain a free flow of lime without bridging or rat-holing. Provisions shall be included in the hopper to allow for emergency rodding and air blasting. The silo hopper shall be sloped a minimum of 60 degrees from horizontal. A manually operated isolation gate shall be provided between the hopper (or bin activator, if provided) and volumetric feeder.

Slurry preparation system equipment may be located in a skirted area below the lime silo provided that all arrangement, access and ventilation, etc. requirements of Section 2.2.4 and 2.2.4.10 are met. The skirt shall be mounted on Purchaser's foundation which will consist of a sloped and curbed concrete pad; seller's general arrangement drawings to reflect this.

2.2.4.2 Volumetric Feeder

The Volumetric feeder shall accept lime from the lime silo and feed it at a controlled rate to the slaker. The feeder shall be completely enclosed to provide dust-free operation including all connections to the lime silo and slaker. The feeder shall be constructed to prevent moisture from the slaker from entering the feeder. Access doors shall be provided such that inspection, maintenance or cleanout of all of the feeder components can be readily performed. The area underneath and around the feeder shall be checker plate. Each feeder shall be fitted with a rotation counter.

2.2.4.3 Lime Slaker-Classified System

A redundant slaker system shall be provided. Each slaker will be designed for batch operation and sized for 100% of the Design lime consumption. The slaker-classifier shall produce a slurry containing solids with a maximum size as required by atomizer clearances. The vibrating screen classifier shall be fitted with heavy rubber boots at all discharge connections. The classifier screen shall have an open top and be made of stainless steel, resist tearing and be easily replaceable. Slurry recirculation from the scrubber shall not be directed to the classifier screen. The classifier shall remove the grits to a discharge 8 ft. above grade. Seller shall provide a rubber (or purchaser approved equal) chute from the classifier to the Purchaser's grit bin. The chute shall be suitably restrained and be a minimum of 60° from the horizontal. Suitable provisions, including adequate access, shall be furnished by the Seller to allow the Purchaser to access the grit bin with a fork lift truck. Seller shall provide a heated enclosure for the grit bin (grit bin is approximately a 6' cube) including a roll-up door. The slaker shall be provided with dust collection and ventilation equipment of the wet educator or wet scrubber type. The hot, humid, dusty air shall be vented from the discharge of the slaker and passed through the wet system. The clean side discharge shall be piped outside the reagent preparation building to a point sufficiently away from all personnel access platforms using a fan system designed for the humid conditions. The dirty side stream shall be returned to the slaker.

The slaker design shall include provisions to prevent explosive slaking. Minimum requirements shall include a high temperature switch and low water pressure switch which will alarm and provide an alternative source of water to the slaker.

The slaker shall be provided with manholes for inspection, maintenance, or cleanout as necessary. The area underneath and around the slaker shall be checker plate.

An in-line preheater shall be provided, if required, to preheat the slaking water during start-up of the lime slaker. The preheater shall be capable of heating water from 35°F to the required inlet temperature.

2.2.4.4 Slurry Tanks

A cylindrical lime slurry storage tank shall be provided for the storage of the slaked lime slurry. There shall be no pumps between the slaker-classifier and the lime slurry storage tank. The lime slurry storage tank shall be furnished with one or more top mounted agitators and baffles to achieve good mixing and :

uniform slurry. As a minimum, the lime slurry storage tank shall have 3 baffles. Adequate provisions shall be included in the design of the lime slurry storage tank to allow representative sampling of the tank contents. Metal tanks shall be all welded construction and shall be constructed of ASTM A283, Grade C or ASTM A36. Structural support members shall be constructed of ASTM A36.

The lime slurry storage tank shall be provided with a net storage capacity of 6 hours at the Design conditions. The net storage capacity is the total volume of the tank less 2' freeboard and the volume below the low-low level pump trip. Two thirds of the net capacity shall be used as inventory between slaker operating cycles, one third shall provide time for operator action if there is a system outage. If the slurry storage tank low level switch is still activated after a suitable time delay, an alarm will be sent to the main control room.

Lime slurry mix/head tanks, shall be sized with minimum residence time, furnished with a top mounted agitator and shall be of the same material of construction as the lime slurry storage tank. The residence time shall be less than 5 minutes at 80% flue gas flow and the low end operating gas temperature.

Suitable instrumentation shall be provided to control level in each tank. As a minimum, this shall include a high-high alarm and low-low alarm/pump trip. Slurry tanks shall be designed so that the low level condition does not infringe upon the minimum required NPSH of the pumps. Each tank shall be totally enclosed with no internal supports.

Top and side (near bottom) entry access doors shall be provided in each tank for inspection, maintenance, and cleaning. Tank design shall comply with AWWA D100. These tanks shall be self-supporting and externally stiffened. A drain connection shall be provided at the base of each tank (as close to the bottom as possible) complete with isolation valve. An overflow port shall be provided near the top of each tank and piped to a trench. Each tank shall be vented.

Access to the top of the tank and instrumentation shall be by caged ladders and platforms with handrailing and toeboard plates which meet all OSHA requirements.

2.2.4.5 Agitators

Each slurry tank shall have at least one top mounted, electric motor driven agitator assembly. All elements of the drive train shall be directly connected; no drive belts or chains will be allowed. Each agitator shall be designed so that no solids settle on the bottom of the tank while the agitator is on. Each agitator shall be designed to restart without overstressing (by a two time stress margin) after the tank solids have settled completely after 24 hours. Side entry agitators shall not be used.

All agitators shall be coated with neoprene or Purchasers-approved equal or constructed of an abrasion-resistant alloy.

The largest diameter pitched-blade impeller required by the design load operating conditions that will provide satisfactory operation over the entire range of operating conditions shall be furnished. The motor and couplings shall be adequately protected from the slurry. Couplings shall be rated at no less than 120% of the motor horsepower.

Lubricating oil shall be prevented from leaking into the tanks. Lip seals shall prevent vapor escape to the atmosphere and foreign material entry to the tank.

Each gear drive unit shall have an AGMA Class I gear rating and service rating suitable for continuous duty and moderate shock loads. Each gear drive shall have a minimum overall service rating of 1.50. All gear drive shafting shall be mounted on antifriction bearings. The minimum AFBMA B-10 life of the output shaft bearings shall be 250,000 hours when subjected to the normal torque, thrust, gear separating forces, and maximum bending force. All other bearings shall have a minimum B-10 life of 50,000 hours.

2.2.4.6 Slurry and Water Pumps

1. General

A completely installed and functional spare pump shall be provided in every service. This can be accomplished either with one pump per train with one common spare, two 100% pumps or three 50% pumps. All pumps, unless dedicated to a scrubber train, shall be hard piped and shall automatically start if the operating pump trips. Slurry pumps dedicated to a scrubber train may be furnished with hose connections such that the spare pump would be manually placed in service via rubber hoses, provided the hoses are fitted with quick disconnect couplings and isolation valves at the hose connection to avoid spillages during a transfer. Pumping systems shall be designed such that, at all conditions of operation, the available NPSH shall be no less than 1.25 times the required NPSH which results in 3 percent breakdown.

Pump suction and discharge lines shall be in accordance with the Hydraulic Institute Standards (HIS) and shall be designed for the maximum pressures and temperatures to which they will be subjected by the pump. Pump systems shall be isolateable to permit shutdown for maintenance. All hard piped pump connections shall be flanged and meet the standard ANSI requirements for size and configuration.

Direct coupled pumps and drives shall be mounted on the drip pan base and prealigned at the Seller's shop.

Centrifugal pumps selected shall be capable of continuous operation at any point on their curves from minimum to runout flow. Operation at shutoff for periods of up to 5 min shall be accommodated with no deleterious effect on seals, vibration, or wear. Pumps shall have constantly rising-to-shutoff characteristic curves.

To minimize operating costs and to provide nominal operating conditions, pumps selected shall be at or near their BEP flows.

Identical pumps shall be manufactured to have completely interchangeable parts. Where possible, a minimum number of pump designs and sizes shall be employed in all of the systems furnished under this specification to minimize parts inventory.

All pumps shall have the following maintenance provisions: lifting lugs or eye bolts as required for component replacement, removable casing cover plate, and removable shaft, impeller, and seal.

Bearings shall be antifriction type on all pumps and shall have a minimum B-10 life at maximum thrust of 50,000 hr. Pumps shall employ grease lubrication (which can be applied while on-line), with no cooling required.

2. Water Service

Water pumps shall be designed in accordance with the attached SM-121 (except for Sect. 1.3 items 1, 2 & 4) and shall be of suitable metallurgy for the service. Water pumps shall have a minimum of 1/8 in. corrosion allowance on areas exposed to the pumped liquid. Metal impellers shall not be greater than 90 percent full diameter.

Water pumps shall be direct drive. Couplings shall be non-lubed flexible disc-type. All couplings shall have coupling guards meeting OSHA requirements.

3. Lime Slurry Service

Slurry pumps may be of the horizontal centrifugal or positive displacement type. Horizontal centrifugal pumps may be rubber or abrasion resistant metal lined. Rubber lined pumps shall be V-belt driven and fitted with variable pitch sheaves so that speed may be increased if necessary to achieve design margins on flow and head. Metal lined pumps shall have a minimum Brinell hardness of 600 and shall include a minimum of 1/8" corrosion allowance. Metal lined pumps shall also include a replaceable suction liner. Metal impellers shall not be greater than 90% full diameter.

Each slurry pump shall be capable of delivering 110 percent of the flow rate required at the Design lime usage rate (at the maximum scrubber outlet temperature - ref. note 3 on pg. A2-2) and 121 percent of the corresponding head. Each slurry piping system capacity shall be at least 10 percent above the capacity required at the Design lime usage rate.

Positive Displacement Slurry Pumps

Positive displacement pumps shall have a relief valve to protect the pump/discharge piping in the event of discharge valve closure.

Progressive cavity positive displacement pumps shall not be used.

Diaphragm positive displacement pumps shall be of the hydraulically balanced diaphragm type as manufactured by Wanner Engineering (Hydra-cell). The pump speed shall be limited to 1/2 the rated speed. The material of construction shall be cast iron or stainless steel pump casing, ceramic valves and seats, Celcon retainers, Elgiloy valve springs, and BUNA-N Elastomers. The suction and discharge shall have reinforced hydraulic hose flexible connections rated at 1-1/2 times the discharge pressure; the suction size shall be one size larger than the pump inlet size.

Centrifugal Slurry Pumps

The design of horizontal centrifugal pumps shall employ adjustment features that permit axial movement to restore clearances without disassembly of the pump or motor.

Packing with lantern rings and injection water shall be used for shaft sealing on all pumps. Hardened surface replaceable shaft sleeves shall be employed under packing with a minimum Brinell Hardness of 600. Stuffing box/impeller designs employing expeller vanes or other features shall be used to reduce to a minimum the injection water requirement. The injection water's function shall be to keep the packing cool, lubricated and free from lime solids. The injection water line shall be fitted with both modulating and isolation valves capable of tight shut-off.

Pump casings shall be designed to accommodate maximum operating temperatures and pressures in all areas wetted by the pumpage from suction to discharge.

The slurry pump impeller tip speed shall not exceed 5,100 ft/min.

The horizontal centrifugal slurry pumps shall be capable of reverse rotation (during flushing) without adverse effects. Positive displacement slurry pumps shall be flushed by running the pump with flushing water in-lieu of slurry.

The entire slurry pump assembly, including base plate, shall be sized so that the first critical speed is above the running speed by at least 25 percent.

The slurry pump peak to peak amplitude of vibration at all flows, as measured on the bearing housings, shall not exceed the limits established by the HIS, Figure 66, for field taken vibration at the running speed of the pump, taken axially or radially. Shop vibration levels taken during shop testing shall not exceed half of the field allowable levels.

V-belt drives shall be in accordance with the Rubber Manufacturers Association (RMA) and the Mechanical Power Transmission Association (MPTA). V-belt drives shall be sized to permit at least the loss of one belt without loss of performance from the pump. They shall include a safety guard and adjustment between the motor and reducer.

2.2.4.7 Piping

Unless otherwise specified herein, all piping materials and fabrication shall comply fully with all applicable requirements of ANSI B31.1 and the Pipe Fabricator's Institute Standards. All carbon steel piping shall be A53 or A106 material.

Except for air piping, all piping 2 in. and smaller shall be minimum schedule 80 carbon steel; all piping 2 1/2 in. and larger shall be minimum schedule 40 carbon steel type. All air piping shall be schedule 40 galvanized steel. All Seller-supplied and designed piping shall be installed above ground and shall be designed for the maximum pressure that could be produced by the pumping systems.

All water and lime slurry piping shall either be enclosed or heat traced. No piping or valves shall be located across platforms, stairs or ladders so as to cause an operating hazard.

Slurry piping shall be carbon steel. Slurry piping shall be furnished with an adequate number of connections for proper flushing and drainage. Piping connections for all slurry services shall be flanged. The inside diameters of all slurry pipe mating connections to valves, fittings, and other pipe shall match. Slurry piping shall be designed so it can be taken apart easily for maintenance and cleaning. Cleanouts shall be provided at all tees, fittings, etc.

Slurry piping shall be arranged to prevent plugging and settling of solids in lines and valves. The slurry piping system shall be designed to maintain velocities of 4-8 ft. per second over the entire load range. Slurry piping shall be routed in straight lines wherever possible to eliminate unnecessary bends. Bends and elbows shall be flanged for easy replacement. Slurry piping shall be designed to be self-draining by gravity. Horizontal lines shall be adequately sloped to ensure drainage.

Seller shall furnish a duplex type basket strainer for each scrubber train accessibly located in the scrubber penthouse upstream of control valves. Strainer basket openings shall be 3/16" maximum. Each strainer shall be fitted with a local differential pressure gauge and a high differential pressure switch which is alarmed in the main control room.

Sample valves shall be included in the design of the slurry piping to allow easy, routine, and representative sampling of the slurry fed to the scrubber.

All piping not to receive insulation shall be primed per the requirements of Specification SA-550

2.2.4.8 Valves

All valves shall conform to the applicable requirements of ANSI B16.34 and all other applicable standards. All valves shall be shipped to the site with a metal tag identification.

The use of valves in slurry lines shall be minimized. Unless otherwise approved by the Purchaser, slurry isolation valves shall be full-port pinch valves, plug or knife gate valves. Pinch valves shall be flanged and designed with through bolts, shall have a totally enclosed cast iron body, and shall be provided with a neoprene sleeve and neoprene lined flange. Pinch valves shall not collapse under negative pressure conditions that may occur.

The use of check valves in slurry lines shall not be allowed.

Manually operated valves requiring manipulation during operation shall be located so that handwheels are not higher than 5 ft above a platform or grade. Valves which do not meet the above requirements shall be equipped with chain operators or extension stems complying with the above criteria. Valve stems shall not be oriented below horizontal centerline. Every effort should be made to locate valves for easy inspection, operation and maintenance.

Restriction orifices used in slurry service shall be of an abrasion resistant material (eg-ceramic); carbon or stainless steel are not permitted.

2.2.4.9 Slurry Flushing/Chemical Cleaning System

A complete manual flushing system shall be supplied including permanently installed piping, pipe hangers, connections, and valves for a complete water flushing system. The system shall include flushing of all slurry piping and equipment from the slurry storage tank to the atomizers. Rubber hoses/hose connections may be used in-lieu of permanently installed piping provided the flushing water piping is within 10 ft. of the slurry hose connection.

As a minimum, the slurry flushing system shall be capable of providing a complete four volume flush of the entire slurry system and be capable of providing flush water velocities of 4 ft/sec. Waste flush shall be directed to the freeboard in the slurry tank. Flushing of piping systems shall be downhill.

Flushing water connections shall be located on the top or side of slurry piping to avoid plugging.

The slurry piping system shall be designed to allow chemical cleaning of all the slurry piping. Sufficient piping connections and isolation valves shall be provided to allow recirculation of chemical from main slurry pumps to scrubber atomizer connection.

2.2.4.10 Reagent Preparation Building

Any equipment which cannot be conveniently located in the skirted area under the lime silo shall be located inside a heated, ventilated and insulated prefabricated building. The building will be constructed so as to leave space clear around all tanks, the volumetric feeder, slaker, classifiers, and pumps for routine inspection and maintenance as well as to allow equipment removal for overhaul or replacement. The building shall be tall enough to allow ready access to the top of the tallest tank and to allow easy removal of agitator assemblies. The building exterior shall match in color, form and texture with the balance of the overall facility. Steel within the building shall comply with the finishing requirements for ferrous metals stated herein and in Specification SA-550.

The ventilation system shall remove all dust from the building.

2.2.4.11 Shower and Eye Wash Stations

Shower and eyewash stations shall be provided in all lime handling areas to meet OSHA requirements. Minimum requirements are as follows:

- Combination shower/eyewash station
 - Slaker area
 - Slaker pump area
 - Scrubber penthouse (one per unit unless combined penthouse with two trains is provided. In this case a common centrally located station is acceptable.
- Eyewash Station
 - Lime unloading station
 - Lime silo feeding area if separate from slaker area
 - All other separate areas where lime is being pumped (valve stations, pumps etc.

All shower and eyewash stations shall be located adjacent to hazardous equipment with unobstructed access from expected operator inspection and maintenance areas. Shower and eyewash stations shall not have curbs or other obstructions. All stations shall be supplied from the facility potable water system unless specific approval is provided by Ogden Martin Systems Inc. Shower and eyewash stations shall be freeze protected.

Emergency shower/eyewash stations shall be per drawings RS-425 A through D (see Attachment 17).

2.2.5 Spray Atomization Compressors

The Seller shall furnish the complete system to supply atomizing air for the spray dryer dual-fluid nozzle, if offered. The Seller shall provide either one compressor per scrubber train with one installed spare, two 100% capacity compressors or three 50% capacity compressors. See Section 2.9.2, Induction Motors, for further sizing guidelines.

The compressors shall be the lubricated rotary screw type and shall be direct driven by an electric motor. Each compressor shall be a package unit complete with all controls, coolers (air coolers are not permitted), lube oil system, etc. Each compressor shall include:

High water temperature alarm switch.

Thermostatic water temperature control valve for each aftercooler.

Cooling water sight flow indicator.

Automatic drain traps for aftercooler moisture separator.

Magnetic water shutoff valve interlocked with compressor motor starter.

One receiver equipped with relief valve, pressure gauge, pressure switches, and automatic moisture trap with drain valve.

Integrally mounted control panel for each compressor.

Integrally mounted motor starter for each compressor.

Hour meter, selector switch (hand-off-auto) and motor starter for each compressor at control panel.

The compressor unit including motor shall be enclosed in a sectionalized steel sound-insulating canopy with doors to provide ready access for normal maintenance.

2.2.5.1 Compressor - Technical

1. General

The compressor shall be the lubricated rotary screw single stage type and shall meet the requirements of this specification. This compressor shall be direct driven by an electric motor (1800 RPM maximum). The compressor tip speed shall not exceed 35 meters per second.

The inlet air filter, cooling water system, control system and driver shall be included as part of the package. Also included shall be a common base-frame for the equipment and an enclosure for the compressor and driver.

All piping shall be in accordance with ANSI B31.1 latest edition.

2. Materials

All materials of construction shall be those proven by service in similar designs and suitable for the specified conditions of service, including atmospheric conditions of pressure, temperature, relative humidity and airborne contaminants. The metallurgy of all major components shall be clearly stated in the Seller's proposal.

Products which contain asbestos are prohibited. This prohibition includes items such as packings or gaskets, even though the item is encapsulated, or the asbestos fibers are impregnated with binder material.

The seller shall select suitable materials and fill in the required information on the data sheets. No changes to the materials so listed shall be permitted after the contract award, without the approval of the Purchaser.

Materials shall be identified by reference to appropriate ASTM Specification, AISI type number, etc. When no such appropriate designation is available, the manufacturer's code or trade name may be used. In such cases, the manufacturer shall be identified and the chemical composition and significant physical properties of the material shall be presented elsewhere in the proposal.

Castings shall be free from shrinkage cracks, hot tears, gas holes, blisters, or other similar injurious defects. Surfaces of castings shall be cleaned by sand or shot blasting, or other standard cleaning method. All mold parting fins and remains of gates and risers shall be removed and ground flush.

3. Stage

The compressor stage shall be a cast iron, one-piece casing that will house two precision-made screw-type rotors.

4. Rotor

Rotors shall be of one-piece steel or nodular iron construction. The rotors shall have a profile that keeps leakage losses at a minimum to insure a high efficiency. Rotors must be balanced dynamically to guarantee vibration-free operation. The shaft shall be the integral part of the rotor.

5. Bearings

Bearings shall be of the antifriction type. Radial loads shall be carried by roller bearings and axial loads by ball bearings. The axial load, resulting from compression, shall be divided on the main and auxiliary thrust bearings through a balancing arrangement.

6. Lubrication System

The lubrication system for each compressor shall include but not be limited to oil filter, high differential pressure switch, water cooled oil cooler, pressure gauge, thermometer, low oil pressure alarm and shutdown switch and oil level gauge.

Each compressor shall be furnished with an air/oil separator designed to produce air with an oil or hydrocarbon content not to exceed two (2) ppm under normal operating conditions.

7. Coolers

Aftercoolers shall be of the shell and tube type, and shall be ASME coded and stamped. Removable tube bundles are required for all coolers. Withdrawal distances for removing tube bundles or tubes from coolers shall be clearly indicated on outline drawings to be furnished by the Seller.

Flanges and gaskets in heads and at tube sheets shall be designed so that water can not leak into air spaces. Tubes shall be rolled into both tube sheets. U-tubes shall not be employed. Heads and water boxes shall be easily removed for cleaning without disturbing connecting piping, and when removed, the tubes shall be accessible for brushing through without removing the tube bundle.

A moisture separator with automatic drainage shall be provided as a part of the aftercooler to remove condensables from the cooled air. An automatic water temperature regulating valve shall also be provided.

8. Air Intake Filter

A suitably rated, dry type air intake filter as recommended by the manufacturer shall be provided with the compressor.

9. Regulating System

The regulating system shall provide compressor operation from full load (100%) to no load (0%), matching the compressor output to system air demand requirements. In addition, the auto start/timed stop control shall also be provided.

10. Unloading Control System

The control system shall be integral to the compressor package and is to consist of an electro-pneumatic regulator designed to provide manual and automatic running. The control system is to provide circuits for loading delay and starting idling delay at shutoff. The control system shall

also provide for automatic shutoff of the compressor during periods of low demand and excessive idling to conserve energy. The control circuits shall be suitable for 120 volt, single phase, 60 Hz.

11. Control Panel and Motor Starter

The control panel shall be integrally mounted with each compressor in an enclosure. A selector switch with hand-off-auto position along with an alternator for lead/lag control shall be provided to manually select either compressor as run or as standby. In addition, in the period of unusual high demand by the system if one compressor fails to satisfy the system demand at the rated pressure, provision shall be made to start the standby compressor automatically. The control panel shall also have the following instruments, gauges and switches mounted on it.

Start/Stop switch with run indicating light

Selector switch for low demand mode and auto-start/timed-stop

Hour meter

Discharge air pressure gauge

Discharge air temperature gauge with sensing element at air compressor

Differential pressure gauge for air intake filter

Cooling water temperature outlet gauge

Power on indicating lights

Each compressor shall be provided with one form "C", dry contact for trouble alarm rated at 5 amps minimum at 120 VAC, wired to Seller's annunciator. Seller shall provide 480V, 3-phase, 3 wire power to each motor starter. Seller shall provide 480V to 120V dry type transformers, complete with both primary and secondary fuses to provide control power for the control panel. Seller shall provide lockable disconnects for each source of the control power. Control power shall be available regardless of which compressor is out of service.

Seller shall provide complete FVNR circuit breaker type combinations motor starters with manual reset thermal overload-relays, 120V AC operating coils, 480 to 120V dry type control transformers complete with both primary and secondary fuses, and a separate enclosures. Circuit breakers shall be capable of interrupting 25,000 amps without the use of fuses or current limiters and without considering the starters and overloads. A disconnecting means shall be provided on the front of the enclosure suitable for locking in the open position. Seller shall provide adequate space and the required terminals to terminate cables.

Enclosures shall be NEMA 12 for indoor applications and NEMA 4 for outdoor applications. Nameplates shall be provided for each device using Purchaser's identification. Each nameplate shall be made of laminated plastic and shall be fastened with stainless steel screws. The nameplate shall be white with black lettering.

12. Air Receiver

An ASME Code Air Receiver, for 150 psig design pressure, shall be furnished. The receiver shall be complete with pressure gauge, relief valve set at 125 psig, automatic moisture trap with drain valve, inspection opening, and base ring. The air receiver shall be large

enough so that, in case of start-stop capacity control, the number of starts shall not exceed that acceptable for the electric motor, but not less than 13.5 cubic feet. In addition, the receiver shall contain a low pressure switch and a high pressure switch to cut-in (start) and cut-out (stop) on the compressor.

13. Noise

The maximum sound level from the equipment furnished under this specification should not exceed 87 dBA at 3 feet from any surface of the unit. Sound pressure levels shall be measured in decibels re: 0.0002 microbars using a sound level meter conforming to ANSI S1.4A tolerance limits. Measurements shall be performed in accordance with ANSI S1.13 (corrected to free field environment in accordance with IEEE 85).

14. Marking

The equipment shall be provided with a permanently attached nameplate located in a readable position. The nameplate material shall be compatible with the material to which it is attached to prevent galvanic corrosion. Nameplates shall not be attached to pressure retaining surfaces with mechanical fasteners.

The compressor nameplate shall be stamped with the following information:

- o Purchaser's mark number
- o Manufacturer's name, model, and serial number
- o Year manufactured
- o Design pressure and temperature
- o Rated capacity, acfm
- o Rated discharge pressure, psig
- o Rated speed, rpm

The intercooler, aftercooler, and moisture separator shall be code stamped and the nameplates shall be in accordance with ASME VIII (latest edition). The dryer name plate shall also include the Purchaser's mark number, manufacturer's name, model, serial number, year manufactured, design pressure and rated capacity.

15. Induction Motors

All motors shall be TEFC and conform to Purchaser's Induction Motor Specification SE-211. An Induction Motor Data Sheet (Attachment No. 1 to Specification SE-211) shall be completed and submitted to the Purchaser for each motor supplied.

16. Wiring

For skid mounted equipment furnished as a complete package, 600 volt cables shall be copper conductors with thermosetting insulation and jacketing material for cables between Seller furnished panels and motors.

PVC material shall not be used. Conduit furnished on skid mounted equipment shall be rigid galvanized steel for outdoor applications or intermediate metal conduit for indoor applications, minimum size of 1/2 inch. Suitable liquid tight flexible conduit shall be provided at each motor connection with grounding jumper.

Electronic instrumentation cable shall be 600V shielded single pair No. 16 AWG or multipair No. 20 AWG as required. PVC material shall not be used.

Control wiring shall be Type SIS No. 14 AWG minimum. PVC material shall not be used. All control wires shall be terminated with insulated ring tongue or locking spade compression type terminals. All wires shall be provided with wire markers.

Power cable between the motor starter and the motor shall have XLPE or EPR insulation and neoprene, hypalon or thermo setting chlorinated polyethylene (CPE) jacket. Cables shall be rated for a conductor temperature of 90°C in dry locations and 75°C in wet locations.

17. Welding

All welding, welding procedure qualifications, and welder qualifications shall be in accordance with the requirements of ANSI B31.1.

18. Piping

All interconnecting piping between equipment (compressor, aftercooler, receiver etc.) shall be 150 lb, carbon steel, threaded (2 in. and smaller) and butt welded (2 1/2 in. and larger).

19. Valves

All isolation valves shall be gate or ball valves that do not require disassembly for installation.

20. Hydrostatic Tests

Each compressor, cooler, filter, and other pressure vessels shall be hydrostatically tested at 1 1/2 times its design pressure. These tests shall be in accordance with code requirements where applicable.

Each component, subassembly or assembled system shall be hydrostatically tested at 1 1/2 times the system design pressure.

Components of the system subject to cooling water shall be hydrostatically tested at 1 1/2 times the cooling water system design pressure but not less than 115 psig.

Tests shall be maintained for a duration of at least 10 minutes to permit examination of parts under pressure.

The basis for acceptance shall be no leakage.

21. Performance Test

The Seller's standard shop mechanical running test shall be performed. As a minimum, this shall include a completely assembled compressor with all auxiliaries and controls. The test shall be run for a period of not less than one hour to ensure proper clearance, internal alignment, bearing operation, and general mechanical acceptability.

Test certificates shall be submitted to the Purchaser.

22. Inspection

The following are the mandatory hold points for which prior notification is required:

- o Major repairs
- o Performance testing (optional)
- o Shipping release

23. Shop Cleaning

Cleaning of surfaces which are not be painted or coated shall be done according to the Supplier's best recommended practice.

Parts or subassemblies that may have crevices or inaccessible surfaces after assembly shall be cleaned as well as practicable prior to assembly.

Welded stainless steel and nickel alloys which are not re-solution annealed, as well as hardened low or high alloy steels, shall not be acid pickled.

All cleaning operations shall be conducted so that stainless steel and nickel alloys are not contaminated with lead, copper, mercury, and/or other low melting point metals; chlorides, sulfur, and halogens, as well as ferritic steel materials.

24. Shop Painting

External noncorrosion-resistant metallic surfaces shall be primed and finished in accordance with the Seller's standards unless otherwise specified below.

25. Packaging

Packaging shall be adequate to prevent contamination, mechanical damage, or deterioration of the item supplied, as defined in the requirements listed below. These requirements are applicable immediately after manufacture.

All expendable materials, such as tapes, barriers, plugs, desiccants and desiccant bags, caps, inhibitors, etc., to be in contact with austenitic stainless steel or nickel alloys shall not contribute to corrosion during the storage period by, for example, rain or condensate leaching deleterious chemicals contained in the expendable material.

Items not immediately packaged after manufacture shall be protected from contamination.

Items shall be inspected for cleanliness immediately before packaging. Cleaning acceptance criteria are invoked as defined in this Specification. Any entrapped water shall be removed.

All openings into items shall be sealed or plugged. Weld-end preparations shall be protected against corrosion and physical damage.

Items shall be packaged in suitable containers, crates, or on skids.

The outermost covering shall be clearly marked with the complete vendor identification, which shall include weight.

The center of lifting points for large and heavy equipment shall also be identified.

All items subject to corrosion shall be suitably protected.

26. Shipping

The weight and lifting points, indicated on the crate, skid, or package shall be utilized for all handling procedures.

When shipping by open carrier, items shall be covered by fire-retardant materials, e.g., tarpaulins, to prevent contamination from road, dust, dirt, salt spray, and other forms of contaminants. Cover installation shall be made so that air circulates under the cover to prevent condensation.

Shipments made in closed carriers do not require tarpaulins.

27. Provision for Storage

It is expected that the equipment will be stored at the jobsite in an unheated building or outdoors with equivalent protection.

The Seller shall include his long-term storage and maintenance procedure(s) applicable to site storage with each shipment to which they apply.

2.3 Baghouse

Allowable baghouse design parameters shall be as follows:

Maximum "pulse jet" net gas to cloth ratio (ft/min)	=	3.3
Maximum "reverse air" net gas to cloth ratio (ft/min)	=	2.0
Minimum "reverse air" fan flow to cloth ratio (ft/min)	=	1.5
Minimum spacing between bags (in.)	=	2.0
Minimum number of baghouse compartments	=	6

Minimum spacing between bags and internal walkways, walls and other internal structures (in.)	=	3.0
Particulate density for particulate hopper capacity design (lb/ft ³)	=	30
Particulate density for particulate hopper structural design (lb/ft ³)	=	120

Maximum air to cloth ratios shall be based on the baghouse inlet flow corresponding to the economizer outlet flow for the process Design condition of Attachment 2 plus inleakage (as estimated by Seller but not less than 3%), atomizing air, quench water and baghouse operation with one module off-line for cleaning. Reverse air baghouse net air to cloth ratio shall include the effect of the reverse air flow. Both reverse air and pulse-jet bag cloth area used in calculating the above air to cloth ratios shall only include the effective bag area and shall not include fabric covered by thimbles, anti-collapse rings, caps, cuffs, seams, etc. Seller shall provide a bag dimensional drawing and the effective bag area calculation method with his proposal in order to verify that the air to cloth ratio has been correctly calculated.

2.3.1 Baghouse Structure

The baghouse shall consist of individual, isolatable modules constructed of structurally stiffened, self-supporting panels. The compartments shall be gas-tight, seal welded internally and structurally reinforced with external stiffeners, ribs, and supports. Baghouses of the structural design (i.e. - adjacent modules share a common wall) may be furnished for reverse air baghouses. No internal structural supports shall be allowed in the baghouse hoppers. Internal supports will be allowed in the compartment provided these supports do not interfere with normal access and maintenance. The roof shall be sloped 1/4 in. per ft or greater. The casing and roof shall be constructed of minimum 3/16 in. plate. Roof areas shall be sloped to drain to gutters and downspouts running to grade at a point just outside the APC area nearest the I.D. fans.

The baghouse shall have a walk-in plenum design to allow access to the bags and cellplate. Access door seals shall be designed to prevent air in-leakage.

Mechanisms such as dampers and damper operators which are exposed to the flue gas shall be designed, constructed, and supported so as to operate properly without any distortion or overstress due to thermal expansion or shock up to the baghouse structural design temperature. Damper bearing grease fittings shall be easily accessible.

The Seller's design shall include provisions to bypass 100 percent of the flue gas flow from the inlet to the outlet of the baghouse under emergency conditions. The bypass dampers and duct shall be designed so that the pressure drop across the baghouse bypass during 100 percent gas bypass will not exceed the pressure drop across the baghouse during the design conditions shown in Attachment 2 with one compartment off-line for cleaning. The bypass dampers shall be poppet type; any other type shall require approval of the Purchaser. Positive shutoff capability is required for these bypass dampers. Bypass dampers shall be fail open type.

The Seller shall supply all baghouse access platforms and stairways from the foundation level up. Reverse air baghouses shall include an internal walkway system to allow access to all bags. Walkways shall be located at the cellplate and bag hanging levels. Pulse jet baghouses shall have access to the cellplate.

Hinged access doors with latch shall be provided in each hopper and where necessary to enable proper inspection, cleaning, and maintenance of the interior of the baghouse including inlet and outlet ducts.

The cellplate shall be leaktight such that flue gas may pass only through the bags. The flue gas inlet to each module shall be located below the bags. Cellplate holes shall be mechanically punched (i.e. - no flame cutting is permitted); hole tolerance shall be ± 0.010 ".

The Seller shall arrange the baghouse to assure an even distribution of flue gas and particulate through the baghouse at all loads and insure no ash build-up in the ductwork. The Seller shall supply internal gas deflector plates at the gas inlet to each compartment if required. The use of perforated plates as a gas distributor is not permitted.

All exposed steel shall be painted in accordance with Specification SA-550.

2.3.2 Bags/Cages

Fiberglass bags with teflon and/or acid-resistant finish are preferred and shall be furnished in accordance with the requirements of section 2.3.2.1 and 2.3.2.2 for pulse-jet and reverse air bags, respectively. The Seller shall provide the type of bag required to meet the emission requirements of Section 3. The type of bags supplied shall have had prior experience in a similar temperature and environment and shall be subject to approval by the Purchaser. Maximum bag dimensions are 14 feet long by 6 inches in diameter and 24 ft. long by 8 inches in diameter for pulse-jet and reverse air type baghouses, respectively.

Bags and their configuration shall be so designed and constructed that replacement may be made without removing other bags (pulse-jet baghouse only) or causing misalignment of the bag supports. Installation and removal of bags shall be a simple process requiring a minimum of tools and time.

Bags for pulse jet air service shall be supported by internal cages in accordance with section 2.3.2.3. The Seller shall provide a bag to cellplate sealing system that will maintain a gas and dust tight seal under all operating conditions. The bag spacing and support shall be such that adjacent bags do not touch each other, baghouse walls or any internal struts during operation. The use of bag alignment grids is not permitted.

Bags for reverse air service shall be clamped to thimbles in the lower cellplate and suspended from a structural member with a spring or counter weight mechanism to maintain proper bag tension. The tensioning system shall include provision for tension adjustment. Snap bands sewn into the bag may also be used for bag to thimble attachment. The Seller shall provide spring tensioning devices for installation of the bags. Bag access at the lower tube sheet shall consist of walkways a minimum of 24 inches wide and arranged such that no more than three rows of bags shall be accessed from each side.

2.3.2.1 Pulse-Jet Filter Bag Specification

Seller to Adhere to the Following Requirements

1. Maximum Fabrication Tolerances for Woven Fiberglass Pulse-Jet Filter Bags (Nominal 6" Diameter by 14' Long)

a. Filter Bag Diameter: Diameter +0.12", -0"
 Flat Width +3/16", -0"

b. Filter Bag Length:

Seam Side: +3/8"
Opposite Seam Side: Note to exceed seam length by more than
 1/2"

Length shall be defined as the distance from the top edge of the bag to the top row of disc stitching; i.e., the effective inside length of the bag.

Refer to Section 4 for the Bag Construction Specification and to Attachment 14 for Fabric Specifications; Seller's exceptions to these requirements must be provided in detail.

2. Filter Bag Quality Control

Two reference filter bags shall be provided to Ogden Martin (Fairfield, NJ) as the baseline comparison with a quality control cage and tubesheet hole to be supplied by the Seller. Quality control filter bags must properly fit the cage and tubesheet and must comply with the dimensional tolerances specified in Section 1 above, with the construction details specified in Section 4 below, and with the fabric specification in Attachment 14. In addition, three bags shall be sent to the job site for field verification of cell plate fit per section 2.3.2.3 of this Specification. The Seller shall not proceed with bag manufacture until reference bags and fabric are approved by Ogden Martin.

3. Quality Inspection

a. Shop Fabrication

Ogden Martin reserves the right to have a representative visit the filter bag fabrication site and inspect the filter bags designated for delivery to the project site. Seller must notify Ogden Martin at least two weeks prior to filter bag fabrication. Notification should be to the Project Manager.

Filter bags shall be measured for their critical dimensions at the fabrication site by the manufacture's inspector. If filter bag tolerances are greater than those specified in Section 1, they will be rejected and deemed unsatisfactory for use at the subject project or any other Ogden Martin Facility unless approved by Ogden Martin. Each rejected bag must be replaced at the Seller's expense with a substitute that complies with this Specification. Ogden Martin will not be responsible for replacement costs of the unacceptable filter bags.

b. Facility Installation

Filter bag quality may be inspected at the Facility after bags and cages have been installed in the baghouse. This quality control inspection will occur if there is visual evidence of poor fabrication as evidenced by crooked, puckered or tight seams; nonuniform bag length; inadequate bag/cage fit; inadequate sealing between the bag and tubesheet; or other associated reasons. The Seller will be contacted before any removal of bags, should this be required to facilitate such an inspection.

Any filter bags which are not in compliance with this specification will be rejected. Replacement components will be supplied by the Seller at the Seller's expense including materials, freight, removal of the rejected filter bags, and installation of the replacement bags, including labor and manpower.

4. Filter Bag Construction

a. Thread

PTFE-coated (Teflon-coated) fiberglass; type B-4 in the vertical seam stitching and type B-4 or B-6 in the circumferential stitching.

b. Seam

The vertical seam shall be "felled" with triple needle type 401 multithread chain stitching. The seam width shall be 1/2" to 5/8" with fabric edges fully interlocked as shown in attachment 15. The seam shall be relatively flat and free of puckers. The filling yarn misalignment at the seam (seam registration) shall not exceed 3/4".

c. Top

The top of the bag shall be designed and constructed to provide a gas-tight seal when properly installed in the tubesheet according to the Seller's instructions. The opening in the top of the bag shall have sufficient clearance to permit the cage to be inserted fully without binding. Baghouse OEMs utilize different bag sealing methods and thus different bag top designs. The most common type is the double-beaded snap band top, the construction of which is specified below. If the Seller uses an alternate design, a detailed description of the bag top construction must be provided.

Double-Beaded Snap Band Type (Example): The top cuff shall be made of a separate piece of woven glass fabric, self-material (same fabric as the bag) or approved alternate. The fabric shall be bias-cut for better conformity to the shape of the gasketed band.

It shall contain a 1.0 inch wide by 0.015 inch thick snap band to which a double-beaded fiberglass gasket has been attached with contact adhesive. The gasket shall be sized to fit around the full circumference of the band (no significant gap) without overlapping.

The snap band shall be constructed of a material which will provide resistance to corrosion (including stress corrosion cracking) in the incinerator/spray dryer flue gas, sufficient to preclude any adverse effect on bag function. The band shall have rounded edges and be free of burrs.

The cuff/band assembly shall be constructed so that it snaps into the tubesheet hole easily but snugly, providing a gas-tight seal. It shall be sewn to the top of the bag with double-needle type 301 lock stitching as shown in attachment 15. The top row of stitching shall be sufficiently close to the band (approximately 1/16") to minimize shifting of the band inside the cuff during installation. The cuff seam shall be positioned approximately 180° opposite the bag seam. The finished cuff length shall be nominally 3 inches long (on its externally facing surface).

d. Bottom

A separate, 3 inch long (minimum) reinforcement, made of self-material or an approved alternate fabric, shall be attached to the bottom of the bag with two rows of double-needle type 301 lock stitching. The reinforcement shall be sewn closed vertically to prevent dust buildup between it and the bag, and this seam shall be offset approximately 180° from the bag seam.

A disc shall be fabricated from two layers of self-material (or approved alternate fabric) sewn together with overcast stitching. This disc shall be sewn into the bottom of the bag using a lap seam with double-needle type 301 stitching. The disc and bottom of the reinforcement may be attached simultaneously.

e. General Sewing Quality

No raw fabric edges shall be exposed.

All circumferential stitching shall be relatively smooth and free of puckers and shall not result in any significant constriction of the bag at the cuff or reinforcement attachments.

On reworked bags, no needle holes (from which stitching has been removed shall be exposed.

f. Bag Dimension and Bag/Cage Fit Guidelines

Bag dimensions shall be governed by the actual fit of the bag on the Seller's cage. The bag "pinch" on the cage, which is approximately equal to one-half the excess circumference of the bag vs. that of the cage, shall range from approximately 1/8" to 5/16", and the flat width of the bag shall be established to achieve this pinch.

When the bag is installed in the tubesheet with the cage fully inserted according to the Seller's instructions, the bottom of the cage shall be located from approximately 1/4" below the disc stitching to approximately 1/2" above the disc stitching at the bag seam. The bag length shall be established to achieve this configuration relative to the cage. Since bag length measurements are difficult to make accurately, with values obtained depending on measurement technique, a suitable bag length shall be

determined by actual bag/cage fit, not by calculation. A properly fitting sample bag shall then be used as a prototype for bag production, and using proper fabrication techniques, a consistent bag/cage fit shall be obtained.

2.3.2.2 Reverse Air Filter Bag Specification

Seller to Adhere to the Following Requirements

1. Maximum Fabrication Tolerances for Conventional Woven Fiberglass Filter Bags.

- a. Filter Bag Diameter: Diameter $\pm 0.08''$
 Flat Width $\pm 1/8''$
- b. Filter Bag Length (under tension):
- Seam Side: $\pm 3/4''$
 Opposite Seam Side: Seam Side Length + $3/4''$ maximum

Length shall be defined as the overall length of the bag proper, excluding cap/bolt height, at the original bag installation tension which shall be specified by Seller.

Refer to Section 4 for Bag Construction Specification and to Attachment 16 for Fabric Specification; Seller's exceptions to these requirements must be provided in detail.

2. Filter Bag Quality Control

Two reference filter bags shall be provided to Ogden Martin as the baseline comparison with a quality control thimble and bag cap to be supplied by the Seller. Quality control filter bags must comply with the dimensional tolerances specified in Section 1 above, with the construction details specified in Section 4 below, and with the fabric specification in Attachment 16. The Seller shall not proceed with bag manufacture until reference bags and fabric are approved by Ogden Martin.

3. Quality Inspection

- a. Shop Fabrication - same as paragraph 2.3.2.1 (3a).
- b. Facility Installation

Filter bag quality may be inspected at the Facility after bags have been installed and tensioned in the baghouse. This quality control inspection will occur if there is visual evidence of poor fabrication as evidenced by crooked, puckered or tight seams; nonuniform bag length; inadequate bag/thimble fit; excessive puckering of cuffs or ring covers; skewed ring covers; or other associated reasons. The Seller will be contacted before any removal of bags, should this be required to facilitate such an inspection.

Any filter bags which are not in compliance with this specification will be rejected. Replacement components will be supplied by the Seller at the Seller's expense including materials, freight, removal of the rejected filter bags, and installation of the replacement bags, including labor and manpower.

4. Filter Bag Construction

a. Thread

PTFE-coated (Teflon-coated) fiberglass; type B-4 in the vertical seam stitching and type B-6 in the circumferential stitching (cuffs and ring covers).

b. Seam

The vertical seam shall be "felled" with triple-needle type 401 multithread chain stitching. The seam width shall be 1/2" to 5/8" with fabric edges fully interlocked as shown in Sketch No. 1 (Attachment 15). The seam shall be relatively flat and free of puckers. The filling yarn misalignment at the seam (seam registration) shall not exceed 3/4".

c. Top Cuff

The bag top shall have an integral cuff, nominally 2" long, enclosing a metal compression band sized to fit the Seller's shop-installed bag cap. The cuff shall be fabricated to provide two layers of fabric on each side of the band; either by use of a separate band cover or a "double turnback" construction. The cuff shall be sewn with two rows of double-needle type 301 lock stitching, and the row of stitching adjacent to the band shall be sufficiently close to the band to minimize its movement inside the cuff. The cuff shall be relatively smooth and free of puckers, especially around the band.

d. Bottom Cuff

The bag bottom shall have an integral cuff, nominally 3" long, sized to fit the Seller's thimble and constructed by one of two alternative methods, according to the type of thimble used:

Compression Band Type: This type cuff shall be fabricated according to the specifications for the top cuff in Section 4.c above. Bag/thimble fit is very critical for this design, and the bottom cuff/band assembly should be sized to fit thimbles with diameters at both extremes of the tolerance.

Rope Type: This type cuff, which requires a separate hose clamp connector for thimble attachment, shall consist of a simple hem enclosing a glass rope at the bag bottom. The cuff shall be sewn with two rows of double-needle type 301 lock stitching.

e. Cuff Band(s)

The compression band inserted in the top cuff (and bottom cuff, if applicable) shall be approximately 0.5" wide x 0.015" thick with a circumference sized to assure proper fit on the Seller's bag cap (and thimble, if applicable). It shall be constructed of a material which will provide resistance to corrosion (including stress corrosion cracking), in the incinerator/spray dryer flue gas, sufficient to preclude any adverse effect on bag function. The band shall have rounded edges and be free of burrs.

f. Anti-Collapse Rings

The bag shall be fabricated with a minimum of five (5) anti-collapse rings attached. The number and spacing of these rings along the length of the bag shall be specified by the Seller, but in no case shall the spacing between any two rings, or the distance from either "end" ring to its respective end of the bag, exceed four feet.

The rings shall be constructed of 1/8" diameter (minimum) mild steel, plated or coated if necessary to provide resistance to corrosion sufficient to preclude any adverse effect on bag function. Galvanized steel is not acceptable. Rings shall be butt-welded with a smooth weld free of burrs. They shall be round, and the ring diameter selected to minimize puckering of either the ring cover fabric or the bag fabric; i.e., the I.D. of the rings should be approximately equal to the O.D. of the inflated bag.

g. Ring Covers

Each ring shall be enclosed in, and attached to the outside of the bag with, a ring cover which shall be nominally 1-3/4" wide. The ring cover shall be fabricated from the same fabric as the bag, and it shall be constructed so that there are two layers of fabric on each side of the ring (in addition to the bag fabric).

The ring covers shall be sewn with two rows of double-needle stitching (type 301 or 401), one row on each side of the ring, and the row of stitching closest to each edge of the ring cover shall be at least 1/8" from that edge. The ring covers shall be sewn perpendicular to the vertical axis of the bag and shall be relatively free of puckers.

h. Bag Cap

A bag cap of the Seller's (or bag vendor's) standard design shall be furnished with each bag. The cap shall be constructed of 22 gauge (minimum) mild steel, plated or coated if necessary to provide resistance to corrosion sufficient to preclude any adverse effect on bag function. Each cap shall be fitted with an eyebolt or J-bolt (also corrosion-resistant) whose dimensions and method of attachment to the cap shall be specified by the Seller. The eyebolt shall remain firmly attached to the cap throughout the life of the bag.

The cap shall be installed by the vendor prior to bag shipment, and each cap shall be oriented so that the plane of the eyebolt is either aligned with, or rotated 90° from, the bag seam, as specified by the Seller. The eyebolt shall be covered with a snug fitting, but easily removable, protective device to prevent damage to the glass bag fabric during shipment.

2.3.2.3 Pulse Jet Cage Specification

1. Construction

- a. 20 vertical wires equally spaced.
- b. Horizontal rings spaced 6 inches apart.
- c. All wires of 11 gauge carbon steel construction unless otherwise specified. Wires may be electroplate galvanized at the Seller's discretion.
- d. All surfaces to be smooth to prevent damage to bag.
- e. Weld all points of contact on cage.
- f. Specified tolerances in item 2 apply throughout entire length of cage.
- g. Bottom pan shall be of 18 gauge carbon steel construction unless otherwise specified. A pan that creates a tapered bottom is not acceptable. Crimping of the pan around wires is not acceptable.
- h. Cage collar for interfacing with cellplate shall be fabricated of 18 gauge carbon steel and shall be level such that it would provide a seal with a level cellplate.

2. Fabrication Tolerances

- a. Diameter : Specified diameter $+0/-1/16$ of cages outside diameter.
- b. Length : Specified length $+0/-1/4$ ".

3. Fabrication Procedures

a. Cellplate Fit

Three test cages which meet these specifications shall be installed at the site to confirm that cage and cellplate sizing is correct. The test cages shall also be fitted with bags at the site to confirm cage - bag - cellplate sizing. The installation shall be witnessed by OMS.

- b. A test cage which meets these specifications shall be fit to a bag to confirm bag-to-cage fit before mass production commences. The test cage shall be fabricated on equipment that will be used for the production run.

2.3.3 Bag Cleaning System

A pulse jet or reverse gas cleaning system shall be designed and furnished for dislodging collected particulate adhering to the collecting bags, and to any other surfaces where accumulated particulate may impair baghouse performance. The bag cleaning system shall clean all bags equally. Pulse-jet baghouses shall be capable of cleaning using both on-line and off-line cleaning. Each pulse jet module valve header shall be isolateable from the compressed air system at the baghouse module.

The Seller shall incorporate, into the design of his bag cleaning system, mechanisms to prevent "bag popping" caused by the sudden rush of incoming flue gas into bags which have just been cleaned. The preferred mechanism is staging the opening of outlet isolation valves of the off-line compartment as it goes back on-line. The Seller may quote an alternative, subject to approval by the Purchaser.

The bag cleaning system shall automatically perform periodic cleaning of bags such that the guaranteed average draft loss through the APC system as stated in Section 7.1bi of Attachment 7 is not exceeded.

The cleaning system shall be designed to dislodge collected particulate into the particulate hoppers without allowing dislodged particulate to be released to the flue gas outlet from the baghouse to a degree that the guaranteed outlet particulate loading and stack opacity will be exceeded. The cleaning system will also be designed to produce a minimum amount of wear and tear on the filter bags consistent with removing a sufficient amount of collected particulate. The off-line cleaning cycle shall consist of the following steps: 1) compartment isolation, 2) bag cleaning by reverse air or pulse jet mechanism, 3) no flow period to allow suspended particulates to settle, and 4) return compartment to service. The on-line cleaning cycle shall include the simultaneous pulsing of the identical row in each of the baghouse modules. The cleaning shall proceed by pulsing alternate rows (i.e. 1, 3, 5...15, 2, 4, 6...14). Pulsing will be initiated at a high differential set point and stopped at a low set point. Both set points will be monitored by separate and independent switches. The next cleaning cycle shall start with the row at which the previous cleaning cycle stopped.

Pulse-jet: For baghouses utilizing the pulse-jet (high ratio) concept, -40°F dewpoint air will be supplied by Purchaser at the piping interface point. Seller to state quantity of air required assuming all trains are cleaning simultaneously. Seller shall provide one air receiver in accordance with Section 2.3.5.

Reverse Air: Baghouses utilizing the reverse air (low ratio) concept shall have one reverse air fan per train. The fan shall be located at grade next to the baghouse to minimize duct work. Reverse gas flow shall normally be taken from the outlet duct of the baghouse. The reverse air fan shall have backward-curved blades and shall not operate at speeds in excess of 1180 RPM. The Seller shall provide an option cost to provide an atmospheric fan inlet with isolation damper and air heater to heat air to flue gas temperature. This system shall be used when the baghouse is operating with high opacity.

Reverse air fans shall meet the technical requirements of SM-104.

2.3.4 Compartment Isolation and Ventilation Systems

Baghouses shall include a compartment isolation and ventilation system capable of providing total compartment isolation and ventilation such that personnel access for inspection/maintenance can be safely effected (i.e. - temperature shall not be greater than 110°F based on the Design Summer ambient temperature) in an isolated compartment within two (2) hours while the rest of the baghouse is on-line and that isolated compartments will comply with any State or OSHA regulations for the protection of personnel. A ventilation system utilizing one portable fan per row of modules and the necessary electrical outlets is acceptable. Each portable fan shall be provided with a weather enclosure for storage when not in use.

The compartment outlet and reverse/pulse air dampers for isolation shall be capable of being manually closed at the baghouse control panel. All baghouse designs shall include mechanical devices to lock dampers in a safe position. All outlet damper and bypass damper actuators shall be accessible from platforms.

The compartment isolation system shall be capable of isolating any individual compartment. Poppet type dampers shall be used for compartment inlet, outlet, and reverse gas dampers. Butterfly damper is acceptable for inlet to module. Any other type of damper will require approval by the Purchaser. The inlet damper shall be capable of being operated manually from grade.

2.3.5 Pulse-Jet Receiver

An ASME Code Air Receiver, for 125 psig design pressure, shall be furnished. The receiver shall be complete with pressure gauge, relief valve set at 125 psig, automatic moisture trap with drain valve, inspection opening, and base ring. The air receiver shall have a capacity of 400 gal. minimum. Portion(s) subject to freezing shall be heat traced and insulated.

2.4 Electrostatic Precipitator

Each ESP shall be sized and designed so that under all operating conditions the outlet dust loading will not exceed the particulate emission and opacity guarantees.

Baffling shall be provided to prevent gas bypassing either above, under, or around the collecting surface.

The precipitator shell shall be fabricated from a minimum of 3/16" plate with external columns and stiffeners. The precipitator shall be gastight.

The entire precipitator roof shall be externally insulated, waterproof, and suitable for foot traffic. Overlapping coating construction seals shall be provided around all protrusions through the roof. All quick-opening openings, through which personnel might come in contact with high voltage equipment, shall be interlocked to prevent opening before the precipitator electrical supply is deenergized. These doors shall have permanently attached warning signs marked "Danger-High Voltage." Multiple-bolted openings shall not require interlocks but must have permanently attached warning signs marked "Danger-High Voltage."

All portions of each precipitator proper shall be weatherproof. Roof areas shall drain to gutters and downspouts to grade at a point just outside the APC area perimeter boundary nearest the I.D. fans.

External accessories, such as extensions for access doors, inspection openings and other equipment, shall be designed to clear by 2 in. an insulation thickness of 3 in. for the shell sides and hoppers plus a ribbed lagging 1-1/2 in. in depth, all of which will be outside the shell and hopper stiffeners. A minimum 12 in. normal clearance shall be provided between the hopper side slope stiffeners and the supporting steel to provide access for installation of insulation and lagging.

Hinged access, inspection, and clean-out doors with gastight seals shall be provided in the hopper, and where necessary, to enable proper inspection, cleaning, and maintenance of the equipment.

Doors shall be capable of gastight sealing with repeated opening and closing and shall be completely equipped with safety interlocks. No sealing compound shall be used to obtain gastightness.

A walk-in penthouse shall be provided, and be equipped with a pressurization fan system. Penthouse shall be sided and roofed to meet requirements of 2.8.8.

The Seller shall design and provide all flow distribution devices to insure proper flow distribution. Stiffening and reinforcement shall be included as needed.

Precipitators shall be designed to accommodate the thermal shock of occasional sudden shutdown and startup, including temperature cycling between ambient and operating temperatures. Seller shall advise if his equipment has any limitations which cannot cope with such an occurrence.

As a minimum, structural design shall be based on a static flue gas pressure at the inlet flange ranging from plus 25 to minus 25 inches of water column.

The precipitator shall be conservatively sized and shall have a minimum of three (3) or more electrically and mechanically separated fields.

2.4.1 Collecting Plates

The collecting plates shall be:

1. Smooth sheet (except for stiffeners and baffles) of minimum 18 gage USSS&P thickness.
2. Designed, constructed, and supported to withstand, without mechanical distortion or overstress, the rapping energies required for proper dust removal.
3. The plate shall not deviate from the normal center line of plate by more than 1/4 in.
4. Constructed and supported to eliminate any distortion due to thermal expansion or shock up to the rated design temperature.

5. Completely shop assembled in individual curtains.

6. SCA shall not be less than 370 sq ft/1000 acfm.

All series fields shall be of the same length in direction of gas flow.

Minimum active aspect ratio to meet performance shall not be less than 1. Aspect ratio is defined as the ratio of total collecting curtain length to collecting curtain height. Active aspect ratio shall be calculated exclusive of spaces between the series fields.

2.4.2 Discharge Electrodes

Discharge electrodes shall be of the stiff or rigid design. Weighted wire electrodes will not be acceptable. Electrodes shall be stabilized against movement by means of a proven design without the use of insulators for attaching the lower frame to the hopper or precipitator sidewall. Each bus section shall be supported by means of alumina insulators. Electric resistance heaters with controls shall be provided for preheating insulators prior to startup and for supplemental heating during low load conditions.

All mechanical terminations and connections of discharge wires to support frames shall be provided with positive electrical contact to prevent spit-arcing, metal fatigue, and breakage, particularly those associated with rapping stresses. All mechanical terminations and connections shall be preferably of a welded nature.

Each discharge assembly shall be designed to remain plumb to ensure accurate electrode alignment throughout the service life of the precipitator. Each assembly shall hang within 1/4 in. of plumb center line.

2.4.3 Rapping Systems

Rapping systems shall be adequate to provide removal of collected particulate matter from both collecting curtain and discharge electrodes, to the extent that precipitator performance requirements and guarantees shall not be impaired by excessive particulate accumulations.

Puffs of particulate matter resulting from rapping shall not be visible under any conditions of precipitator operation. The collecting curtain rapper system shall be of the impact type, as distinguished from the forced vibration or vibrator type. The maximum installed and operating design levels of specific rapping energy expressed as foot pounds per pound of system rapped by an individual rapper shall be stated. A minimum of 50 G's acceleration shall be imparted to all parts of the collecting curtain.

There shall be maximum of 1,500 sq ft of collecting surface per individual rapper. The rapping system shall be completely flexible and adjustable as to rapping period, frequency, and rapping cycle. Rappers in any one series field shall be separately adjustable with relation to the rappers in any other series field. The rapping system shall be designed so that adjustments can be made on an individual rapping section, whether the precipitator is energized or not.

The rapper controls shall be of the maintained contact type, i.e., all controls shall restart without operator action upon energizing the entire precipitator system. A test shall be conducted on all rappers to demonstrate that rapping

uniform and in accordance with design requirements. The details of the test procedure shall be submitted to the Purchaser in advance for approval.

2.4.4 Electrical

The precipitators shall be designed with the following electrical equipment:

1. Heavy-duty, high-voltage support insulators and bushings.
2. Main high-voltage silicone oil filled transformer and silicon diode rectifier sets and protective equipment, all totally enclosed in a self-contained tank, for outdoor service conforming to all applicable codes and regulations. Bus and bus duct to connect T/R to discharge system.
3. Each T/R shall contain primary voltage taps, terminals for wiring to a separate T/R control unit, insulating fluid high temperature and low liquid level alarm contacts, insulating fluid temperature and level indicators, and key interlocked position selector switch.
4. 460V, 3 phase, power distribution switchboard, circuit breaker type, each panel breaker; the necessary feeder breakers for distributing power to all transformer-rectifiers, rappers, vibrators, and all other equipment required for operation of the precipitators, and the necessary monitoring instruments.
5. Contactors, control relays, load sensing devices, and all necessary controls including rectifiers, control units, and reactors, completely wired.
6. Automatic programmable controller system for optimum precipitator energization under fluctuating boiler flue gas outlet conditions.
7. Indicators to monitor precipitator performance and detect grounds in addition to control cubicle instruments, failure indicators for electrode rappers, and provisions for adding remote indicators for each high voltage system.
8. Electrically-operated rapping systems with automatic controls.
9. Rapper control cabinet for collecting curtain and discharge electrode rappers, completely wired.
10. Alarm circuit system for rectifier and ventilating system.
11. Provisions to allow shutdown of any one of the precipitator sections with uninterrupted service of the remaining sections.

2.4.5 Platforms and Stairways

Platforms, access stairways, walkways and handrails shall be provided to all areas requiring equipment and valve access, maintenance and routine inspection. Caged ladder access to precipitator roof from grade shall be furnished.

2.5 Hoppers (Baghouse and Precipitator)

A minimum number of ash collecting hoppers consistent with good design shall be provided. Precipitators shall have troughed hoppers which terminate with a 12 inch wide flanged opening. Baghouses shall have one pyramidal hopper per module, which terminate in a 12" x 18" flanged opening (18" dimension shall be parallel to the baghouse collecting screw conveyor). Hoppers shall be constructed of minimum 1/4 inch plate. A Purchaser-supplied screw conveyor will run beneath the hopper outlets of each row of modules along the scrubber/baghouse (precipitator) axis. Each hopper flange shall be capable of supporting 200 lbs. per linear foot of conveyor located directly beneath each module or 2000 lbs., whichever is greater. In addition, each pyramidal hopper shall be provided with two hanger rod mounting lugs, each designed to support 1000 lbs. of Purchaser's equipment. Location of these lugs shall be coordinated with conveying equipment supplier through the Purchaser's Engineer.

Sufficient allowance in hopper dust capacity shall be made for unequal distribution of ash between the front and rear hopper sections. Adequate hopper capacity shall be furnished for minimum of 8 hour emergency fly ash storage at the Design conditions shown in Attachment 2.

Hoppers shall be located so as to eliminate the possibility of ash build-up in the immediate area of the gas distribution plates. The valley angle of all hoppers shall not be less than 55 degrees with the horizontal. The temperature of the hoppers shall be maintained at flue gas temperature by electrical heaters and insulation during normal operation.

Hoppers shall have no internal baffles. Each pyramidal hopper shall have a high level switch, two poke holes of 4 inch diameter pipe with caps, two connections (90 degrees apart) for a future air cannon, one 8 inch square strike plate, one electric vibrator with adjustable on/off cycle timer, and one flanged clean-out and hinged access door with safety chain and closure plate. The high level switch should be located at an elevation equal to that of the bottom of the hopper access door. Troughed hoppers shall have similar provisions but in numbers consistent with the hopper length. Hoppers shall be arranged to provide a minimum clearance of 10 feet to finish grade below hopper flanges for installation of Purchaser's ash removal system. Access to the hoppers may be from either side that is not obstructed by the ash conveyor. All poke holes, strike plates, level probes and the access door shall be on these sides of the hopper. The air cannon connections and vibrator may be located on the hopper sides above the ash conveyors. No conduit, piping or other obstructions shall be located to obstruct access to the access door, strike plates or poke holes, nor shall the strike plates and poke holes obstruct the access door.

2.6 Ductwork

2.6.1 General

Ductwork shall be designed so that the maximum gas velocity at the Design load gas flow rate specified in Attachment 2 shall be 3,600 feet per minute.

The maximum and minimum temperature of the flue gas (temperature gradient) at the baghouse or precipitator inlet shall not deviate by more than plus or minus 5-F from the bulk average gas temperature.

All ducts shall be gas-tight and seal welded internally and shall be structurally reinforced with external stiffeners, ribs, and supports. The use of internal supports shall be minimized.

Damper bearing grease fittings shall be easily accessible outside the gas stream for on-line greasing.

Rigid stiffener corners shall be designed to resist the moment and shear developed by the stiffeners. Plates, channel stiffeners, and supporting structures shall be designed using a minimum particulate load of 200 psf on the projected area of the bottom of the scrubber outlet duct; the minimum particulate load for all other ducts shall be 100 psf. Under the maximum design loading condition, the deflection of duct plate and duct plate stiffeners shall not exceed the lesser of 1/240 of the span or the plate thickness.

Access doors shall be provided and located on the sides or top of ducts and shall be located such that each duct section can be entered for inspection and maintenance. As a minimum, access doors shall be provided at the inlet of the spray dryer, inlet of the baghouse, outlet of baghouse and outlet of I.D. fan. Access doors must be hinged and be easily accessible from platforms and ladders.

Particulate fallout hoppers shall be provided as necessary including those determined necessary by model study. These hoppers shall be fitted with all the accessories a baghouse hopper is fitted with (e.g. hopper heater, vibrator, level switch, etc.) Hopper outlet shall be 12" square flanged and 10 ft. above finished grade.

The Seller shall design for proper flow distribution of flue gas and solids within the ductwork by providing adequate distributors or other devices as required. Scrubber and I.D. fan inlet ducts shall be horizontal or vertical only. In sharp turns or elbow sections, a suitable number and arrangement of curved deflector vanes shall be provided to avoid turbulence and minimize pressure loss. Vanes shall be adequately braced and stiffened. Suitable man access ways shall be provided to each vane assembly. Vanes shall be designed to minimize the build up of ash on their surface.

Seller to provide two 4" diameter, 150 lb. ANSI flanged instrument connections on the scrubber inlet duct for Purchaser's CEM analyzers. As part of the option requested in Section 4.4.5, Seller shall provide two 6" diameter (180 degrees apart and in the same plane) and two 4" diameter 150 lb. ANSI flanged instrument connections on the vertical portion of the I.D. fan inlet duct for the Purchaser's opacity and CEM analyzers, respectively. The opacity and CEM connections shall be located in accordance with CFR, Title 40, Part 60, Appendix B.

8" diameter, 150 lbs ANSI flanged test ports together with blind flange shall be provided both in the inlet duct of the scrubber vessel and, as part of the option requested in Section 4.4.5, the vertical portion of the I.D. fan inlet duct. These test ports shall be provided in accordance with the CFR, Title 40, Part 60 Appendix A, Method 1, but as a minimum, shall not be less than two equivalent duct diameters downstream and one half equivalent duct diameter upstream of ANY flow disturbance (expansion joints are to be considered a flow disturbance). The test ports shall have a clearance zone to accommodate the sample testing apparatus. This clearance zone (when facing the test port) should be at least

12" to the right/left and top/bottom of the port center line, respectively, and should extend at least one duct diameter (or duct width, if rectangular) plus 3 feet from face of flange. Also eye hooks shall be provided approximately 4 feet above the 8" diameter ports. 2" diameter threaded test ports with caps shall also be provided on the I.D. fan inlet and outlet ducts for the purpose of testing fan performance in accordance with AMCA.

A single sample extraction point shall be provided between the scrubber and particulate collector.

The 8" diameter test ports, opacity connections and CEM connections shall be in accordance with Attachment 18.

Instrument test and sample connections shall be welded to the duct in accordance with ANSI B31.1. All welding shall be done prior to insulation. All duct connections shall terminate 6 in. outside stiffeners, insulation and lagging, except as may be required by CFR, Title 40, Part 60, Appendix B, Specification 1 for the opacity ports.

2.6.2 Materials

The choice of ductwork material shall be supported by successful experience with the selected material in similar environments and shall be subject to approval by the Purchaser. The steel plate used in the ductwork shall not be less than 3/16 in. thickness. Continuous angle or bent plate shall be 1/4 in. minimum.

Ductwork material shall conform to the requirements of this specification and to all applicable ASTM and AWS specifications as listed below:

1. As a minimum, structural steel shapes and plates shall conform to ASTM A36 or high strength steel as selected by the Seller and approved by the Purchaser.
2. As a minimum, pipe stiffeners shall conform to ASTM A53, Grade A or B.
3. As a minimum, weld filler material for ASTM A36 steel shall conform to AWS A5.1, E70 series.

2.6.3 Expansion Joints

Expansion joint material shall be designed to withstand the acidic condensation, thermal expansion, high chloride, high fluorides and caustic concentration, hygroscopic ash, flyash and APC system waste abrasion, and other harsh environments. Expansion joints shall be designed for the design temperature that will be encountered with the scrubber out of service and the baghouse bypassed. Expansion joints shall be gas-tight and installed in all gas ducts as required so that the expansion and contraction of the ducts during operation, including torsion and misalignment, can be readily accommodated without damage, misalignment or excessive stress of support structural steel members or connected equipment. Expansion joints shall be installed such that half the stress exists in the cold position and half in the hot position to avoid extreme deflections. Seller shall coordinate with the Stack & Boiler suppliers, the movements of the stack breaching connection and the Economizer outlet connection.

Any ties across the joint shall be between structural elements on the duct rather than to portions of the joint. Every reasonable effort shall be made to avoid locating expansion joints in horizontal gas ducts.

Fabric expansion joint frames and backing bars shall be of the same material as the adjacent duct plate. All holes in the plate, including flange bolt holes, shall be drilled unless otherwise specified. Corners shall be molded with no splices. A backing bar shall also be provided with holes matching the flange bolting pattern.

The expansion joints will be designed and constructed so that, under any operating condition, no portion of the joint will extend beyond the inside surface of the connecting duct.

Expansion joints shall include a system of internal baffles or "pillow" to keep particulates from collecting.

Expansion joints shall be of "multi-layer" design with sufficient insulation layers to prevent the formation of cold spots.

2.6.4 Ductwork Access

Access platforms shall be provided for all areas requiring routine access and as a minimum shall include damper actuators, I.D. fan inlet guide vanes, duct access doors (except those which can be accessed from grade as with the hopper access doors), all sample connections and instruments as well as the instrument connections and test ports required for Section 2.6.1, except for the scrubber inlet duct test ports (except as required below) and the 2 inch diameter AMCA test ports.

Access to the scrubber inlet duct test/instrument port access platform is from the boiler building. This platform is cantilevered off boiler building steel and provided by the boiler vendor. However, if Seller locates these test/instrument ports in the horizontal duct run to the scrubber (assuming port locations are in accordance with CFR, Title 40, Part 60), then Seller shall furnish, support and provide access to this platform and, if any of the test ports are on the top of the duct, Seller to provide a monorail with a manual hoist supported from the penthouse roof with sufficient clearance for the test apparatus as described in Section 2.6.1.

For plants with more than two APC trains, a 10 foot high x 12 foot wide (minimum) clearance zone is to be provided between the baghouse (precipitator) and I.D. fan or the I.D. fan and the stack.

2.6.5 Transition Pieces

Seller shall provide all necessary transition pieces in the ductwork between the economizer gas outlet and the scrubber inlet, between the electrostatic precipitator or baghouse outlet and the I.D. Fan inlet connection, and between the I.D. Fan outlet connection and the stack inlet connection for each train. Economizer outlet transition shall have a maximum angle of divergence of 30 degrees. All transition pieces shall be fitted with turning vanes if required to ensure proper flue gas distribution. Seller to provide the gaskets and bolts/nuts for the economizer and stack duct connections.

2.7 General Mechanical Equipment Requirements

2.7.1 Pipe and Pipe Supports

The Seller shall engineer, design, detail, furnish, fabricate, and deliver all materials and components necessary for the complete and adequate support and restraint of all piping systems included in the scope of this specification.

Supports shall include, but not be limited to, hangers, springs, anchors, guides, sway braces, vibration eliminators, shock suppressors, pipe attachments, supplementary steel, masonry anchors, and all hardware and components necessary for the proper support of the piping systems.

Seller-supplied pipe supports shall be designed to avoid problems such as pipe breaking, cracking, joint separation, and shear loads due to valve weight. The design of support systems and the individual supports shall comply with all requirements of ANSI B31.1, except as specified herein.

Outside pipe supports shall include provisions for heat tracing and insulation, as required.

Minimum overhead clearances for the lowest projection of any support component shall be 7'-0" except where operation, maintenance, equipment removal, or other considerations require additional clearance. No supports, however, shall interfere with stairs, passageways, access door, or normal plant activities; nor shall any support component project through platforms, floors, stairs, or walls. Supports shall not utilize other piping systems for attachments or be attached to valve, flange, or equipment bolts. No supports shall be affixed to equipment or piping specialties.

2.7.2 Heating and Ventilation

The Seller shall design and supply the complete heating and ventilation systems for the scrubber vessel atomizer enclosure, reagent preparation building, compressor building and lime silo equipment areas. The design shall be in accordance with ASHRAE, NFPA 90 and SMACNA.

Each heating and ventilation system shall heat and ventilate the enclosures, maintain a uniform temperature throughout the enclosure, and allow all enclosed equipment to operate within normal operating temperature ranges without failure or adverse effects.

The ventilation systems shall be designed to minimize dusting in those areas of the APC system which are near equipment handling dust.

Electric heating shall be used throughout the enclosures and buildings. Electric heaters shall have electric heating elements with built-in thermostats. Heating coils shall be electrically operated. Electric heating equipment shall bear the UL approved label. Heater controls shall have NEMA 12 enclosures (minimum).

2.7.3 Thermal Insulation and Lagging

The Seller shall provide thermal insulation and lagging on all surfaces subject to elevated temperatures during operation, such as scrubber and baghouse- (precipitator) shell, roof, hoppers, etc. and ductwork, and transitions. Hopper

shall be insulated down to purchaser's ash removal equipment. In addition Seller shall provide thermal insulation and lagging for the reverse air fans and I.D. fans (if I.D. fans are in Seller's scope) and the stack breechings up to the stack shell. Fan inlet guide vanes shall be fitted with removable insulation for ease of maintenance. Insulation shall consist of fiberglass or mineral wool blocks of suitable thickness to assure that the cold face temperature does not exceed 120°F at the design summer ambient temperature. Minimum thickness shall be 3 inches.

Insulation shall be provided in spaces between adjoining walk-in plenums. Insulation is also required between adjacent modules of reverse air baghouses. Pulse-jet baghouses designs may insulate between modules or seal this space and provide draft stops at 2 feet intervals. For reverse air baghouses of the structural design, insulation shall be provided on at least one side of all common walls. Lagging connecting the hoppers to the side walls shall be provided so as to avoid up drafts.

The thermal insulation for the system ductwork and equipment shall be designed to maintain the minimum stack entrance temperature (see Attachment 3) under all conditions as shown in Attachment 2. The temperature loss across the baghouse (precipitator) shall be limited to 10°F at minimum ambient conditions.

Lagging shall be suitable for outdoor installation, flush with insulation and consist of minimum 0.04" thick ribbed, aluminum, installed properly and fastened to provide a waterproof envelope for the insulation. Lagging color (manufacturer's standard), texture and profile shall be as specified by the Purchaser to match the facility building siding.

The entire system, from discharge of the economizer to and including the stack breeching inlet shall be considered as an outdoor application unless noted otherwise in Section 4.4.9; and shall be detailed, fabricated, and installed to be completely weatherproof in all respects. In addition, all panels shall be designed to accommodate thermal expansion and be readily removable for inspection and repair of the gas system without extensive dismantling of nonaffected areas.

Insulation material shall be Owens-Corning T.I.W. - Type II or equal with a nominal density of 3 1/2 lb./ft or semi-rigid bonded mineral wool block insulation with a nominal density of 10 lb./ft.

Proper drainage for all horizontal insulation surfaces exposed to the weather shall be provided. A minimum 1/4 in. per foot slope is required for the top of the baghouse or precipitator, outside roof areas of the absorber vessel, tops of rectangular or square ducts, and other flat areas exposed to the weather.

Insulation support steel and panels for the top of the baghouse or precipitator, scrubber vessel, and rectangular or square ducts shall be capable of supporting a 250 lb walking load without permanent deformation or crushing of insulation.

The Seller shall supply all access doors of the baghouse, or precipitator, hoppers, and scrubber vessel with hinged insulated panel doors fitted with bolt or snap latches and designed for frequent use. All other access doors, removable panels and other parts which must be infrequently opened or removed shall be insulated with removable insulation panels.

The Seller shall furnish and install insulation and lagging for piping or equipment for personnel protection when the piping or equipment is located within 8 ft above operating levels, and at or near platforms and walkways or where there exists the possibility of human contact. Cold lines such as cooling and process water will have anti-sweat insulation.

Personnel protection insulation shall be provided to limit temperature to 135°F maximum on outside surface of insulation at the design summer ambient temperature. The Seller shall also furnish and install insulation and lagging for all heat traced pipe and equipment.

2.7.4 Hopper Heaters

The Seller shall provide a hopper heating system for the scrubber and baghouse or precipitator hoppers that ensures a minimum temperature, equal to the flue gas temperature, maintained at the hopper walls.

The heaters shall be designed to supply a start-up temperature rise to 150°F above an ambient of 70°F in 8 hours. The design safety factor shall be 10 percent. The heaters shall be concentrated on the bottom third of the hopper height, heaters shall also be provided on any transition pieces or chutework beneath the hopper. For heat loss calculations, the entire hopper area shall be considered.

Strip heaters or tape shall be used on the bottom of scrubber and particulate removal hoppers to compensate for heat sink losses at the outlet (throat) poke holes, strike plate, etc. Each heater shall be supplied with high temperature insulated cold leads long enough to reach terminal boxes mounted on two opposite corners of the hoppers. All heater connections, both parallel and series, shall be made inside these terminal boxes.

The heaters for the hopper walls and other flat surfaces shall be of the metal-clad "Module" low watt density type to be mounted directly to the hopper wall between the stiffeners with a minimum of two weld studs. Modules shall be sized to cover the maximum area of the section being heated.

Hopper heating shall be individually controlled (per hopper). Two temperature sensors per hopper shall be supplied. One RTD shall be used as a spare with its leads brought out a minimum of 12 inches to a terminal box. Both temperature sensors shall be mounted on the hopper surface. The sensors shall be located in the lower section of the hopper approximately 12 inches from the throat.

The heaters and temperature sensors shall be resistant to natural and induced vibration plus shock loading that will be encountered in normal operation.

Open areas between the ends of adjacent stiffeners shall be closed off to prevent any vertical or "chimney" heat losses. Insulation shall not touch heaters except at "cold ends." The contactors, circuit protection, appropriate switches, and relays shall be supplied by the Seller.

2.8 Structural Requirements

2.8.1 General

The Seller shall furnish the Purchaser with a comprehensive load diagram for use in the design of all support foundations including I.D. fan, if furnished by Seller. The load diagram shall be stamped by Seller's Professional Engineer registered in state where work is performed and shall contain support loads for each load combination. The diagram shall also contain any special requirements that need to be accounted for in the foundation design, such as component weights and centers of gravity for each loading condition, clearance requirements, pier size restrictions, in addition to base plate sizes, anchor bolt diameters, locations, projections and all that is necessary to complete foundation design.

Seller shall supply design loads and other data as required for the inlet duct which may be supported off boiler building steel. Seller shall also provide the Purchaser with reasonable, allowable settlements of foundations and tolerances of alignments acceptable for the performance of Seller's equipment. OMS foundation design criteria is one inch total settlement and 3/4 inch differential settlement.

2.8.2 Design Loads

Design loads shall conform to Governing codes and regulations, as applicable, and the additional requirements herein. The APC system equipment shall be self-supporting above Purchaser's foundations and designed structurally for the following load conditions:

1. Dead Loads (DL)

Dead load shall consist of the weight of all permanent construction including, but not limited to, fixed equipment (including Purchaser's ash conveying equipment), framing, piping, floors, walls, roofs, partitions, insulation, stairs, handrail, ductwork, siding, Purchaser's and Seller's cable trays, electrical raceways, enclosures/boxes, lighting fixtures and other structures.

2. Live Loads (LL)

Live load shall be considered as loading not permanently fixed to the structure and occurring over areas not occupied by equipment. Actual equipment loads shall be used whenever they exceed the live load specified for that area.

Equipment laydown loads shall be considered as live loads. However, no live load reduction will be permitted in areas where laydown loads are considered. Live load for ash buildup in the scrubber inlet ducts shall be 200 pounds per square foot; 100 pounds per square foot for all other ducts.

The following table is a guide to the minimum live loads required for the APC system and its related structures.

<u>Location</u>	<u>Live Load (psf)</u>
Roofs and Casing	
Access Prevented	30*
Access not Prevented	100
Access Floors	125
Stairs	100**
Walkways & Misc Platforms	100
Heavy Storage Areas	250

* or snow load (when applicable) which ever is higher.

** Fixed stairways shall be designed and constructed to carry a load of 5 times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of 1,000 pounds (OSHA 1910.25).

3. Wind Loads (WL)

Wind pressures and shape factors to be applied to all APC system components and exposed equipment and structures shall be determined in accordance with the applicable building code. Allowance shall not be made for the effect of shielding by other structures.

Ideally, the overturning moment calculated from wind pressure shall not exceed two-thirds of the dead load resisting moment. The uplift forces calculated from the wind pressure shall not exceed two-thirds of the resisting dead loads. However, for overall design economy, the dead load of foundations may be utilized (in whole or in part) provided the foundation system is not penalized. Vendor is to identify his requirements (with proposal) for OMS review and approval.

For determining stresses, all vertical design loads, except roof live loads and monorail loads (both vertical and horizontal), shall be considered to be acting simultaneously with the wind pressure. All allowable stresses shall be increased by one-third when wind or seismic loads are included.

4. Seismic Loads (SL)

All structures shall be designed for lateral and vertical forces for the applicable seismic zone in accordance with the requirements and procedures set forth in the applicable building code. The lateral load resisting system will be braced frames.

Individual pieces of mechanical equipment shall not require seismic design (except in Seismic Zones 3 and 4) other than their support and anchorages. The design of the structures, equipment anchorages, and supports shall be adequate to prevent overturning, displacement, and

dislocation. Piping and ductwork shall be investigated to determine whether stops or other restraints are required for seismic design loading.

Earthquake forces shall be assumed to act at right angles to only one face of the structure at a time for rectangular structures.

5. Thermal and Shrinkage Loads (TL)

The APC system shall be designed with due consideration to the loads forces and effects due to contraction or expansion resulting from temperature changes, shrinkage, moisture changes, creep in component materials, or combinations thereof.

6. Combination of Loads

The design of the APC system shall consider the combination of loads listed in the applicable building code.

2.8.3 Structural Material Standards

Structural Steel shall conform to the requirements of the attached specification SS-410. Preparation and painting shall conform to the requirements of specification SA-550. Gasket material shall comply with ASTM F104.

2.8.4 Structural Steel

The Seller's work includes designing, furnishing, detailing, fabricating, shop priming, transporting, delivering, handling and erecting all the structural steel and platework required for the APC system ductwork, scrubber vessel, baghouse or precipitator, reagent preparation equipment, control room enclosure and other equipment.

The attached OMS Specification SS-410 and State/local building Codes, are hereby incorporated in this Specification and shall apply except as otherwise specified or required.

The Seller shall correct any errors caused by faulty fabrication or detailing at no cost to the Purchaser. The Purchaser and the Seller's Registered Professional Engineer will approve all methods employed to correct errors.

The structural steel includes:

1. The complete structural steel framing and bracing systems above the Purchaser's foundation level (which is approximately 6" above finished grade) to support Seller's equipment. Seller to coordinate bracing design to avoid Purchaser's screw conveyors.
2. Galvanized grating, complete with primed plate, angle curbs, railings, toe plate, banding, sleeves & stiffeners.
3. Stairways including stringers, stair treads, handrail, landings, hangers, and bracing. Treads with non-skid nosing & connecting clips.

angles. All stair treads and platform grating shall be serrated when located outdoors in northern climates where ice and snow accumulation can occur.

4. Structural steel for equipment, pipe supports and duct supports.
5. Ladders, safety cages, top hoops, guides, supports and self-closing safety gates.
6. All lifting beams attached to steel framing.
7. All miscellaneous steel framing, platforms, and pipe supports, including clips and angles for attachment to plates or embedded items.
8. Miscellaneous plates including raised pattern plates, flashing, and plates attached to or welded to structural steel framing.
9. All base plates for columns or posts and shim plates.
10. Bolts, washers, nuts, and direct tension indicators, where applicable, for all shop and field connections.
11. Shop weld.
12. Shop priming or galvanizing where required as indicated on drawings and specified herein.
13. Temporary steel that may be required for erection purposes.
14. Support brackets for Purchaser's cable trays and screw conveyors.
15. Pre-engineered enclosure for electrical and mechanical items.

Full provision shall be made so that each component can expand and contract under the operating cycle of temperatures without damage to itself or to any adjoining component, and without the leakage of any gas outward or of air inward. Expansion joints, guides, braces, stiffeners, etc., shall be provided as required so that this thermal movement can be accommodated in a conservative, properly engineered, trouble-free manner, without deleterious side effects.

All structural components shall be stiffened and braced in such a manner as to prevent detrimental distortion, deformation or an objectionable level of vibration. Stress analysis shall consider the most severe load combinations which could result from the above listed loadings acting with the loads imposed by all component equipment, platforms, ladders, and other attachments, including the loads and forces imposed thereon.

Arrangement of vertical bracing for precipitator or baghouse structure should allow passage under the structure. K-brace is preferred in lieu of X-brace. Bracing design shall accommodate purchaser's screw conveyors.

Structures, equipment, buildings, weather enclosures and the top surface of horizontal ducts shall be designed so that the surfaces are self-draining.

The noncumulative tolerances of linear dimensions for terminal flanges and load supports shall be as follows:

Dimensions 10 ft or less: 1/8 in.

Dimensions greater than 10 ft: 1/4 in.

All paint priming of structural steel shall follow the requirements of Specification SA-550.

2.8.5 Access Platforms, Ladders, and Stairways

The APC system design shall include adequate access to all equipment requiring maintenance and/or inspection.

Areas accessible by personnel shall be designed according to the applicable building code and OSHA standards.

2.8.6 Railing and Grating

All railing shall be constructed of 1 1/4" diameter schedule 40 pipe (OSHA approved). Handrail shall be designed in accordance with the applicable building code and OSHA standards (check codes for 2 or 3 rail system). Posts shall be spaced a maximum of 8 feet on center. It shall be the responsibility of the Seller to determine the required spacing of rails and point load requirements.

All pieces cut for piping or equipment shall be banded where the opening is more than 8 inches in diameter or more than 50 sq. inch in area. Banding strips shall project 4 inches above the top of the grating to form a curb and be at least the same thickness as the bearing bars to which they are welded.

Stair treads shall be the same construction as the floor grating. Standard treads shall not be less than 9-3/4 inches wide. The Seller shall provide special sized treads where they may occur, or otherwise be necessary due to interferences, notably at the top tread of certain runs.

Treads shall not have kick plates. Standard supporting clips shall be provided at each end of stair treads for mounting to the stair stringers with two 3/8 inch diameter bolts.

Cast 1-1/4 inch abrasive nosings shall be fastened to all stair treads and to grating at main floors or landings at the head of all descending stair runs.

2.8.7 Siding and Roofing

Siding will be furnished by the Seller. Siding shall be same as the lagging on the insulated baghouse or precipitator. The siding shall be insulated to provide a U-value not to exceed 0.14. The exterior metal panel shall match in color, pattern and texture with the balance of plant buildings. Coating shall be factory applied synthetic coating.

Roofing type shall be determined by Seller for best response to need. All roofing shall be by one manufacturer.

2.9 Electrical Requirements

2.9.1 General

The electrical system shall meet all applicable NEMA, IEEE and ANSI standards and shall be in full compliance with the latest issue of the National Electrical Code and the National Electric Safety Code.

The installed electrical system shall meet the requirements of Purchaser's technical specification for Electrical Installation, SE-213.

Equipment to be supplied by Seller shall include but not necessarily be limited to the following major items per flue gas train:

- 480 Volt Power Switchgear
- 480 Volt Motor Control Centers (including current limiting reactors)
- Control Panels
- Motors
- Grounding System (above grade)
- Cable Tray and Conduit
- Wire and Cable
- Interior Lighting System, 480V Power receptacles and 120V convenience outlets
- Heat tracing

Seller shall provide clear access and working space around control panels, starters and disconnect switches in accordance with Article 110-16 of the NEC. In no case shall the minimum clear distance be less than 3 feet for 0-150 volt enclosed equipment and 3 1/2 feet for 151-600 volt enclosed equipment. The minimum width of the working space shall not be less than 30 inches. Electrical equipment, raceway, devices and support shall not block or obstruct access to screw conveyors, access doors, platforms, instrumentation, etc.

The Purchaser will furnish, install, and connect one 480 volt, 3 phase, 3 wire power feed per flue gas train to the Seller furnished equipment. The mechanical design philosophy is that no single equipment failure will shut down more than one APC train. The design of the electrical distribution system shall be consistent in that the loss of a single feeder shall not affect more than one APC train. Seller shall state in his proposal the maximum demand kW and KVA of each feeder. Purchaser will furnish, install and connect one 125V DC feeder for the annunciator. Seller shall state the demand kW of the DC feeder.

Seller's system must be capable of safe shutdown during a complete loss of AC power. If Seller proposes to use DC power to accomplish this, all loads must be clearly identified in the proposal. A typical one line is shown on Attachment 4. The information shown is typical for each train. Common equipment shall be capable of being manually transferred to an alternate source of power.

All control and instrumentation wires requiring remote connection to the control panel in the plant main control room shall be terminated by Seller at the Seller's junction box and/or control cabinet (Ref. Attachment 10) located in the APC system building (provided by Seller) at ground elevation.

2.9.2 Induction Motors

All motors shall conform to Purchaser's Induction Motor Specification SE-211. An Induction Motor Data Sheet (Attachment No. 1 to Specification SE-211) shall be completed and submitted to the Purchaser for each motor supplied. Motors 100 hp and above shall be supplied from a 480V power switchgear circuit breaker.

It is the Purchaser's strong preference that all motors be limited to 200 HP, 460V. If the Seller's equipment requires larger motors the Seller shall, prior to submitting the proposal, obtain guidance concerning allowable motor size, voltage level, and power feed from the Purchaser. All motors at voltages greater, than 460V must be 4000V and comply with the Purchaser's Specification SE-212, Squirrel Cage Induction Motors, 2000V and above.

2.9.3 480V Power Switchgear (if required)

Each low voltage switchgear section shall consist of one metal enclosed indoor switchgear assembly, drawout type, rated 600V AC and arranged for 480V three-phase, three wire as indicated in Attachment No. 4. It shall be designed, factory assembled, and tested in accordance with the latest applicable IEEE, NEMA, and ANSI Standards.

The switchgear shall consist of sufficient vertical dead front steel structures to house the required number of circuit breakers with a minimum number of empty spaces remaining. Each individual frame shall be divided into a front breaker compartment, a bus compartment and a rear cable compartment. The bus compartment shall be located between the front enclosure and a cable compartment. It shall contain main horizontal bus and bus supports. The bus compartment shall be completely isolated from the other two compartments by barriers. The cable compartment shall be completely isolated from the bus compartment and adjacent units by means of removable barriers.

Field adjustable cable supports shall be provided in the cable compartment for all power cables.

Access to breaker and auxiliary compartments shall be provided by hinged front doors of formed steel construction. Access to rear compartments shall be provided by removable bolted steel covers.

Main bus shall extend through all units of the switchgear with bus interconnections to the circuit breakers in each individual unit. The bus material shall be copper with tin or silver plated joints and of the same current rating as the main circuit breaker when a main breaker is required. It shall be braced to withstand the stresses resulting from the maximum short-circuit current available. The minimum bracing shall be 50,000 amperes symmetrical unless otherwise specified. The bus shall be complete and all hardware for joining shipping splits shall be furnished by the Seller, with assembly procedures and torque values to be used for tightening bolts.

A copper ground bus, minimum size 1/4 inch by 2 inches, shall be furnished over the full length of the switchgear, bolted or brazed to the framework of each vertical section. Compression type terminals shall be furnished at each end for 4/0 AWG copper grounding cable.

Each power circuit breaker shall be 600 volt Class, 3-pole, air break, draw-out type with stored energy operating mechanism. The power circuit breakers shall be manually or electrically operated and be furnished with solid state trip devices having trip elements as stated in Attachment No. 4. Trip indication lights or targets on solid state trip devices shall be furnished.

The draw out mechanism shall hold the circuit breaker rigidly in connected, test, disconnect, and fully withdrawn position. The draw out mechanism shall be operated externally by a removable handle. The removable handle shall engage the rack out mechanism through an opening in the breaker.

Electrically operated breakers, if required, shall be equipped with an electric motor to charge the stored energy mechanism and be provided with one pushbutton for tripping the breaker. After the circuit breaker is closed, the motor shall charge the closing springs for subsequent operation of breaker. It shall be possible to manually charge the stored energy mechanism in the event the control power is lost, and manually close and trip facilities shall be provided. The electrically operated breakers shall be suitable for operating from the Purchaser's control voltage source which can vary between 70-140V DC.

When the circuit breaker is in the test position, control circuits shall permit local operation of the breaker. Circuits for remote operation and indication of the breaker shall be disconnected when the breaker is in the test and disconnect position.

Manually operated breakers shall be spring charged and closed by the operation of an insulated handle and be furnished with a manual trip button for tripping the breaker.

The circuit breaker shall be furnished with mechanical indicators for:

1. Positive indication of breaker open or closed position.
2. Breaker closing spring charged or discharged status.
3. Positive indication of breaker position i.e. connected, test or disconnect.

Each breaker shall have provision for padlocking in disconnect position.

Each circuit breaker element shall be provided with a minimum of 4 normally open and 4 normally closed auxiliary switches for Purchaser use.

Electrically operated breakers used for motor feeders shall be provided with an Overcurrent Trip Switch (OTS). The OTS shall operate only when the breaker is tripped on an overcurrent or fault condition. A reset pushbutton on breaker face plate shall be provided. The OTS shall have two independent normally closed and two independent normally open contacts for breaker interlocking and alarm purposes wired to accessible terminal points.

Terminal blocks shall be barrier type with a marker strip down the center and shall be suitable for ring-tongue terminal lugs. All terminal blocks shall be readily accessible. At least 20% spare terminals shall be provided.

All switchgear assemblies shall be furnished completely wired. All alarm and control wiring shall terminate at terminal blocks.

All spare auxiliary switches shall be connected to terminal blocks.

All secondary control circuit wiring shall be not smaller than No. 14AWG. PT circuit wiring shall not be smaller than No. 12AWG and CT circuit wiring shall not be smaller than No. 10AWG. The control wire shall be flexible, stranded, tinned-copper, Type SIS, VW-1 rated, 600V rated.

All fuse blocks for secondary circuits shall be pullout block type. Trip and close circuits shall be fused separately in each compartment. Fuses shall be nonrenewable type and shall be furnished by the vendor. Fuse size shall be 30 Amp. minimum for trip circuit.

Connections between shipping sections shall be arranged to require a minimum of field wiring. Terminal blocks shall be provided on one side of a shipping break and coiled wires, property tagged, shall be provided on the other section to facilitate these connections.

Terminal lugs for the Purchaser's external power, and grounding cables shall be furnished by the Seller. The lugs shall be Burndy YA, two hole, compression type.

Wiring splices of any type will not be accepted. Both ends of all internal wires shall be identified by preprinted plastic sleeves. Wire leads shall be terminated using indent compression type ring-tongue lugs.

The following maintenance accessories shall be furnished:

1. One breaker levering crank for each switchgear.
2. One manual spring charging lever for each switchgear.
3. One solid state trip device test and calibration unit per purchase order. It shall be suitable for operation from a 120V AC 1 phase, 60 Hz power supply. Device shall be suitable for each type of breaker furnished.
4. One travelling type circuit breaker lifting device with rail mounted on top of switchgear.

Low voltage switchgear shall be tested in accordance with requirements and procedures of the applicable standards with any additional inspection and tests which may be required to insure that all devices are correctly wired and that all equipment are in satisfactory operating condition.

Each circuit shall be given a continuity test.

All power and control wiring shall be given a voltage test for one minute at a minimum of 1,500 volts.

After fabrication, all metal work shall be thoroughly cleaned, given a bonderizing or equivalent treatment, and immediately prime coated with a rust-resistant paint. The prime coated surfaces shall be given two finish coats

of ANSI No. 61 gray paint for indoor equipment. Touch-up paint shall be furnished by the manufacturer and shipped with the low voltage switchgear.

Nameplates shall be provided for each circuit breaker. Each nameplate shall be laminated plastic 3/32 inch minimum thickness, 1 inch high and 3 inches wide. The plate shall be white with 3/16 inch high engraved black lettering. All four front edges shall have a 1/16 inches bevel. Each nameplate shall be fastened to the compartment door with two stainless steel self-tapping screws. Nameplate inscriptions will be specified by the Purchaser. In addition, a nameplate shall be provided for each unit substation of the same material and construction except that the lettering shall be 1/2 inch high.

Laminated plastic nameplates, legible from floor level, shall be provided for all enclosures and control items such as meters, relays, switches, fuses, etc.

2.9.4 Motor Control Centers

Motor control centers shall be totally enclosed, free-standing, cabinet-type structures with copper main and vertical buses, combination motor starters, circuit breaker switches and other equipment as required. The systems fault current shall be limited to 22,000 amp symmetrical. This shall be accomplished by incorporating current limiting reactors into the Motor Control Centers.

Base pricing shall include current limiting reactors. An optional deduct price for eliminating the reactors shall be listed in the proposal. Purchaser will decide at the time one line diagrams are submitted for approval if the reactor will be required.

The motor control centers shall comply with SE-205.

Note that motor circuit protectors are not acceptable. All 480V motors, including motors supplied with subvendor systems such as the lime handling equipment, shall be fed directly from a Motor Control Center in the Seller's electrical building.

2.9.5 Grounding

The Seller's grounding system shall consist of the above-ground connections to the Purchaser's below-grade ground loop that will provide a network to which all equipment and metallic structures shall be connected, either directly or by interconnecting cables.

Purchaser will provide pigtailed from the below grade ground loop for connection to building steel at alternate structural columns. Seller shall connect these pigtailed to building steel at grade elevation. Equipment ground conductors shall be in strict compliance with the NEC and OMS specification SE-213. All ground connectors shall be UL approved.

2.9.6 Cable Trays

Cable trays may be used for raceways where practical and consistent with the provisions herein and in compliance with the NEC. Cable tray materials and installation shall be in accordance with SE-213.

Where installed in trays, low voltage power cables, control cables and instrumentation cables shall be run in separate cable trays. Control cables may be run in the same tray as the low voltage power cables provided they are separated by a continuous barrier to prevent mixing.

Trays for cables of different voltage levels shall be stacked in descending order with the highest voltage at the top.

2.9.7 Conduit

Conduit shall be as specified in SE-213

2.9.8 Wire and Cable

All cable shall be in accordance with OMS specification SE-210, "Power, Control & Instrumentation Cable".

Power cables for 480 volt service shall be rated 600 volts with individual round stranded copper conductors and shall be three conductor for sizes smaller than 250 MCM, and single conductor for sizes 250 MCM and larger. Three conductor power cables shall include a ground conductor sized in accordance with the NEC.

Control cable shall be multi-conductor and rated 600 volts with individual round stranded copper conductors. Multi-conductor control cables shall be selected so as to result in as few conductor combination as practical.

Ampacities and conductor sizes shall be based on the following:

1. Ampacities shall be determined in accordance with the NEC.
2. Voltage drop in feeder cables between bus and load shall not exceed 3 percent of rated voltage during rated operation of auxiliaries.
3. Control cables shall be No. 14 AWG minimum. Larger sizes shall be used if required for voltage drop considerations.
4. Cables for CT runs shall be No. 10 AWG minimum.
5. The full load current for transformers shall be determined from the KVA corresponding to their highest allowable continuous temperature rise.

Acceptable cable manufacturers and installation requirements shall be in accordance with SE-213.

2.9.9 Heat Tracing

All equipment, piping and instrumentation that is subject to freezing shall be protected with electric heat tracing. Termination of heat tracing on pipes shall extend a minimum of two feet into the heated enclosure. Heat tracing, installation and material requirements shall be in accordance with SE-213 and SE-209. Information identified in SE-209 to be provided by Purchaser shall be developed by Seller & provided to the heat tracing sub-vendor.

2.9.10 Installation Design Drawings

Seller shall furnish design drawings for the entire electrical installation. As a minimum, the drawings shall include a one line diagram, selective coordination curves, logic diagrams, control wiring diagrams comprised of schematic, elementary, internal and interconnection wiring diagrams for all power, control and instrumentation devices (including heating and ventilation), all conduit and cable tray routing drawings, grounding drawings, lighting drawing, and cable and conduit schedules.

Diagrams shall be complete system oriented, making it a complete self-explanatory system. The interconnection diagrams shall show the wiring from panel to panel or from panel to each remote point and shall include cable and wire numbers, conductor color coding and connections to terminal blocks.

Drawings for installation design shall be at least a quarter inch to the foot. Dimensions or undimensioned details not to scale shall be clearly identified as such.

The drawings shall be of sufficient scope and detail to permit checking of design by Purchaser. The design shall provide accessibility for maintenance work and for future additions; and ease of field connections.

2.10 Controls and Instrumentation Requirements

2.10.1 General

The Seller shall be responsible for the design, specification, purchase, installation and start-up of a complete system capable of automatically controlling the APC system. The operation of the system shall be from the Purchaser's main control room in accordance with the configuration selected in Section 4.4.10.2 and as described throughout section 2.10.

If the Seller determines that local panels are also required to support remote operation and start-up of the APC system, they shall be provided as required. However, continued APC system operation shall not be dependent on operators manning these local panels.

All elements of the APC control system shall be suitable for the plant operating environment. Suitable vibration suppression mountings complete with all hardware and fastening devices shall be provided, if required, to ensure that the elements are substantially isolated and that normal operation and life expectancy of the elements will not be adversely affected by vibration. However, seismic integrity of the equipment shall not be compromised.

2.10.2 APC Control System Functional Requirements

The system shall function automatically over the entire range of the operating conditions specified in Attachment 2 including startup and shutdown of the scrubber module.

The boiler draft control system, furnished by others, will control the I.D. fan inlet vanes in order to maintain a constant draft in the boiler. The Seller's controls shall be capable of maintaining stable APC system operation under these potential gas flow variations.

The system shall include automatic control of the lime feeding and slaking system in order to provide the proper lime slurry concentration to the atomizers and maintain the acid gas removal setpoint. The lime slakers shall provide a slurry of fixed concentration and store it in a lime slurry storage tank. Lime slurry from this tank will be further diluted with water to meet the requirements of each scrubber. Systems utilizing mix/head tanks for dilution shall be sized for a minimum residence time (ref. sect. 2.2.4.4).

Automatic control of stack SO₂ and HCl concentrations at a given setpoint over all operating conditions listed in Attachment 2 and load changes shall be provided for each APC train. The lime feed rate shall be regulated in proportion to the acid gas loading at the stack using as feed forward signals flue gas flow and/or inlet SO₂ concentration, as required. The Purchaser shall provide 4-20 MA signals for the variables specified by the Seller in Section 7.2, Item M of Attachment 7. The inlet and outlet SO₂ signals will be as described in section 4.4.14. The SO₂ signals will be corrected to 7% O₂ (or 12% CO₂).

The measurement of temperature at the scrubber vessel inlet and outlet ductwork shall be accomplished by using a minimum of three thermocouples at each measurement point for averaging or median selection. The automatic temperature controls shall protect the baghouse during load changes and trips from high and low temperature excursions. The outlet temperature of the scrubber vessel shall be automatically controlled to within 5-F of the setpoint.

Reset windup on loss of slurry or water source shall be eliminated in order to prevent overshooting on restart of these sources.

Pressure and temperature before (same location as CEM and Test ports) and after the scrubber and at the I.D. fan inlet (i.e.-same location as the test ports requested in Section 4.4.5) and pressure drop across the baghouse shall be measured and continuously recorded in the main control room either on a strip chart recorder or accessible via a CRT, as applicable. Pressure drop across each baghouse module shall be locally indicated. Pump discharge pressure shall be locally indicated.

The baghouse controls shall automatically cycle the compartments and control damper operating speeds to allow for cleaning without sudden pressure changes to allow for smooth ID fan operation.

The baghouse controls should provide capability to vary both the cleaning sequence and the cleaning time for each compartment to account for: (1) other compartments out of service, (2) the possibility of some compartments collecting more particulate than others because of inlet duct/compartments arrangement, and (3) on line cleaning of pulse-jet units.

Bag cleaning controls for initiating and monitoring the cleaning cycle, shall be furnished as required (see Paragraph 2.3.3 for the cleaning cycle requirements). The cleaning time, reverse gas time, dwell, settle and stage time, the overall pressure drop required to initiate the cleaning cycle, and the time interval which initiates the cleaning cycle even if the necessary pressure drop has not been reached, shall all be adjustable inputs to the bag cleaning control scheme. It shall not be necessary to re-configure the PLC or the DCS in order to change any of these adjustable inputs. A manual initiator shall also be provided at the main control room which will allow actuating a cleaning cycle at any time.

The scrubber and baghouse (precipitator) ash hoppers shall be equipped with automatically controlled electric heaters. The vibrators on ash hoppers shall operate under an automatic on/off sequence; both on and off time intervals shall be field adjustable within 1 to 10 minutes. It shall not be required to re-configure the PLC in order to adjust the timers. The vibrator's operation on a hopper shall be interlocked with the downstream screw conveyor (or dump valve) running. Purchaser will provide one dry contact for this purpose.

Unless otherwise required by conditions of attachment 9 the baghouse shall automatically go into bypass mode, under a de-energized condition, on:

1. high baghouse inlet temperature
2. low baghouse inlet temperature
3. loss of scrubber slurry
4. high baghouse pressure drop
5. loss of power
6. loss of control air
7. I.D. fan trip (signal from purchaser)

All abnormal conditions shall be alarmed as they occur. The following types of alarm shall be provided:

1. Process alarms for process variables out of limits.
2. Trouble alarms for systems malfunction.
3. Equipment trip and/or failure to start alarms.

2.10.3 Control System

2.10.3.1 Single Loop Controller for the Plant Control System

The analog control system shall consist of individual control loops utilizing two wires, 4-20 ma transmitters and dedicated control algorithms for each control loop programmed into a programmable logic controller (PLC). Shared algorithms are not acceptable. The digital control system shall use the same PLC used for the analog control loops. System capacity, in terms of I/O and memory, shall provide for 20% expansion capability at a future date. One PLC per APC train shall be provided. PLC's shall be mounted in Seller's control cubicles for installation in Seller's electrical room (not in Purchaser's main control room).

The operator's interface with the APC control system will be thru a CRT system provided by the Seller (ref. attachment A10-1.) The CRT system shall meet the following requirements:

1. CRT's shall be at least 19 inch diagonal, include at least 8 selectable colors and have a resolution of at least 648 by 480 pixels.

2. Operator's input device shall be a keyboard. Touch screen CRT's are also acceptable. Any operator action either for screen access or equipment operations shall be executed in a direct and simple manner (e.g., using function keys). Provision shall be made to prevent inadvertent operation through accidental keystroke.
3. Two sets of CRT's with electronics and key board, redundant to each other, shall be provided. Any CRT set shall be capable of total control of the system, although each CRT set may be dedicated for a particular function during normal operation. Failure of one CRT set shall not inhibit, in any way, operation from another.
4. CRT's shall display actual process information without significant delay (less than 2 sec.). Any operator action shall be executed in less than one second. Display background information shall come up rapidly (less than one second).
5. CRT's shall have the following display formats: overview, group (or faceplate), point detail, trend, and process graphic. Process graphics shall be interactive reflecting actual on-line conditions.
6. All variables which otherwise were recorded on pen or multipoint recorders shall be trended on the CRT. It shall be possible to select any multiple process points for simultaneous trending and comparison on the CRT.
7. CRT electronics shall be capable of performing historical data storage and retrieval. The historical data shall be downloaded on a removable magnetic media for long time storage. The operator shall be alerted when a downloading is needed, so that previously stored data is not lost. It shall be possible to recall and view data points presently being stored or to reload pre-recorded points and to similarly view them.
8. CRT shall perform the communicator function of alarm displaying and listing. Means of rapid access to the CRT display page showing details of the alarm shall be provided.
9. One high speed printer shall be provided. The operator shall have the capability to direct data to the printer from either of the two CRT consoles.
10. CRT, printer, and keyboard shall be provided mounted in a console. Console configuration and color shall match Purchaser's control room layout. Purchaser shall approve console design.

2.10.3.2 Distributed Control for the Plant Control System

Both analog and digital controls shall use a Bailey network 90 DCS unit. The analog control loops shall use two wires, 4-20MA transmitters. The configuration (programming) of the Bailey DCS unit will be the Seller's responsibility in cooperation with Bailey. The seller's DCS unit will then be integrated with the purchaser's balance of plant DCS system by becoming a "drop on the purchaser's data highway (ref. Attachment A10-2).

One Bailey DCS unit per APC train shall be provided, and each DCS unit shall have redundant multifunction controllers (MFC); the I/O supporting hardware need not be redundant. System capacity, in terms of I/O, memory and power supply, shall provide for 20% expansion capability at a future date.

Seller, in cooperation with Bailey, shall provide the CRT graphics required for total system control and monitoring from the plant DCS CRT stations (by purchaser). Graphics shall be in the form of files ready to run on the purchaser's operators console (Bailey's MCS).

Option:

If requested in section 4.4.10.3, Seller shall provide an option for a PLC based control system in-lieu of a Bailey DCS (ref. Attachment A10-3).

The analog control system shall consist of individual control loops utilizing two wires, 4-20 ma transmitters and dedicated control algorithms for each control loop programmed into a programmable logic controller (PLC). Shared algorithms are not acceptable. The digital control system shall use the same PLC used for the analog control loops. System capacity, in terms of I/O and memory, shall provide for 20% expansion capability at a future date. One PLC per APC train shall be provided. PLC's shall be mounted in Seller's control cubicles for installation in Seller's electrical room (not in Purchaser's main control room).

Operator's interface with the APC control system will be through the plant distributed control system (Ref. Attachment 10, Page A10-3). A serial RS232 interface and a modem shall be provided for each PLC. Only control action with status feedback and data acquisition functions will be exercised over this serial link. Seller shall provide means of testing and starting up his system (to the point where the APC system is turned over to the purchaser) without the DCS, on a temporary basis. Permanent operation of the APC system without the DCS is not required.

Seller shall also provide CRT graphics (in the form of sketches) needed to interface his control system through the DCS, and the I/O signal list (with addresses of read and write PLC registers) required to support their graphics.

2.10.3.3 Field Wiring

The field wiring shall not connect directly to the Programmable Controller (PC) terminals. The PC terminals shall be wired to terminal blocks capable of connecting 600V, 12 AWG wire with ring tongue connectors; provisions shall be made for adding future terminal points to wire the added I/O. All inputs and outputs shall be isolated from the external devices; suitable isolating devices shall be provided by Seller.

2.10.4 Local Control Panels

If required, the local control panel(s) shall be vertical, and fabricated of hot rolled steel. The panels shall be suitably reinforced to provide sturdy, freestanding, rigid units. The panel shall be arranged for floor mounting with bottom cable entry.

The panel shall be totally enclosed NEMA 4 if in process areas or outside buildings, NEMA 12 in all other areas.

Internal fluorescent lighting and 120V, 20 amp utility receptacles for full height enclosed panels shall be provided.

2.10.5 Annunciator

Solid state annunciator shall be furnished in conjunction with a main control panel to provide visual and audible alarms for abnormal process conditions as specified in Purchaser's Technical Specification SC-317 Annunciator.

2.10.6 Local Instrumentation and Controls

All local instruments shall be fitted with a 1" x 2" x 1/16" stainless steel tag with instrument tag number stamped on it.

2.10.6.1 Transmitters

Transmitters shall be a 4-20 ma DC, two wire, solid state type, with plug in circuit board, external zero and span adjustments, and a minimum accuracy of $\pm 0.5\%$ of range.

Transmitters utilized for measuring differential pressure, flow, and level shall be furnished with a preassembled five way valve manifold suitable for mounting directly on the transmitter. Each transmitter shall have an integral junction box with terminal strip, integral test jacks, and conduit connection, and shall be complete with all mounting accessories.

When transmitters are required to provide multiple outputs to recorders, indicators, etc, as well as providing an input to the control system, the circuit shall be arranged so that disconnecting an input to a recorder, indicator, etc, shall not cause an upset in the control system, or a change in transmitter calibration.

Thermocouple converters shall have a minimum input resistance of 1 MOHM, input/output isolation, reference junction compensation, and zero and span adjustments with span suppression and elevation. The phasing (direction) of the thermocouple open circuit response shall be selectable in the field and preset at the factory for the fail safe direction.

2.10.6.2 Control Valves

Generally, control valves for throttling service shall be globe type for air and clean water with pneumatic diaphragm actuator and current to pneumatic positioners. The use of throttling control valves in slurry lines is not desired and shall be minimized; if required, the Clarkson Series C (Iris pinch type) or Fujican shall be used.

Control valves for on/off service may be of the plug knife gate or pinch type for slurry service and shall have diaphragm or pneumatic piston actuators.

Throttling control valves in slurry service shall be designed for a maximum turndown of 5 to 1 and a maximum velocity of 20 feet per second.

The materials of construction, specifically the wetted parts shall be chosen to provide the least maintenance and maximum reliability. Nitriding treatment of an surface exposed to the working fluid is not acceptable.

Generally, all valves in non-slurry service shall have welded ends. Valves in slurry service shall be flanged. Seller must also meet the requirements of Section 2.2.4.8.

Pulse-jet air pressure regulating valves shall be furnished for each train.

2.10.6.3 Air-Operated Actuators and Devices

Devices requiring air supplies of less than 90 psi shall be supplied with a filter regulator air set mounted and tubed on the device. Air sets shall consist of a combination air filter, pressure regulator, and integral relief valve and output gage. Connections shall be 1/4 inch minimum or more if required for speed of response of the device being supplied. Oilers shall be supplied, if needed.

2.10.6.4 Thermocouples

Iron constantan grounded type "J" thermocouples with magnesium oxide stainless steel sheathing shall be used. Thermowells shall be provided in all fluid system applications in order to facilitate thermocouple maintenance.

Thermocouple limits of error shall conform to National Bureau of Standards. (Where such accuracy is not satisfactory for the process ungrounded 100 ohm platinum RTDs may be used.)

2.10.6.5 Local Temperature Indicators

Local temperature indication shall be bimetallic type with universal joint and 5 inch diameter dial. Each thermometer shall be supplied with a thermowell.

2.10.6.6 Local Pressure Indicators

Pressure indicators shall be bourdon type, accurate to within 1 percent of span. Dials shall be white with black markings and shall be 4 1/2 inch in diameter. Gage movements shall be stainless steel, geared type. Case shall have a blowout disc in the back. Bourdon tubes used in flue gas service shall not contain copper material. Diaphragm seals shall be provided for services other than clean and non-corrosive fluid applications.

2.10.6.7 Pressure Switches

Switches shall be snap acting type with NEMA 4 cases. All wetted parts shall be stainless steel. Pressure connections shall be 1/2 in FNPT. Alarm and shutdown switch settings shall not be adjustable from outside the housing.

Switch contacts shall have a dual form "C" configuration and shall be rated at 125V AC, 10A resistive, and 125V DC 0.5A resistive. Switch contacts shall be wired to separate terminals. Alarm switches shall open to alarm. Switches used for shutdown and control shall open to cause the desired action.

2.10.6.8 Vibration Monitoring Equipment

When utilized, the vibration monitoring system will house all monitoring channel modules in an enclosure designed for mounting in the Seller's local control panel.

The vibration monitor will include power supplies, relays, and inter- connecting cabling with the following functions:

1. Alarm Functions

A sequence of two lights per point for warning and high vibration.

A third light will be illuminated when the monitoring channel is inoperable.

Warning lights shall have an amber lenses and danger lights red lenses.

Each light shall be identified on the vibration alarm panel, according to the functions, the rotating equipment being monitored and an appropriate unique instrument tag number.

2. Meters

The monitors shall be supplied with analog meters for indication of the level of the signals from the probes. One meter with a selector switch for all channels will be acceptable. The meter scale shall be in units of displacement.

3. Outputs

A 4-20 ma analog output, equivalent to units of displacement, shall be provided for each channel for use as a computer input.

Front of the panel auxiliary outputs shall be provided for each channel to allow monitoring with external equipment.

Two auxiliary form C alarm contacts common to all channels shall be provided at the warning vibration level. All vibration alarms shall be displayed by the Seller in the main control room.

2.11 Welding

All welding, weld, welding procedures and qualifications, and welder qualifications shall be in accordance with AWS D1.1, ANSI B31.1, AWWA D100 (as applicable), and the additional requirements of this specification. Welding procedures and welder qualifications shall be kept on file by the Seller and shall be subject to Purchasers' review upon request.

Drawings which require fabrication by welding shall indicate with symbols the joints to be welded in accordance with AWS A2.4.

As a minimum, all welds shall be visually inspected in accordance with the appropriate fabrication code. Individuals performing nondestructive examinations shall be qualified in accordance with SNT-TC-1A.

2.12 Cleaning, Surface Preparation, and Painting

All cleaning, surface preparation, and painting shall be in accordance with SA-550 and completed in the manufacturer's shop before shipment to the maximum extent practical. All internal and external surfaces of the equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter.

All external ferritic steel surfaces shall be prepared and coated in accordance with this section and SA-550. Surfaces of corrosion resistant materials (i.e. stainless steel or aluminum) shall not be painted or coated with rust preventatives. Machined surfaces, flanges, and other surfaces where the application of a protective coating might interfere with the intended operation shall be coated with readily removable rust preventative such as Tectyl 506G as manufactured by the Ashland Chemical Co. of Ashland, KY, or Purchaser's approved equal.

Field touch-up and finish painting of all uninsulated ferritic steel surfaces is by others.

Surfaces which will be insulated shall not be primed but shall be suitably protected prior to insulation. Surfaces which will be in contact with flue gas shall not be coated. All other surfaces shall be given a single shop primer coat.

2.13 Noise

The design and operation of the APC system and equipment shall meet all local, state and federal OSHA regulations pertaining to the control of noise. The design shall minimize noise levels to safeguard personnel on the site and to prevent noise pollution to the surrounding neighborhood. Interior work areas including the lime preparation and pumping areas, air compressor rooms, electrical rooms and the scrubber penthouse shall be designed to meet the OSHA eight hour unprotected exposure level per paragraph 1910.95. The maximum allowable noise level radiated externally shall be 60 dBA at 50 feet from the APC system.

2.14 Erection Requirements

2.14.1 Scope of Erection

Seller shall install the equipment furnished in accordance with approved drawings and instructions and shall provide all of the materials, labor, supervision, tools and equipment necessary for such work.

Work shall include receiving, unloading, storage, protection, necessary moving from storage, rigging, drilling, doweling, setting, welding, assembly, aligning, cleaning, testing, and any other work necessary to prepare the equipment and accessories, for normal continuous service. The equipment shall be installed in the locations shown on Purchaser approved drawings.

It shall be understood and agreed to by Seller that the work herein described shall be complete in every detail even though every item involved is not specifically mentioned. The Seller shall furnish the necessary field labor and supervision to erect the equipment and material furnished hereunder.

All sections of the scrubber vessel, baghouse or precipitator, and ductwork shall have parallel horizontal mating surfaces and square vertical mating surfaces. All sections shall be square on the mating surfaces and shall not require shimming, jacking, or distortion. Each scrubber vessel mating section shall be shop assembled one to another, securely fastened, match marked, and, for flanged sections, match drilled or punched and dowelled to assure trouble free field assembly and erection. The sections shall then be disassembled and shipped. Shipping braces shall not be used during shop assembly. Field corrections to fabricated mating components that do not mate properly shall be performed by the erection contractor at the Seller's expense (material and labor).

The Seller shall make all connections to Purchaser's economizer outlet, I.D. fan inlet and outlet (if fan is furnished by purchaser), stack inlet and utility and electrical ties and shall coordinate its terminal connection activities with Purchaser's or others erection schedule.

The Seller shall furnish, as required for erection and timely completion of scheduled activities, all cranes, derricks, trucks, rigging, welding machines, stress relieving and preheating apparatus, general tools, hand tools, and special tools for erecting the apparatus specified hereunder. All erection equipment shall remain the property of the Seller, unless otherwise agreed upon, and shall be operated under the Seller's direction. Transportation charges for all erection equipment shall be the responsibility of the Seller.

The Seller shall furnish all consumable, expendable, and minor materials required for the complete erection including, but not limited to, nuts, bolts, welding rod, gaskets, scaffolding, planks, cribbing, slings, and primer.

All work performed shall be in accordance with the applicable requirements of the OSHA safety and health regulation for construction and other codes and standards specified herein.

Hoisting and handling equipment shall be operated and maintained in accordance with the requirements of ANSI B30.2.0, Safety Standard for Overhead and Gantry Cranes, ANSI B30.5, Safety Standard for Crawler, Locomotive and Truck Cranes, ANSI B30.6, Safety Standard for Derricks, and ANSI A10.5, Safety Requirements for Material Hoists.

An inspection program shall be established for equipment and rigging.

2.14.2 Mechanical Erection Requirements

Equipment installation manuals that are provided by manufacturers shall be available at the Jobsite and shall be followed unless directed otherwise by the Purchaser or by the Manufacturers (with the Purchaser's approval).

Prior to setting equipment, the surfaces of all foundations, anchor bolts, soleplates, equipment, etc., shall be inspected, cleaned, and prepared to ensure satisfactory setting of the equipment.

Products which contain asbestos are prohibited. This prohibition includes items such as packings and gaskets even though the item is encapsulated or the asbestos fibers are impregnated with binder material.

Tanks and vessels shall be erected in accordance with AWS D1.1 and AWWA D100. All couplings and other exposed rotating parts shall have Seller-supplied safety guards meeting OSHA requirements.

2.14.2.1 Initial Setting Requirements

Manufacturers' installation and operating manuals shall govern all installation and erection work. Equipment shall be handled and set by the Seller to the correct elevation, location, and levelness. Jacking and/or leveling bolts not provided by the manufacturer shall be furnished by the Seller. In all cases, a sufficient number of jacking or leveling bolts or other such provisions shall be furnished to properly set baseplates without sag or stress.

All separate bearing plates shall be set level and flat within prescribed tolerances and to an elevation 1/8 to 1/4 in. below that required for the surface of the machine base which it is to support. The difference shall be made up when the equipment is set with shims, properly secured against shifting, in accordance with Manufacturers' instructions, and having sufficient area to transmit all expected static and dynamic loading without distortion of the equipment.

In the cases of equipment having more than one component mounted on a common base and those that are set on separate bearing plates, the shims shall be so arranged and secured that subsequent doweling after run-in and final alignment check will penetrate the shims so that dowels are not subjected to supported bending.

Consideration shall be given in all phases of the Work for the operating requirements of the equipment and due allowances made for thermal expansion of all components, thrust loadings, shaft sag, etc.

Local chipping of concrete shall be performed and temporary and permanent jacking plates and wedge blocks required for setting of bearing plates and alignment of equipment shall be set in grout, where required. Machining and final fitting of fillers, attachments, and interference-fit fasteners or dowels and the installation of all bearing plates, shear pins, etc., required for anchorage and alignment of all equipment and accessories included in this specification shall be provided by the Seller.

Due allowance shall be made for differential thermal expansion and shaft sag of equipment components at this and later points in installation and the equipment so set that final alignment can be made without cutting into the base material or appreciably reducing the built-in adjustability of the components in the form of shim stacks, etc. The final step in preparation for grouting shall be the correct and even tensioning of the anchor bolts using calibrated torque wrenches or extensometers as required by the manufacturer's instructions and final check on shaft alignment.

2.14.2.2 Shimming and Grouting

Shims for concrete foundations shall be random size stainless steel or brass sheets, plates, or bars, for all permanent shims exposed to air or water. Carbon steel may be used for temporary shims and those fully surrounded by grout. Shims shall be located adjacent to all anchor bolts and at sufficient intermediate

points to ensure adequate support of equipment. Shim packs used for fan bearings shall be a minimum of 90% contact with the concrete it rests on with no grout underneath shims. Shims for structural steel foundations shall be stainless steel sheets or plates cut to suit.

Seller shall comply with Equipment Manufacturers' recommendations. Baseplates or soleplates shall be leveled by means of a precision level. Shaft alignment shall be inspected and approved by OMS.

2.14.2.3 Alignment of Equipment

Alignment of equipment shall be in accordance with the instructions provided in the manufacturer's installation manual. Alignment checks affecting performance shall be made in accordance with manufacturer's instructions, witnessed by the Resident Construction Manager, if so requested, and recorded. As a minimum a 16 point face check and 14 point rim check or reverse dial procedure shall be used for final coupling alignments of all rotating equipment.

After all piping and/or ducts have been connected to the equipment and initial start-up is imminent, a check shall be made of the alignment by the Seller, and realignment made if necessary, prior to makeup of the coupling. Motor halves of couplings shall be safely secured prior to motor rotational check.

After final alignment and torquing of anchor bolts, locking or jam nuts shall be provided for all bolts and shall be drawn up tightly. All anchor bolts having a projection beyond the locking nut of more than one-half the bolt diameter shall be cut off and deburred.

2.14.2.4 Lubrication

Lubrication of journal and thrust bearings shall be maintained as recommended by the equipment manufacturer.

At the completion of erection and alignment, and prior to initial rolling of equipment on power, lubrication of equipment shall be accomplished as recommended by the manufacturer.

All lubricating and oil systems shall be free from dust, dirt, and other foreign materials prior to the charging of lubricants.

2.14.2.5 Doweling of Equipment

After the installed equipment has operated at its normal operating temperature for a period of time, alignment shall be rechecked at essentially operating temperature, and upon approval by OMS, dowel pins shall be installed in the designated equipment, drivers, and baseplates. Where doweling is required by the manufacturer in other than hot operating condition, the manufacturer's recommendations shall be followed.

Dowel pins used for final positioning of equipment on baseplates shall conform to the requirements of the Standard for Threaded Taper Pins of The American Society of Tool Engineers and shall be furnished with threaded tops and fitted with backing out nuts to facilitate pin removal.

The dowels shall be correctly located, and holes drilled and reamed, and dowel inserted and seated in accordance with Manufacturers' instructions. The dowel shall form a full bearing, interference fit with all parts connected and mounted.

precisely match the size and taper of the holes. On certain equipment, some doweling is required during installation and must be performed in correct sequence in accordance with the Manufacturers' instructions.

2.14.2.6 Tools and Spare Parts

All erection tools and spare parts furnished with the equipment shall be turned over to OMS at the conclusion of erection. Any tools furnished with the equipment and used by the Contractor for erection purposes shall be replaced if lost or broken, and cleaned and reconditioned before being turned over to OMS.

2.14.2.7 Piping and Valve Erection

1. General

The Seller is responsible for the furnishing, fabrication, and installation of all piping systems for the Work.

All shop and/or field fabrication and installation Work and all materials furnished shall comply with all requirements of ANSI B31.1 Power Piping.

Extreme care must be taken to minimize contamination in cutting and fabricating pipe and fittings.

Cleanliness of piping is imperative, therefore, extra care shall be taken to insure that the inside of all pipe, fittings and valves are thoroughly cleaned before erection. All parts of the piping system shall be free of blisters, mill scale, rust, sand, dirt and foreign material after fabrication and before erection.

All temporary openings in this piping system during erection shall be covered to maintain cleanliness.

2. Fabrication and Installation Requirements

Only pipe made by the open hearth, electric furnace or basic-oxygen processes shall be supplied. Pipe made by the acid-bessener process is unacceptable. Piping 2 inch NPS and smaller shall be field fabricated.

Piping 2 1/2 inch NPS and larger may be either shop or field fabricated. Piping requiring heat treatment or other special preparation or use of special tools and equipment not normally available at the Jobsite shall be fabricated in the shop.

The Seller shall make allowance for gaskets and backing rings or weld shrinkage, where required for joints.

Shop fabricated piping shall include appropriate couplings, fittings or stubs. For smaller field fabricated branch connections 2 inch NPS and smaller, nipples shall not extend more than 12 inches from the outside of the header.

Attachments welded to piping shall be of the same P-number material group as the piping material. Attachments, such as supports, braces, lugs and T-bars shall be furnished by the Seller and installed in the field. (Except piping which is heat treated and thin walled)

Piping 2 1/2 inch NPS and larger shall be shown on Seller's orthographic drawings as well as diagrammatically on P&ID's. Piping 2 inch NPS and smaller is generally shown diagrammatically on P&ID's only. Actual routing of these pipe lines shall be the responsibility of the Seller in the field.

To minimize risk of personal injury, equipment damage, and construction delays, all piping shall be erected in its permanent hangers.

Prior to erecting fabricated assemblies, the Seller shall inspect all exterior surfaces and interior surfaces, where possible, for cleanliness, damage, welding, and coating. Unsatisfactory fabrication shall be cleaned or repaired prior to rigging to position to minimize erection delays.

Piping and valves shall be carefully rigged into permanent supports with a sufficient number and size of hoists to prevent injury to personnel or damage to material. For slurry hose, if used, the Seller shall hoist hose into position in accordance with manufacturer's instructions, e.g. bending allowance. All hoisting forces imposed on building or hanger steel shall be reviewed by the Seller prior to making a lift to assure the adequacy of the supporting supply member; however, any subsequent damage to the structure or equipment caused by errors or omissions by the Seller shall be the Seller's responsibility to repair or replace.

After rigging and prior to welding or attaching in place, piping locations shall be checked for conformity to design dimensions, equipment location, and weld or gasket gaps. Welding procedures, as indicated in Section 2.11, and qualified welders shall be employed for all welding operations.

Piping shall be routed for adequate flexibility to permit expansion without imposing excessive forces and moments on connected equipment. Piping shall not be installed in passageways or in areas reserved for equipment removal. Piping shall be routed above required headroom clearances and parallel and close to walls and columns.

After connection of all piping to equipment, all flanged joints shall be disconnected and the alignment of the flanges at equipment shall be checked. Any misalignment shall be corrected by resetting or reworking the piping and/or pipe supports to prevent distortion of the equipment. Springing, bending, or localized heating to align the connection will not be permitted.

Piping shall not be routed through Electrical rooms or above electrical equipment.

During erection operations, pipe openings shall be temporarily covered to prevent the entry of dirt and foreign objects. Prior to ceasing daily work, open ends of erected piping shall be closed with covers of sufficient strength to suit conditions.

Piping, valves, and fittings shall be kept a sufficient distance from other work to permit not less than 1/2-in. clearance after allowance for insulation, if required. Care shall be taken in the installation of pipeline runs where drainage is required so that the pipeline will slope down toward the point of drain. All slurry pipe shall be sloped 1/4 inch per foot minimum for drainage.

For piping 2 1/2 inches and larger, the Seller's piping orthographic drawings shall indicate all valve handle extensions, chain operators, or other specialties which are required for adequate valve operation.

Valves shall be thoroughly inspected by the Seller and identified prior to erection. Operation and handwheel orientation shall be confirmed, and all components shall be checked for installed clearances and suitability for operation. Flange faces, weld end preparation, and body material shall be checked to assure proper alignment, bolting, and welding. Welding end valves, other than check valves, shall be one-half opened prior to welding and stress relieving. After erection, valve packings shall be adjusted, bonnet bolting checked, and operators lubricated and protected against freezing, rusting, or other damage.

Manually operated valves requiring manipulation during operation shall be located so that handwheels are not higher than 5 ft above a platform or grade. Valves which do not meet the above requirements shall be equipped with chain operators or extension stems. Valves shall be located or have stems turned so that handwheels or chains do not hang in passageways or over moving equipment. Valve stems shall not be orientated below horizontal centerline. Motor-operated and air-operated valves shall be located to allow easy access for maintenance.

For welded carbon steel pipelines, all items such as Saunders type diaphragm valves which contain materials subject to damage by heat, stressing, etc, during normal erection, welding, and testing shall be disassembled, and those materials shall be removed, tagged, and stored until the proper time for reinsertion in the body of the equipment.

High point vents and low point drains, including 3/4 in. valves of comparable material and pressure/temperature rating to the piping system on which they are used, shall be furnished and installed by the Seller. Vents, drains, and utility connections shall be arranged to prevent unintentional or undetected leakage.

Vent piping outlets shall be located so as not to be hazardous to personnel.

3. Clearance

In general, minimum headroom clearance under all piping, covering, and appurtenances shall be as follows:

- 6 ft-8 in. within structures
- 10 ft-0 in. within yard areas
- 16 ft-0 in. over secondary unit roads
- 22 ft-0 in. over railroads and main plant roads

No field run piping shall be located on floors or walkways or located in such a way as to cause tripping or "head knocker" hazards.

4. Instrument and Branch Connections

All instrumentation shall be furnished as specified in Specification SC-318, Technical Specification for Instrument Installation. The Seller will install connections for this equipment in accordance with the below listed requirements:

All in-line devices will be the same size as the pipe in which they are installed. All flow measuring instruments shall be installed with proper upstream and downstream straight pipe runs in accordance with ANSI/API-2530 (AGA Report No. 3) Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids. Meter runs shall be determined at a Beta ratio of 0.7. Use of actual Beta ratio and/or straightening vanes may be considered to shorten meter runs, with approval of the Purchaser.

For all other instruments, a 3/4 inch NPS pipe with root valve (shut off valve) and flange, where required, shall be provided by the Seller.

Piping branch connections to the first shutoff valve including instrument sampling takeoffs, flow, and pressure connections, shall conform to the applicable piping class and shall be not less than 3/4 inch NPS.

Root valves shall be of a standard globe pattern (diaphragm for slurries), mounted with stem upright or horizontal, unless otherwise specified.

Root connections on horizontal or sloping lines shall not be located below the center of the line. The following rules shall be observed:

- a. Root connections for service on flue gas, shall be taken from the top or side of the duct, or from any point between the top and the side.
- b. Root connections for service on liquids shall be taken only from the side of the pipe, with the root nipple horizontal.

All root nipples shall be as short as possible, in standard lengths. Room shall be allowed for free manual operation of the valve without the hand or fingers coming into contact with the surface of the pipe/duct or its insulation. Root nipples longer than 6 inch end-to-end shall not be used.

Stainless steel thermowells shall be installed in accordance with the Manufacturer's instructions.

All drain connections shall be valved; all hydrostatic vents shall be plugged.

All threaded pipe connections shall conform to American Standard Taper pipe threads per ANSI B1.20.1. All threads shall be full and clean-cut, ends shall be reamed after cutting to remove all burrs. Thread engagement shall be sufficient to make a tight joint. All threaded joints shall be made up with the use of a thread sealant on the male end.

Permissible sealants are:

- Cajon - SWAK anaerobic pipe thread sealant (temperatures less than 350°F)
- Federal Process Co - Antisieze Thread Guard with teflon tape (temperatures greater than 350°F)

Threaded joints in main steam, fuel gas and ammonia service shall be seal welded where feasible. Seal welded joints shall be made up without any sealant.

Pipe shall normally be supplied in double random lengths, except where price, availability, or special requirements dictate otherwise.

Steel pipe for butt weld construction shall be furnished with ends cut square for wall thickness 1/8 inch or less; wall thickness in excess of 1/8 inch shall be supplied beveled @ $37.5^\circ \pm 2.5^\circ$ with 1/16 inch land.

Flanges and flanged fittings shall be in accordance with ANSI B16.5 Standard. 150 lb ANSI Steel flange faces shall have a serrated finish per paragraph 6.3.4 of ANSI B16.5 unless otherwise noted.

Welding neck flanges shall be specified in general, but slip-on flanges may be used where necessary to satisfy space requirements. The maximum allowable pressure rating for slip-on flanges, 300 lb ANSI.

Forged steel socket weld fittings shall conform to ANSI B16.11.

The use of short pieces of pipe (jointers) to make up straight lengths less than 20 ft long shall not be permitted.

Cast iron plugs in steel orifice flanges or elsewhere in steel piping, valves, equipment or fittings shall be replaced with solid steel plugs.

When bolting steel flanges to flat-faced cast iron flanges, the steel flanges shall be flat faced.

Nonmetallic gaskets for flanged pipe joints shall conform to ANSI B16.21.

Nuts for bolts and studs shall be the American Standard Hexagon Heavy Series. All bolts and capscrews shall be carbon steel. Nuts shall be cadmium plated.

5. Bends

Where not shown otherwise, the centerline radius of bends shall be five nominal pipe diameters. Final wall thickness of bends shall not be less than 87.5% of nominal thickness. Flattening shall not exceed 5% of nominal pipe diameter.

Bends shall be fabricated in accordance with the requirements of ANSI B31.1 and PFI.ES24.

6. Tolerances

Fabrication tolerances and minimum bending radii shall comply with the requirements of PFI Standards ES-3 and ES-24. Maximum allowable dishing of flange facing shall be 1/64 of an inch.

All bolt holes shall straddle horizontal and vertical centerlines of flanges unless otherwise noted. Bolt holes shall be aligned within a tolerance of 1/16 inch of the centerline of the piping.

The Seller shall check the internal alignment of pipe and fitting end preparation for makeup of weld joints. The total parallel misalignment of the inside of the root pass end preparation shall be no greater than 1/16 of an inch at any point on the circumference of the joint. Where misalignment is in excess of 1/16 of an inch the pipe or fitting ends shall be machined or ground until internal misalignment is within the 1/16 inch tolerance. Where necessary, the piping or fitting shall be built up by welding and machined or ground to suit this requirement. In no case shall machining or grinding reduce the thickness below the minimum wall thickness required by the applicable code plus 1/32 of an inch.

7. Joint Assembly

All piping connections shall be accurately aligned before bolting up to avoid distortion and to prevent misalignment of equipment.

All flanged connections shall be tightened evenly to assure uniform bolt tension and pressure distribution on the gasket face. New gaskets shall be used for each assembly operation, unless such assembly operation is intended solely for fit-up.

No reused gaskets shall be installed in the final assembly.

8. End Preparation and Backing Rings

Butt weld ends on piping and components will have end preparations dimensioned in accordance with ANSI B31.1.

The use of backing rings shall be in accordance with ANSI B31.1.

Permanent backing rings shall not be used for joints in raw water piping, steam lines or any piping which contains corrosive fluids or operate at pressures above 150 psig.

9. Welded Attachments

Integral attachments welded to piping shall be of the same P-number material group as their piping material.

10. Welding Inspection (Per requirements of ANSI B31.1)

The Seller shall perform visual inspection of welding operations including examination for internal alignment and groove details prior to welding, examination for surface holes, cracks, and other defects during welding, and

examination for surface defects, undercuts and reinforcement heights after welding. Visual examination shall be performed after any required repair welding.

11. Welding

All welding, welding procedures, including welding procedures qualifications and welder qualifications shall be in accordance with ANSI B31.1 and additional requirements of this specification. The Seller shall submit for Purchaser's approval his proposed welding procedures. All welding procedures and qualification test reports shall be maintained in the Seller's files. One copy of approved welding procedures shall be submitted to the OMS field office. Further, the Seller shall maintain full documentation of welds and weld repairs, including welder, metals, systems, test, etc.

Welding shall not be performed on materials that are below a minimum temperature of 55°F and surfaces to be welded shall be free of moisture prior to welding. All welds shall be full penetration, except fillet, socket and seal welds. Limitations in the code for pressure piping on weld reinforcement shall apply to internal surfaces as well to external. Welds shall be free from projections beyond permitted reinforcement. Welding shall not be performed if the ambient temperature is below 10°F.

Only low-hydrogen type electrodes shall be used to weld steels when the shielded metal arc welding (SMAW) process is selected for production.

12. Weld Filler Metals

Weld filler metals shall meet all requirements of the applicable ASME II, Part C, Specifications.

All welding materials shall be stored in a controlled access, clean, dry area that is weathertight and is maintained at a temperature between 40°F and 140°F. Low hydrogen electrodes shall be stored in their sealed shipping containers.

Welding rod shall only be issued to welders for a maximum of a 2-hour period if not heated at the location of the Work.

If the seal is damaged during shipment or storage, the covered electrodes in that container shall be rebaked prior to issuance. If a container is damaged in storage, and the damage is witnessed, the electrodes from that container shall be immediately placed in a storage oven. When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion shall be immediately placed in a storage oven. Electrodes shall be issued from

the storage oven on a first-in, first-out basis. Covered electrode storage ovens shall be maintained at the following temperatures:

EXX 15, 16, 18	300 F, $\pm 50^{\circ}\text{F}$
EXXX 15, 16, 18	

All other covered electrodes requiring oven storage	180 F, $\pm 25^{\circ}\text{F}$
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These storage ovens shall only be used for the holding of the aforementioned types of covered electrodes.

Materials which are damaged shall be discarded. All covered electrodes which are oil or water soaked, dirty, or the flux has separated from the wire, shall be discarded. Bare carbon steel wire shall be discarded if a bloom of rust develops on it and cannot be removed by light sanding. All flux cored wire shall be discarded if it becomes oil or water soaked. Bare and flux cored wire that becomes dirty can be used if it is cleaned prior to use.

13. Weld Repair

The repair of any unacceptable defect disclosed by visual, or other inspection means shall be made by removing (per Code) the material in the defective area until free of the defect, then rewelding and reinspecting, observing all of the requirements of this specification for each operation performed. Repair work shall be performed only after review by Resident Construction Manager. Inspection of repairs shall be performed by the same method and to the same acceptance standards as the method which disclosed the defect. Peening of weld deposits is prohibited.

14. Brazing

All brazing shall be in accordance with ANSI B31.1.

Brazing filler metals shall meet the requirements of the applicable ASME II, Part C, Filler Metal Specification.

15. Leak Testing

All piping shall be leak tested in accordance with ANSI B31.1, Chapter paragraph 137. Hydrostatic testing is the preferred method and shall be used to the greatest extent practical. An initial service leak test may be used

systems similar to those described in Chapter VI, paragraph 137.6. Leak tests shall be performed on completed piping systems or completed portions of systems whichever is more convenient; however, all piping shall be leak tested as required by the Code. All leak tests shall be witnessed by OMS. The Seller shall notify the Resident Construction Manager at least three (3) working days in advance of any scheduled leak testing.

16. Valves

The Seller shall be responsible for installing all valves in accessible locations. Where valves are unable to be located adjacent to platforming, chain operators shall be provided to allow operation from below. The maximum allowable valve height with relation to grade or platform shall be 6 feet-3 inches to the handwheel with the valve stem in an upright vertical position. The maximum allowable horizontal distance from a platform to the center line of the handwheel (i.e., valve stem) shall be 2 feet, with the handwheel at a maximum height of 5 feet-3 inches above the platform.

Valve stems shall be installed in the vertical position whenever possible. Under no circumstances shall valve stems be installed below a horizontal position.

17. Pipe Hangers and Supports

The Contractor shall be responsible for the engineering, design/ arrangement, furnishing, delivery, and installation of all pipe hangers and supports.

a. Materials

Materials used for pipe supports shall conform to the requirements in Paragraph 121 of ANSI B31.1 and in MSS SP-58 as applicable.

Unless otherwise specified, structural shapes shall be ASTM A36 and structural tubing shall be ASTM A501 or A500 Grade B.

Welded attachments to piping shall be of the same P-number material group as the piping.

b. Pipe Support Design

All hanger components and pipe supports shall be designed by the Seller to meet the requirements of Paragraphs 120 and 121 of ANSI B31.1, and shall conform to the requirements of the Manufacturer's Standardization Society Standard Practices SP-58 and SP-69.

c. General Requirements

All hanger components shall support the pipe in the normal operating position and during hydrostatic test and shall allow for the expected expansion or contraction except where anchored and guided, and shall not cause excessive stresses in the piping or loads on the connected equipment or structural component.

The Seller shall be held responsible for damage caused by pipe movement due to improper support to attachments, connecting equipment, insulation, etc. All piping attached to pumps shall be reviewed for flexibility and to ensure that pump nozzle loads are within pump allowances.

Standard stock or production parts shall be used where possible, but the recommended load ratings and limitations in hanger catalogs shall not be exceeded.

No support shall utilize other piping systems for attachment. Hangers shall not be attached to flanges, valves or equipment bolts, or to equipment.

No support shall be located where there is a piping weld.

Supports made of structural steel shall be designed to be shipped in one piece where practical.

All piping shall be adequately flexible for differential settlement of 3/4 inch and total settlement of 1 inch.

Miscellaneous structural steel shall be fabricated in accordance with AISC.

Piping systems, in addition to being properly supported, shall be restrained where applicable for horizontal stability against dynamic effects such as wind, seismic vibrations, excessive movement, etc.

Vertical pipe should be supported directly with riser type hangers rather than having the weight of the riser supported by adjoining horizontal pipe. When a riser support employs two hanger assemblies, each shall be designed to support total design loads. When riser clamps are used to support vertical piping, the Seller shall design and furnish suitable stops or lugs for attachment to the pipe. Friction clamps alone are not acceptable.

A minimum of 6 inches shall be maintained between pipe supports and any obstructions.

All supports for FRP or Mastic piping shall be designed and located using recommended practice established by reputable manufacturers (i.e., Fibercast, A. O. Smith, etc.)

When the pipe is covered with insulation and is to rest on the support, protection saddles or shoes shall be used. Protection saddles shall be tack-welded to carbon steel piping. The saddle material shall be of the same P-number group as the piping material.

All hangers, riser clamps and anchors, saddles and floor flanges shall be galvanized or cadmium plated for outdoor services only. Threaded rods and nuts shall be cadmium plated. Use painted carbon steel for indoor services.

Galvanizing coating shall conform to ASTM Specification A123.

d. Support Loads on Structures

Pipe support loads shall not overload building structure members.

Channels, stair stringers, braces, and intermediate walkway members shall not be used for piping loads.

Accurate weight balance calculations shall be made to determine the required supporting force of each hanger and the limits imposed upon each equipment connection. The weight balance for all hangers shall include the weight of the

pipe, fittings, valves and specialties, the medium transported, the insulation used, and the suspended portion of hanger assemblies and pipe attachments.

Should individual or accumulated loads exceed supporting structure design limits, or should there be any question of the adequacy of the supporting member, or the support point is located between structural members, the Seller shall provide supplementary supporting steel. Supplementary steel shall be properly framed to

columns or beams of sufficient capacity to support the load within the allowable stress and deflections specified by the applicable sections of the AISC specification for the Design, Fabrication, and Erection of Steel Buildings.

Pipe support rods shall not pass through cable trays, and pipe shall not be hung from cable trays or cable tray hangers.

Structural steel for pipe supports shall not be cantilevered from building structural beams, or channels, etc., except when specifically reviewed and accepted by the Purchaser.

Pipe support attachments shall not impose torsion on structural steel members.

Where it is necessary to weld to existing structural steel members to carry pipe supports, anchors, etc., the welds for securing plates to the structural members shall in all cases be parallel to the length and located at the web of the structural member. Welding across the flange of existing structural steel members is not permitted.

e. Attachments to Piping

Integral attachments shall be used only where nonintegral attachments are impractical.

Nonintegral attachments to piping shall be of materials compatible with the pipe material and operating temperature of the piping system. Pipe attachments shall be suitably coated or isolated from the pipe where required to assure the expected life of the piping and the hanger. Attachments to the piping shall be of sufficient area to prevent stress concentrations in the piping and shall have sufficient rigidity to prevent distortion of the pipe by the suspended load. Double bolt pipe clamps shall be utilized when possible to ensure that rods are connected outside of insulation.

f. Attachments to Structures

Structural attachments to steel shall be designed to support the maximum calculated loads. Welded attachments to beam flanged in tension shall require all welding to be parallel to the web of the members.

g. Anchors, Restraints, and Sliding Supports

All anchors, guides, and restraints shall be capable of supporting the pipe and resisting any expansion or contraction thrusts, water hammer, that may be imposed by the piping.

Sliding supports and guides shall be designed to withstand the induced friction force in addition to other loads on the support.

Corners and edges of metal slides and guides in sliding supports shall be rounded or chamfered and guide parts shall be designed with sufficient length so that binding within the necessary clearance will not occur.

h. Hangers

Screw adjustments shall be accessible and workable when fully loaded. Nuts, clevises, sleeves, turnbuckles, etc. shall have their full length of thread in complete service while in use and the amount of male thread available for adjustment plainly visible. Sight holes shall be provided for visibility in parts where necessary.

Full locknuts or other suitable locking devices shall be furnished where necessary. Upset threads shall not be used as a locking method for threaded parts which require disassembly.

i. Hanger Rods

Hanger rods shall be designed in accordance with paragraph 121.2.2 of ANSI B31.1. Rods shall be compatible with the other component parts of the hanger assembly and shall be subjected to tension loads only. Where horizontal movement is anticipated, the rod shall be fitted with welded eye rods, links, or swivels to permit unrestrained swinging of the rod. Where lateral or axial movements exceed 4 deg, all hanger assemblies shall be offset in the cold position to ensure vertical alignment when the piping system is in operation. Hanger rod lengths shall be calculated to provide for at least plus or minus 2 inches of rod adjustment subsequent to hanger erection. Maximum length (pin-to-pin) of rods shall be 20 ft unless otherwise specifically approved by the Purchaser. Minimum rod length (pin-to-pin) shall be 12 inches for each half inch of horizontal movement using rod and clevis or rod and clamp type support. If space does not permit adequate rod length, a trapeze tube support shall be used.

j. Components

Bolt heads and nuts shall be heavy hex and shall conform to the dimensions and tolerances of ANSI Standard B18.2.1 and B18.2.2.

Material for bolts and nuts shall conform to ASTM A307 and ASTM A325. Material for anchor bolts, hanger rods, U-Bolts, etc., shall conform to ASTM A36.

2.14.2.8 Insulation Erection

All insulation and insulation supports shall be furnished and installed by the Seller.

Insulation for equipment requiring normal maintenance or periodic inspection shall be of the boxed construction type and design, which is easily removable and replaceable without damage to the insulation or associated equipment.

Insulation shall be placed behind the identification plates on vessels and equipment, sealed with mortar, and flashed with aluminum against the entrance of water. Nameplates shall remain visible on all insulated components.

2.14.2.9 Scrubber Vessel, Baghouse or Precipitator and Ductwork Insulation

The Seller shall apply panel insulation to all exposed steel surfaces of the scrubber vessel, baghouse or precipitator, ductwork and hoppers.

The entire insulation system shall be designed, fabricated, installed, flashed, and sealed to provide complete weatherproof integrity under the full range of interior and exterior temperature conditions.

All joints and trim shall be of good workmanship, clean and neat in appearance. Corrugations must nest neatly and properly on all overlappings.

All expansion joints shall be covered with insulation only up to and inclusive of the metal flanges.

2.14.3 Structural Erection Requirements

All structural and miscellaneous steel and associated items shall be erected in accordance with the AISC Manual of Steel Construction and SS-410.

Welding

All welding requirements shall be as specified in Section 2.11.

2.14.4 Controls and Instrumentation Erection Requirements

The Seller shall furnish all labor, materials, and supervision required to complete the work. All flushing, purging, testing, precalibration inspection and loop checking, calibration and calibrated loop checking of installed instrumentation shall be performed by the Seller. For detailed requirements refer to Purchaser's Specification for Instrument Installation No. SC-318.

3.0 GUARANTEED PERFORMANCE, TESTS, MODEL STUDY AND FILTER BAG WARRANTY

3.1 Required Performance Guarantees

The Seller shall guarantee that the minimum particulate, sulfur dioxide, hydrogen chloride, hydrogen fluoride and sulfuric acid removal efficiencies and maximum concentration and opacity in the flue gas exiting the baghouse or precipitator will be as shown in Attachment 3 based on test procedures outlined in Section 3.2.1.1.

Additional required performance guarantees are shown in Attachment 3. The Seller shall also guarantee that there will be no buildup of solid material on or in the scrubber vessel, baghouse or precipitator, ductwork, hopper sides, horizontal shelves, vanes, or any other equipment which would be detrimental to the APC system and/or to its continuous operation.

The APC system shall meet these guarantees while the following conditions (which may or may not occur simultaneously) are imposed:

1. The boiler operating under any condition of normal operation, including periods when boiler tube soot blowing or rapping is taking place.
2. Any plant operating conditions including any flue gas conditions entering the APC system within the Expected Continuous and Design ranges specified in Attachment 2 and Figure 1 of Attachment 3.
3. Removing particulate from the scrubber vessel and baghouse or precipitator hoppers.
4. Normal operation, with any one of the baghouse compartments isolated for cleaning, except for the average system pressure drop guarantees.

3.1.1 Performance Guarantee Curves

In its bid, the Seller shall furnish the following performance guarantee curves. These curves will be used to correct from actual test conditions to guarantee conditions to determine if the Seller's APC system actually meets the Performance Guarantees during the Purchaser's Acceptance Tests.

These curves shall be drawn on graph paper of sufficient divisions to allow the determination of the parameters to three significant figures.

1. The Seller shall provide a set of curves or equations to adjust the lime consumption guarantee to actual flue gas test conditions. The adjustment shall include all possible flue gas variations that the vendor expects will affect performance, such as HCl, SO₂ and HF content, inlet and outlet temperatures, and ratio of HF concentration and HF to SO₂. The range of SO₂ and HCl concentration shall be from 50% of Expected Continuous Operation to Design

- conditions, the range of inlet temperature shall be from 50° less than Expected Continuous Operation to Design Operation Condition as shown in Attachment 2.
2. Guaranteed APC system static pressure drop vs. the total flue gas flow rate (in ACFM) exiting the economizer for maximum and average guarantees.
 3. Guaranteed precipitator collection efficiency vs. gas volume.
 4. ESP correction curve factors vs. temperature, moisture and resistivity.

Additionally, in its bid, the Seller shall address any other operating parameters, if any, which may affect the test verification of compliance with the Performance Guarantees.

3.2 Tests

Seller shall make provision in the design of the equipment for installation of all the required test instruments. As a minimum, this shall include the required test ports and access.

3.2.1 Performance Tests

System performance testing for verification of guarantees shall be performed by the Purchaser. The Seller shall provide a technical representative to participate in the development of testing procedures and provide technical direction for the tests. Deficiencies, or fault conditions determined during these tests shall be promptly corrected by the Seller.

3.2.1.1 Performance Test Procedures

The system performance tests for verification of Seller's acid gas removal, particulate removal, opacity, lime consumption, system delta P and power consumption guarantees shall be performed simultaneously and be based on the following:

1. Particulates: Test Method 5 as published in the most recent edition of Title 40, CFR part 60, Appendix A or the results from a combined test method 5/12/101A.
2. PM-10: Test method 201A as published in the most recent edition of Title 40, CFR part 60, Appendix A.
3. Sulfur Dioxide: Test Method 6C as published in the most recent edition of Title 40, CFR Part 60 Appendix A.
4. Hydrogen Fluorides: Test Method 13B as published in the most recent edition of Title 40, CFR Part 60, Appendix A. Test to include analytical finish from Standard Methods for the Examination of Water and Wastewater.

5. Hydrogen Chlorides: Test Method 26 as published in the NSPS with analysis of the impinger catch by ION chromatography.
6. Opacity: Test Method 9 as published in the most recent edition of Title 40, CFR Part 60, Appendix A or by an EPA approved opacity monitor.
7. Sulfuric Acid: Test Method 8 as published in the most recent edition of Title 40, CFR Part 60, Appendix A.
8. Lime consumption, system pressure drop, and power consumption: test methods as mutually agreed to by Purchaser and Seller.

The above tests shall also include all other referenced test methods as published in the Federal Register.

Acceptance shall be based upon the average test value of three consecutive tests.

3.2.2 Shop Tests

Purchaser shall be given 10 days prior notice of all shop tests.

The Seller shall perform shop performance tests on all equipment specified herein to demonstrate proper operation and to verify performance. These tests shall be conducted in the Seller's shops prior to shipment.

All tests shall comply with and be conducted in accordance with the applicable governing codes and regulations. Subsupplier-furnished equipment shall be tested and certified by the respective manufacturers.

Rotating atomizers shall be shop tested for dynamic and static balance. The nozzles shall be shop tested for slurry flow and droplet size distribution.

All pressure sealing baghouse (precipitator) welds including the cellplate shall be dye penetrant tested.

For each precipitator rapper, Seller shall demonstrate that rapping is uniform and in accordance with design requirements. The details of the test procedure shall be submitted to the Purchaser in advance for approval.

All transformers shall be subjected to routine tests as required by NEMA Standard ST-1 and ST-20. Values measured during transformer tests must agree with guaranteed values within ANSI standard tolerances.

Each load center assembly and each breaker removable element shall be given the full series of production tests described in ANSI C37.20. Where test jigs are used to adjust and verify mechanical alignment as a substitute for aligning breakers in cubicles, the mechanical operation tests, ANSI C37.20 Section 20-5.3.2, of all assemblies and all removable elements shall demonstrate correct operation of the secondary contact subassemblies by means of electrical continuity checks.

Each instrument transformer shall be given routine tests described in

ANSI C57.13. In addition, each potential transformer shall be given an induced potential test in accordance with ANSI C57.13.

Each protective relay shall be given a dielectric test in accordance with ANSI C37.1. The test shall include coil and contact circuits and shall be made either at the point of relay manufacture or as a part of the dielectric test of the switchgear assembly.

Each motor control center shall be subject to the following: dielectric tests listed in NEMA ICS-1 and ANSI C37.90, as applicable; continuity tests on secondary wiring, instrument wiring and grounding of noncurrent carrying parts. Shop tests shall be performed to demonstrate the proper operation of the control systems and provide the systems with an initial calibration. Calibration data on test instruments shall be furnished to the Purchaser, and shipped to the jobsite with respective instruments.

3.2.3 Component and Subsystem Field Tests (By Seller)

After the APC system has been erected, the Seller shall inspect the unit to ensure that it has been erected in accordance with the Seller's drawings and this Specification. Any erection errors or deficiencies shall be corrected by the Seller at its expense. Upon correction of any deficiencies in erection, the Seller shall notify the Purchaser in writing that the unit has been erected in accordance with the Seller's drawings and specifications. The Seller shall continue to be responsible for the maintenance and condition of the equipment and material until it is turned over to the Purchaser.

The Seller shall furnish all equipment, materials, labor and supervision personnel including service representatives from the Seller's sub-suppliers to perform component and subsystem field tests as outlined below. All tests shall be sequenced properly to avoid schedule delaying repairs if the tests indicate inadequate design or performance. All energization of motors and electrical equipment shall be performed by the Purchaser's personnel with the concurrence of the Seller. All other work associated with these tests shall be performed by the Seller. The Seller shall also furnish all equipment, material, and personnel to prepare the unit for these tests including furnishing and installing start-up strainers, installation of packings, aligning and lubricating couplings, removing loose materials from vessels and compartments, checking rotation of motors and rotating equipment, filling instruments with necessary fluid, and checking level of lubricating and seal oil in rotating equipment and drivers.

During the component and subsystem field tests, if the Seller finds installed equipment which does not operate as required, the Seller shall immediately advise the Purchaser of the existence and nature of the problem. Any equipment which does not operate as required shall be repaired or replaced by the Seller at the Seller's expense. Additional tests required to show that the repaired or replaced equipment operates as required shall be performed at the expense of the Seller.

The Purchaser may witness and/or participate in the component and subsystem field tests. The following component and subsystem field tests shall be carried out:

1. Piping Systems

All piping shall be field tested in accordance with ANSI B31.1.

2. Electrical Tests

The following electrical tests and checks shall be performed:

- a. Megger and record reading for all circuits and equipment except instrumentation and control panels which could be damaged by this test.
- b. Megger and record reading for all motors when received, including those shipped with the driven equipment.
- c. Check out and test of all systems to make certain that operation of these systems conform to the design drawings.
- d. Phase rotation and voltage of power interconnections.
- e. All fuse and circuit breaker ratings correct as specified or shown on drawings.
- f. Control switchboards and switchgear in operating condition, clean, adjusted and tested, all circuit breakers aligned and checked for proper operation. All relay shipping blocks removed. Protective relays properly set and adjusted.
- g. All equipment properly grounded. All metal raceway electrically continuous and correctly grounded.
- h. All motors checked for rotation, properly lubricated, tested, clean, and ready for operation, with driven equipment connected or positively and safely disconnected as may be required. Thermal overload relays in motor starters of correct ratings and properly installed.
- i. Valve and damper operator and other limit switches correctly connected and adjusted.

3. Instruments and Controls Calibration and Loop Check

All instrument loop check and calibration work shall be performed by qualified calibrating technicians under the supervision of a Seller supplied qualified calibration engineer. When the instrument loop has been tested and calibrated, the event shall be recorded on a document bearing the date of verification, and the signature(s) of the responsible supervisor(s) who performed the inspection.

Inspection and preparation of instrument loops for release for calibration shall include the following (see also Purchaser's Specification for Instrument Installation No. SC-118):

- a. All loop hardware shall have been inspected for conformity to

drawings and specifications and for integrity of workmanship.

- b. All electrical circuits pertinent to the loop shall be energized, preferably from their permanent power sources with fuses and protective devices in place and functional.
- c. Functionally closed loops should be checked by manipulating the primary sensing device(s) and observing response of the final control element(s).
- d. Digital inputs from switching devices to electrical systems, such as logic matrices and motor control circuits, shall be checked by verifying that it actuates the correct relay in the correct direction.
- e. Alarm circuits shall be checked by manipulating the switching device to sound the alarm and light up the correct display window.
- f. Analog or on-off inputs from, or outputs to, other loops shall be checked by verifying correct action at the receiving device, preferably while operating all loop components in concert.
- g. All fluids introduced to instrument bodies and attached piping for purpose of calibration, or for any other purpose, shall be compatible with the fluid with which the instrument and piping will be filled during normal operation, and shall be free of system contaminants.
- h. All analog devices shall be adjusted for zero, linearity, and span across the full range and their smooth performance shall be verified by repeated cycling across the full range. All instruments shall be adjusted to their full design accuracy.
- i. Every instrument shall be individually calibrated by applying measured inputs and measuring the outputs. In no case shall two or more instruments be gang calibrated, as, for example, by feeding measured pressure into a transmitter and then adjusting the receiver gage to agree.

4. Inspection of Baghouse Tubesheet Welds

A complete visual inspection of the tubesheet shall be made to check the welds around the thimbles and the welds between sections of tubesheet. In addition, for field fabricated tubesheets, a dye penetrant test shall be made of all tubesheet welds. All leaks shall be repaired by the Seller to the satisfaction of the Purchaser.

5. Absorber Vessel, Baghouse, or Precipitator and Ductwork Weld Tests

After the absorber vessel, baghouse or precipitator, and ductwork are erected, and preferably with a minimum of insulation in place, the absorber vessel, baghouse or precipitator, and ductwork shall be tested for leaks. 10% of the

welds shall be tested using a dye penetrant test. OPI field personnel to approve Seller's selection of welds to be tested. If more than 10% of the tested welds fail, Seller shall test all welds. All discernible leaks shall be repaired by the Seller to the satisfaction of the Purchaser.

6. Tanks, Bins, and Vessels

Tanks, bins, and vessels (except the absorber vessel) shall be tested in accordance with AWWA D100 or AWS D1.1, whichever is applicable.

7. Other Component and Subsystem Field Tests

Running tests of all other equipment shall be conducted for a general operational check including vibration, noise, clearances, tightness, lubrication system, and performance at design point. These tests shall be performed in accordance with manufacturers' recommendations and all applicable codes and standards.

3.2.4 Model Study

If required by Section 4.4.2, the Seller shall be responsible for the construction and performance testing of a three-dimensional model of the APC system including, but not limited to, ductwork from the economizer to the scrubber vessel, the scrubber vessel, the ductwork from the absorber vessel to the baghouse or precipitator, the baghouse or precipitator, and the ductwork from the baghouse or precipitator through the ID fans to the stack inlet. If I.D. fans are furnished by Purchaser, Seller shall model the ductwork from the baghouse or precipitator to the ID fans based upon the Purchasers' design. Tests are to be conducted that will establish the proper arrangement of the APC system equipment with regard to adequate and correct gas flow, temperature, and particulate distribution throughout the gas flow rates specified in this specification. The three-dimensional model shall not be smaller than 1/12 scale and shall be constructed of transparent plastic to the greatest extent possible so that visual inspection may be made of all areas.

Dimensionless similarity parameters shall be maintained at the same value as in the actual design. Where this is physically impossible, the Seller shall include, in the test result report, a list of the variations from model to actual values and the correction factors used for these variations.

The APC system model shall be built and tests shall be performed by a firm approved by the Purchaser or, Seller may use its own in-house laboratory and test facilities to model the APC system if approved by the Purchaser.

Induced draft fans shall be used to draw air through the APC system model. The model shall be constructed with sufficient detail to incorporate any structural or mechanical members including, but not limited to, gas distribution vanes, duct supports, stiffeners, dampers, and other flow control devices, particulate filter media, tubesheet, internal compartment braces and any other equipment located internally to the APC system. Internal members shall be physically modeled, mathematical models of internal members are not acceptable.

Tests shall be performed at flue gas flow conditions which simulate the Minimum,

Expected Continuous operation and Design flue gas flow as specified in Attachment 2 with different combinations of baghouse compartments isolated.

Test results and Seller's conclusions shall be submitted to the Purchaser for review and comment prior to fabrication of the APC system equipment and ductwork components.

All changes, modifications or adjustments to the Seller's APC system, which are shown by the model studies to be necessary to meet Seller's guarantees and/or the performance requirements of this specification, shall be made by the Seller at no additional cost to the Purchaser, and a modified flow model system shall be retested to verify that all guarantees and requirements of this specification are being met.

Seller shall maintain the APC system model until after completion of the Purchaser's Acceptance Tests. Upon successful completion of the Purchaser's Acceptance Tests, the APC system model shall be destroyed or shipped to the Purchaser whichever the Purchaser selects.

3.3 Filter Bag Warranty

The Seller shall guarantee baghouse pulse-jet/reverse air filter bags for a period of two/three years from the date of first refuse fire. The filter bag warranty shall be valid for on-line or off-line cleaning or a combination of both over time. During the guarantee period the Seller shall provide replacement bags for all failed bags, as well as all failed replacement bags, at no cost to the Purchaser. Replacement bags shall be of equal or superior quality to the original bags. If it is shown that the bags are not adequate for the service described in this specification or if greater than 20% of the installed bags have failed, the Seller shall execute a test program to determine the correct bag material or design, and shall re-fit each baghouse at no cost to the Purchaser. This test program shall be executed with all reasonable efforts to minimize its affect on the operation of the resource recovery facility.

4.0 SUPPLEMENTAL REQUIREMENTS

4.1 Conditions

No deviation or nonconformance from this specification or applicable codes and standards invoked by this specification shall be accepted until approved by the Purchaser. Deviations are considered departures from any requirement of this specification. Uncorrectable nonconformances are considered to be conditions which cannot be corrected within the specification requirements by rework or replacement.

The Seller shall promptly document and notify the Purchaser of all deviations and nonconformances from the specification such as deviations from applicable codes and/or drawings. Further engineering and fabrication after detection of any deviation or nonconformance prior to the Purchasers' approval shall be at the Seller's risk. No departure from the specification shall be binding on any party until an addendum or revision to the specification has been issued by the Purchaser.

4.2 Proposal Data and Drawings

The Seller shall indicate his understanding of and compliance with this specification by completing and submitting information requested in Attachment 6 of this specification with the proposal. Seller's proposal shall indicate in detail, in separate section, any exceptions taken to this specification, explaining the inability to comply and any alternatives offered. Blanket or general exceptions will not be accepted, each exception shall include the specific paragraph to which the exception refers, the Seller's alternate equipment or system and the cost impact of this change.

Detailed information concerning all components and accessories shall be furnished in the form of an equipment data list. Erection weights shall be included. Deviations from such information will not be permitted subsequent to issuance of a purchase order.

Seller shall include with the proposal, a priced list of all recommended spare parts and special tools.

Seller shall fill in completely all data required in Attachment 7. The data that do not apply to the Seller's equipment shall be answered with "N/A" (Not Applicable). The data contained in Attachment 7 shall be a firm contractual commitment of what the Seller will furnish. Changes to the data shall be submitted in writing and shall be subject to Purchaser's approval.

4.3 Approved List of Subsuppliers

Seller shall purchase equipment, material, or services from the suppliers included in the list below or from Purchaser's approved equal.

<u>Equipment</u>	<u>Manufacturer</u>
Compressors	<ol style="list-style-type: none"> 1. Gardner-Denver 2. Sullair 3. Ingersoll-Rand 4. Atlas Copco 5. Joy Manufacturing 6. Dresser Industries
Fans	<ol style="list-style-type: none"> 1. Buffalo Forge 2. Howden 3. TLT Babcock 4. Garden City
Valves	<ol style="list-style-type: none"> 1. Rockwell Edward 2. Powell 3. Dezurick 4. Clarkson 5. Jamesbury 6. Fisher (all control valves for water, air...) 7. Fujican
Valve Operators (motorized)	<ol style="list-style-type: none"> 1. Limitorque 2. Rotork
Water Pumps	<ol style="list-style-type: none"> 1. Ingersoll-Rand 2. Lawrence Pump, Inc. 3. Gould Pumps
Slurry Pumps	<ol style="list-style-type: none"> 1. Warman International Inc. 2. Robins Myers 3. Lawrence Pumps, Inc. 4. Goulds (Morris) 5. Wanner (Hydra-Cell)
Agitators	<ol style="list-style-type: none"> 1. Chemineer 2. Philadelphia Gear 3. Cleveland Mixer 4. Lightning
Filter Bags	<ol style="list-style-type: none"> 1. BHA 2. Midwesco 3. Menardi
Hopper Heaters	<ol style="list-style-type: none"> 1. Edwin L. Wiegard Division of Emerson Electric Co. 2. Bylin Heating System 3. Hotfoil
Slakers	<ol style="list-style-type: none"> 1. Wallace & Tiernan 2. Kennedy Van Saun 3. Portec 4. WHM 5. BIF

<u>Equipment</u>	<u>Manufacturer</u>
Small Dust Collectors (Not baghouse)	1. Zurn 2. Mikropul 3. American Air Filter 4. Flex-kleen
Volumetric Feeders	1. Wallace & Tiernan 2. Ramsey 3. Merrick
Bin Activators	1. Vibranetics 2. Kinergy Corp. 3. Vibra Screw
Expansion Joints	1. Pathway Bellows Inc. 2. Raybestos Manhattan 3. Papco 4. Dynex
480V Power Switchgear	1. Westinghouse Type DS 2. Powell 3. ABB 4. General Electric
Motor Control Centers	1. Westinghouse (Series 2100) 2. Siemens-Allis 3. Tetramanique Square D
Programmable Logic Controller	1. Modicon 2. Allen Bradley 3. Westinghouse 4. GE
Low Voltage Power Cable and Lighting Wires	See SE-213
Control Cables	See SE-213
Instrumentation Cables and Thermocouple Extension Wires	See SE-213

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4.4 Project Specific Requirements

The attached Project Specific Requirements, if any, are clarifications additions, deletions, and/or revisions to the preceding Specification requirements and shall be considered as part of this Specification.

- 4.4.1 Number of Trains
- 4.4.2 Model Study (yes/no)

2
NO

- 4.4.3 ID Fans (yes/no) YES
- 4.4.4 The following economic factors shall be used in evaluating the vendors proposals:
1. Lime (\$/LB/HR of 90% CaO): 3700
 2. Power Consumption (\$/KW): 2600
 3. Pressure Drop (\$/In. w.g./train): 55000
- 4.4.5 Seller to provide an option price to have test ports and instrument connections for Purchaser's opacity and CEM instruments located on the I.D. fan inlet duct (Ref. Section 2.6.1) plus associated access platforms (Yes/No) OPTION IS NOT SELECTED
YES 15
- 4.4.6 Design summer/winter ambient temperature (°F) 110 / 35
- 4.4.7 Structural Design Criteria
- . Governing Code SBCCI Year LATEST EDITION
 - . Wind Speed 100 MPH 6 Exposure
 - . Earthquake Seismic Risk Zone 0
 - . Ground Snow Load (Minimum) 0 psf
- 4.4.8 Boiler auxiliary fuel (fuel oil, natural gas, propane) PROPANE
- 4.4.9 APC area to be enclosed (Yes) YES
- 4.4.10 Control System
- 4.4.10.1 The balance of the plant control system is:
- Single Loop Control System
 Distributed Control System;
Manuf./Model BAILEY NETWORK 90
- 4.4.10.2 Seller to provide the Control System interface in accordance with page:
- A10-1
 A10-2
- 4.4.10.3 Seller to provide option for a PLC based control system (ref. Att. A10-3) in-lieu of a DCS based system (yes/no) OPTION IS NOT SELECTED
YES 15
- 4.4.11 Boiler will have ammonia injection for reduction of NO_x (Yes) YES

- | | | |
|--------|--|------------------|
| 4.4.12 | Additional economizer outlet particulate loading (Above those shown in attachment 2) due to purchaser's furnace dry lime injection system, gr/scf dry (Expected Continuous/Design) | <u>N/A, N/A</u> |
| 4.4.13 | Cooling Water Pressure at interface point, psig | |
| | 1. Supply available | <u>LATER</u> |
| | 2. Return required | <u>LATER</u> |
| 4.4.14 | The Purchaser's CEM system shall provide the following SO ₂ control signal | |
| | 1. Inlet to scrubber (yes <input checked="" type="checkbox"/>) | <u>YES</u> |
| | 2. Outlet to stack (yes <input checked="" type="checkbox"/>) | <u>YES</u> |
| | 3. "Sample and Hold"/Dedicated | <u>DEDICATED</u> |
| | 4. Continuous Signal time (minutes) | <u>N/A</u> |
| | 5. "Hold"/Calibration time (minutes) | <u>15</u> |

REFER TO PAGES 101-106
FOR ADDITIONAL REQUIREMENTS

b
6

Project Specific Requirements

- 4.4.15 All equipment including scrubbers, fans, breaching, ducts and baghouses shall be insulated to maintain a maximum 10°F temperature drop through the entire unit. As a minimum, 4 inches of fiberglass batt insulation over external stiffeners shall be installed complete with cladding.
- 4.4.16 All expansion joints handling gases above ambient temperatures shall be insulated to prevent condensation at the joint.
- 4.4.17 All expansion joints shall be flanged with air tight sealing gaskets made of non-hazardous materials.
- 4.4.18 The APC equipment and ID fans shall be completely enclosed. Therefore, weather enclosures or penthouses are not required. Walk-in plenum baghouses are still required.
- 4.4.19 Heat tracing provided only for freeze protection is not required. Heat tracing required for the process, if applicable, shall be provided. P 7
- 4.4.20 The maximum available clearance at the scrubber area is 95 feet. The maximum available clearance at the baghouse area is 51 feet. The APC system, including the 12 foot by 25 foot CEM enclosure, ID fans and all required access and maintenance areas shall fit within the 135 foot long 94 foot wide area shown on Attachment 8. Access provision within the APC area shall include a path capable of accommodating fork lift truck access to all areas. An 8'-0" minimum clearance shall be provided between the lime silo and all support column piers, and a 7'-0" minimum clearance shall be provided between the ID fans and the baghouse support column piers. P 7
- 4.4.21 The lime silo vent baghouse shall have a maximum air to cloth ratio of 4:1 and shall be designed to have a particulate removal efficiency of 99% of particles larger than 1 micron.

- 4.4.22 All rooms or enclosures (i.e., Lime Slurry prep., MCC's, control room etc.) located within the enclosed APC area shall be provided with lighting, convenience receptacles and appropriate HVAC systems. Emergency battery packs shall be provided and shall meet the requirements specified herein and NFPA 101 Section 5-9.
- 4.4.23 A complete set of aperture cards and a complete set of all CADD files shall be provided for all as-built drawings associated with this contract. The aperture card requirements shall be consistent with Attachment 19.
- 4.4.24 Seller shall provide a complete Mercury Control System. The system shall be designed for the following conditions:
- Unabated Hg @ economizer outlet = 500-1500 micrograms/DNM³ @ 7% O₂
 - Required stack concentration of Hg = 100 Micrograms per DNM³ @ 7% O₂ or 80% removal, whichever is less stringent
Hg emissions shall not exceed 0.0379 lb/hr per unit
 - Flue gas at economizer outlet shall have volumetric flow and composition shown on specification SM-105 data sheets for the design case.
 - Powdered activated carbon consumption shall not exceed 1 lb/ton of MSW burned and the use rate shall be continuously monitored and recorded.
 - Carbon handling shall accommodate "supersaks" which are loaded to the system at grade.
 - System shall be redundant in that a single component failure shall not impact operation of both boiler trains.
- 4.4.25 The monorail to hoist the atomizers shall be supported by the Seller and shall be completely independent of Purchaser's enclosure. Seller shall not rely on Purchaser building steel for support. Further, the hoist mechanism shall be electrically driven in both directions, with provision for manual override and operation.

4.4.26 Page iv, Table of Contents:

Attachments 11.2, 11.3, 11.4, 11.6, 11.9, 12, 16 and 18 are not applicable to this project and are deleted from the specification. Attachment 19, Aperture Card Requirements, is added to the specification requirements.

4.4.27 Page 1, Section 1.2:

520 hours of start-up and check-out supervision and 40 hours of operator training shall be provided.

4.4.28 Page 7, Section 2.1.1 third paragraph:

Purchaser's ash removal equipment will be designed for continuous ash removal to prevent hopper build-up. Purchaser will supply an air-lock mechanism below each scrubber hopper flange.

4.4.29 Page 8, Section 2.1.1 twelfth paragraph:

Idled equipment will be flushed and drained to avoid solids settling if downtime is greater than 4 hours.

4.4.30 Page 11, Section 2.1.6:

Compressed air supplied by Purchaser to a single interface point will not be dry. Seller shall provide a dual 100% electric heat regenerative air dryer for -40 F dewpoint and distribution piping for compressed air.

4.4.31 Page 13, Section 2.2.1, Second paragraph:

Provisions need not be provided for a future delumper at the scrubber outlet hopper.

4.4.32 Page 14, Section 2.2.3:

Each scrubber vessel shall be provided with a single rotary atomizer of the Combustion Engineering design.

4.4.33 Page 17, Section 2.2.4.2:

Provisions shall be included to allow for grab sampling of lime from the lime storage silo.

4.4.34 Page 17, Section 2.2.4.3:

Each slaker shall be located at a different floor level within the lime silo enclosure to maximize access. Independent grit screens must be maintained. In addition, the lime preparation control panel shall be located external to the enclosure, to prevent damage from the lime preparation area environment.

4.4.35 Page 18, Section 2.2.4.4, fourth paragraph:

Ultrasonic type level probe shall be provided for the lime slurry storage tank.

4.4.36 Page 19, Section 2.2.4.5, second paragraph:

The life of the output shaft bearings shall be 50,000 hours, as opposed to 250,000 hours.

4.4.37 Page 21, Sections 2.2.4.6 and 2.2.4.7:

Concentrated lime slurry flow rate to each scrubber head tank shall be measured and recorded utilizing Controlotron ultrasonic flow meters.

Dedicated lime slurry and dilution water pumps shall be provided for each unit, each with independent and separate ring headers to feed the scrubber head tanks. A back-up slurry and back-up water pump shall be provided to supply either unit. Low slurry pressure alarms shall be provided for each ring header at the inlet to slurry control valves. Fujikin control valves shall be provided to: 1) regulate flow to the head tanks to the feed tanks and 2) regulate flow from the feed tanks to the atomizers. Gravity return headers shall be provided on slurry and water supplies to the head tank and arranged so that constant pressure is maintained at the inlet to regulating valves.

4.4.38 Page 21, Section 2.2.4.7, second and fourth paragraphs:

Cleanouts will be provided at all tees and 90° elbows, but not necessarily at all fittings such as valves etc.

4.4.39 Page 22, Section 2.2.4.8, first paragraph:

All slurry valves will conform to ANSI B16.34. Water or air valves may require the use of screwed connections on some supplied valves.



4.4.40 Page 23, Section 2.2.4.9, second paragraph:

Reject water from the flushing process will not be directed back to the slurry storage tank. Valving and connections shall be provided to recycle flush water or discharge to floor trenches.

6

4.4.41 Page 33, Section 2.3.2:

Bag cages of split design shall be allowed to reduce overall height requirements. However, all aspects of cage construction must meet specification requirements.

4.4.42 Page 33, Section 2.3.2 third paragraph:

The bag suspension system is designed to avoid contact between adjacent bags. During installation and operation some bags may touch, however, these shall not exceed 5% of the bags in any one module. No bags shall touch the side walls.

7

4.4.43 Page 46, Section 2.5, fourth paragraph:

Delete "and closure plate" from the end of the first sentence.

4.4.44 Page 47, Section 2.6.1, fifth paragraph:

Ductwork plate deflection shall not exceed 1.5 times the plate thickness. Ductwork stiffener deflections shall not exceed L/240.

4.4.45 Page 47, Section 2.6.1, eighth paragraph:

Test ports at scrubber inlet ductwork shall also comply with the requirements of the Florida Administrative Code Section 17-2.700.

4.4.46 Page 50, Section 2.7.2:

The lime silo vent and carbon use bins shall be vented to the outdoors (external to APC enclosure by Purchaser). Slakers shall be vented from the slaking area.

7

4.4.47 Page 51, Section 2.7.3, fourth paragraph:

Lagging on outdoor equipment and ductwork (i.e. ductwork to chimney) shall be identical to lagging utilized by Purchaser for balance of Facility.

4.4.48 Page 52, Section 2.7.4, fifth paragraph:

Hopper heaters shall be controlled by thermostats in lieu of RTDs. A single, dual setpoint thermostat shall be provided for each hopper. One setpoint shall be for control, while the other shall be for low temperature alarm. The loss of a single controller shall not affect the operation of other heaters.

4.4.49 Page 53, Section 2.8.1, second paragraph:

The 3/4" differential criteria is between supports of different equipment. A 3/16" differential between supports of the same equipment will be utilized.

4.4.50 Page 53, Section 2.8.2

Building code safety factors will be followed for local combinations addressed by the Building Code. For load combinations not addressed by Building Codes, standard procedures will be used.

4.4.51 Page 56, Section 2.8.4, item 14:

Support brackets for Purchaser supplied cable trays shall be by Purchaser. Seller shall include provisions for accepting associated loading on Seller supplied steel.

4.4.52 Page 62, Section 2.9.4, fourth paragraph:

Westinghouse Series "C", or purchaser approval equal, motor circuit protectors may be provided in the supplied combination motor starters.

4.4.53 Page 65, Section 2.10.2, second paragraph:

Feed forward correction of SO₂ set point shall be utilized.

4.4.54 Page 65, Section 2.10.2, seventh paragraph:

Baghouse controls shall accommodate simultaneous cleaning of a minimum of four baghouse modules when in on-line cleaning mode.

All baghouse outlet dampers shall fail open on loss of air or loss of power.

Baghouse bypass damper(s) shall fail closed on loss of power. An air cylinder with trip valve(s) shall be provided to allow manual opening of the damper(s) from the control room on loss of air, or locally on loss of power.

4.4.55 Page 66, Section 2.10.2, second paragraph:

Change the words "the baghouse shall automatically go into bypass mode, under de-energized condition" to "the control system shall alarm".

4.4.56 Page 73, Section 2.14.1, first paragraph:

The absorber vessel, baghouse and ductwork need not be shop assembled and disassembled prior to delivery. Match marking, punching or doweling of absorber vessels is not required.

4.4.57 Page 97, Section 4.3:

Add Chemco as an approved slaker supplier.

4.4.58 Attachment 2, page A2-2:

Add to Note 2 that the baghouses will remain on-line during start-up and shut-down of the boiler units.

4.4.59 Attachment 4:

The power distribution system shall be similar to the alternate scheme presented. The 150 hp atomizer motor starters are not local combination starters, but shall be installed in the MCC prior to the current limiting reactors.

((((END OF PROJECT SPECIFIC REQUIREMENTS)))

ATTACHMENT 1
SYSTEM CONFIGURATION

Proposals shall be provided for the following system configurations:

- | | | |
|---------------------------------------|--------------|-------------|
| . Electrostatic Precipitator Only | _____ Yes | <u>X</u> No |
| . Scrubber/Electrostatic Precipitator | _____ Yes | <u>X</u> No |
| . Scrubber/Baghouse | <u>X</u> Yes | _____ No |

General Arrangement Drawings (See Attachment 8)

Economizer Outlet Connection (Approximate Ref. Section 2.1.7)

- | | | |
|--|-----------------------|-----------|
| . Centerline Height above grade | <u>32'-6"</u> | |
| . Height/Width (ft.) | <u>3'-10", 30'-8"</u> | |
| . Distance inside Boiler Building Column (ft.) | <u>1 FOOT</u> | 15 |
| . Stoker Width (ft.) | <u>29'-6"</u> | |
- CENTERLINE**

Stack Interface (approximate)

- | | |
|--|---------------------|
| . Maximum Breeching Width/Height (ft.) | <u>4'-5", LATER</u> |
| . Stack Shell Outside Dimensions (ft.) | <u>LATER</u> |
| . Stack Foundation Dimensions (ft.) | <u>LATER</u> |

ATTACHMENT 2
ECONOMIZER OUTLET OPERATING CONDITIONS(1)

		<u>Expected Continuous(2)</u>	<u>Design(3)</u>
Gas Quantity (wet)	lb/hr	<u>382,910</u>	<u>440,000</u>
Gas Quantity (dry)	lb/hr	<u>350,896</u>	<u>406,000</u>
Gas Volume (wet)	SCFM (@68°F)	<u>86,080</u>	<u>99,000</u>
Gas Temperature	°F	<u>425-500</u>	<u>425-500</u>
Gas Pressure	IWC	<u>approx. -1.5</u>	<u>approx. -3</u>

Gas Composition (Wet)

CO ₂	vol. %	<u>8.57</u>	<u>8.30</u>
O ₂	"	<u>9.16</u>	<u>9.75</u>
N ₂ + Ar	"	<u>68.98</u>	<u>70.09</u>
H ₂ O	"	<u>13.24</u>	<u>11.72</u>
SO ₂	"	<u>0.0116</u>	<u>0.0530</u>
HCl	"	<u>0.0420</u>	<u>0.0883</u>
HF	"	<u>0.0</u>	<u>0.0044</u>
Total		<u>100.00</u>	<u>100.00 (Rounded)</u>

Gas Composition (Dry)

CO ₂	vol. %	<u>9.88</u>	<u>9.40</u>
O ₂	"	<u>10.56</u>	<u>11.04</u>
N ₂ + Ar	"	<u>79.50</u>	<u>79.40</u>
H ₂ O	"	<u>0.0</u>	<u>0.0</u>
SO ₂	"	<u>0.0134</u>	<u>0.0600</u>
HCl	"	<u>0.0484</u>	<u>0.1000</u>
HF	"	<u>0.0</u>	<u>0.0050</u>
Total		<u>100.00</u>	<u>100.00 (Rounded)</u>

<u>Acid Gases (Dry Gas)</u>		<u>Expected Continuous (2)</u>	<u>Design(3)</u>
SO ₂	Lbs/hr	<u>100</u>	<u>531</u>
SO ₂	PPMDV	<u>134</u>	<u>600</u>
HCl	Lbs/hr	<u>206</u>	<u>494</u>
HCl	PPMDV	<u>484</u>	<u>1000</u>
HF	Lbs/hr	<u>0</u>	<u>14</u>
HF	PPMDV	<u>0</u>	<u>50</u>
H ₂ SO ₄	PPMDV at 7% O ₂ (4)	<u>14</u>	<u>45</u>

Particulates (Wet Gas) (5,6)

gr/scf (68°F)	<u>2.2</u>	<u>2.5</u>
lbs/hr	<u>1623</u>	<u>2121</u>

NOTES

1. All data are for one (1) unit and are based on combustion calculations and not the "pitot tube" conditions. The Seller shall provide allowance for in-leakage (3% minimum); this shall be included in Seller's mass balances (assume inleakage occurs half in scrubber & half in baghouse). In addition, the boiler may be fired on Auxiliary fuel (see section 4.4.8), refuse, or a combination of both.
2. Minimum operation will be at 70% of flow based on Expected Continuous operation. During initial start-up of the boiler, economizer outlet flue gas temperatures will be about 330°F. As the boiler fouls the outlet temperature will increase to the temperature shown. This initial operation will last approximately 4 to 6 weeks. Similar, less severe, conditions may also occur after major boiler overhauls. The scrubber vessel and auxiliaries shall be designed such that acid gas scrubbing can begin at 330°F and 70% of "Expected Continuous" gas flow and flue gas can be passed through the baghouse modules. Lime consumption and acid gas removal efficiency guarantees are not required for this operation. The Seller shall state the estimated acid gas removal efficiency at this operating point. The Seller shall also list any other system start-up limitations that would affect operation under the above conditions.
3. Seller shall provide mass balance for the Design Condition at the normal operating, high O₂ and high H₂O points shown in figure 1 of attachment 3. For the high O₂ and H₂O cases, the lbs/hr of flue gas and acid gases are the same as shown above. The gas compositions for the High O₂ and High H₂O cases are shown below. Seller shall also provide Mass Balance for the Design Condition based on the highest scrubber outlet temperature shown in note 2 of attachment 3 using the most stringent combination of O₂/H₂O (Ref. figure 1 of Attachment 3) with respect to consumption of lime.

Gas Composition (Vol. % Wet)

	<u>High O₂ Case</u>	<u>High H₂O Case</u>
CO ₂	<u>7.06</u>	<u>8.70</u>
O ₂	<u>11.16</u>	<u>8.36</u>
N ₂ & Ar	<u>70.49</u>	<u>66.50</u>
H ₂ O	<u>11.23</u>	<u>16.38</u>

4. H₂SO₄ concentrations are shown at an O₂ concentration of 7%. The APC system shall be designed to accommodate the range of O₂ concentrations shown in figure 1 of Attachment 3.
5. Minimum particulate loading is 0.25 gr/dscf.
6. Seller's design shall also include the additional particulate loading shown in section 4.4.12.

ATTACHMENT 3

REQUIRED GUARANTEES

- 3.1. Emission Guarantees (1) **
- Particulates: 0.010 gr/dscf corrected to 7% O₂ .
- PM-10 0.010 gr/dscf corrected to 7% O₂ .
- Sulfur Dioxide: 85 % min. removal rate or 30 ppmv (dry)(max) corrected to 7% O₂ , whichever is less stringent.
- Hydrogen Chlorides: 95 % min. removal rate or 25 ppmv (dry) (max) corrected to 7% O₂ , whichever is less stringent.
- Hydrogen Fluoride: 95 % min. removal rate or 1 ppmv (dry) (max) corrected to 7% O₂ , whichever is less stringent.
- Sulfuric Acid: * % min. removal rate or * ppmv (dry) (max) corrected to * , whichever is less stringent.
- Opacity: less than 10 % under all operating conditions and based on a 6-minute rolling average

Averaging Time: The above guarantees shall be verified by the test methods in Section 3.2.1.1 Acid gases that are monitored with CEM analyzers and subject to averaging times will be monitored for a 72 hours period to confirm that system response time is sufficient to maintain compliance. Averaging times are as follows:

(REFER TO ATTACHMENT 9)

3.2 Overall System Static Pressure Drop (1)

Seller shall provide overall maximum and average APC system static pressure drop guarantees based on the flows and temperatures at the Economizer outlet. The Maximum pressure drop shall be with one baghouse compartment isolated at the start of a cleaning cycle. The Average pressure drop shall be the average between the baghouse cleaning and non-cleaning modes. Correction curves shall be provided as specified in Section 3.1.1. These guarantees shall be provided for the following operating conditions:

- a. Expected Continuous Operation - Maximum and Average
- b. Design Condition - Maximum and Average
- c. 0.91 x flow at the Design Condition - Maximum only (for use in I.D. fan Test Block Pressure determination)

*** - H₂SO₄ EMISSIONS SHALL NOT EXCEED 8.95 LB/MR**

**** - REFER ALSO TO ATTACHMENT 9**

3.3. Total System Power Consumption

- a. Vendor to supply this data for Expected Continuous Operation and Design Conditions. Guarantee values shall be 24 hour average values and shall include all equipment (except the I.D. fan) supplied by Seller.
- b. Guaranteed maximum power demand.

3.4 Total System Water usage

Seller to supply this data for Expected Continuous Operation and Design Conditions.

3.5 Instrument/Pulse-Jet Air Consumption

3.6 Total Reagent Consumption (as 90% CaO) (1)

Vendor to supply this data for Expected Continuous Operation and Design Conditions and correction curves as specified in Section 3.1.1.

3.7 Bag Life - 2 years (minimum) for Pulse-Jet Bags

3.8 In addition to the above, Seller shall guarantee that the APC system being furnished will meet all sections of the regulations of applicable regulatory agencies and permits that apply to acid gas removal and particulate removal requirements including test methods, reporting criteria, etc. Copies of which are attached hereto and form an integral part of this Specification (Attachment 9).

3.9 Gas Temperatures for Above Guarantees

- a. Scrubber Exit (2)

285 °F

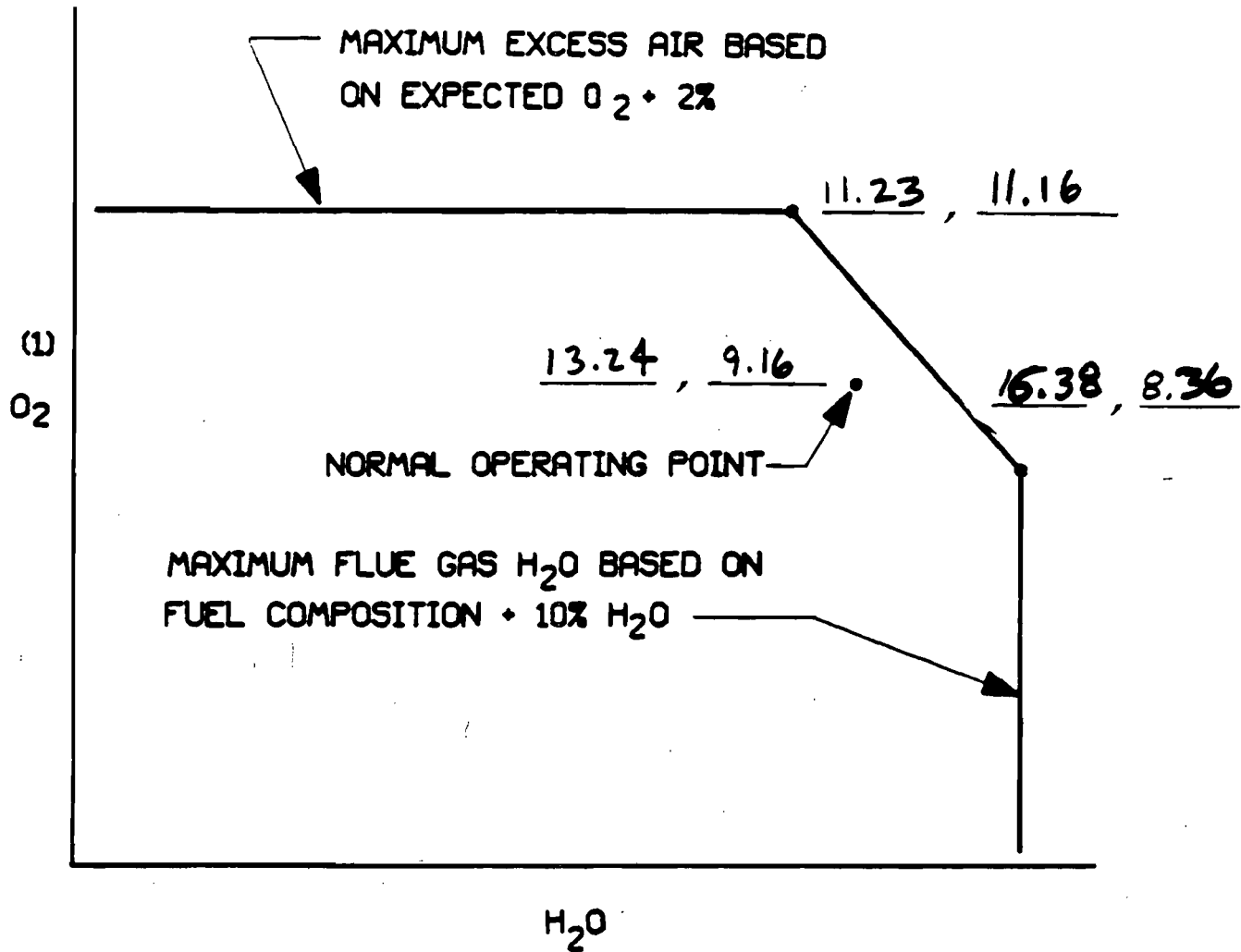
- b. Stack Inlet

maximum 10°F drop from Scrubber outlet

NOTES:

1. These guarantees shall be met for each individual combustion train. The methods of Section 3.2.1.1 and compliance with averaging times as verified with facility CEM equipment shall be used.
2. Emission guarantees shall also be met for scrubber outlet temperatures ranging from 270 °F to 300 °F.





(1) O₂ IS BASED ON HIGH EXCESS AIR OPERATION.
ADDITIONAL AIR FLOW SHALL BE CONSIDERED.

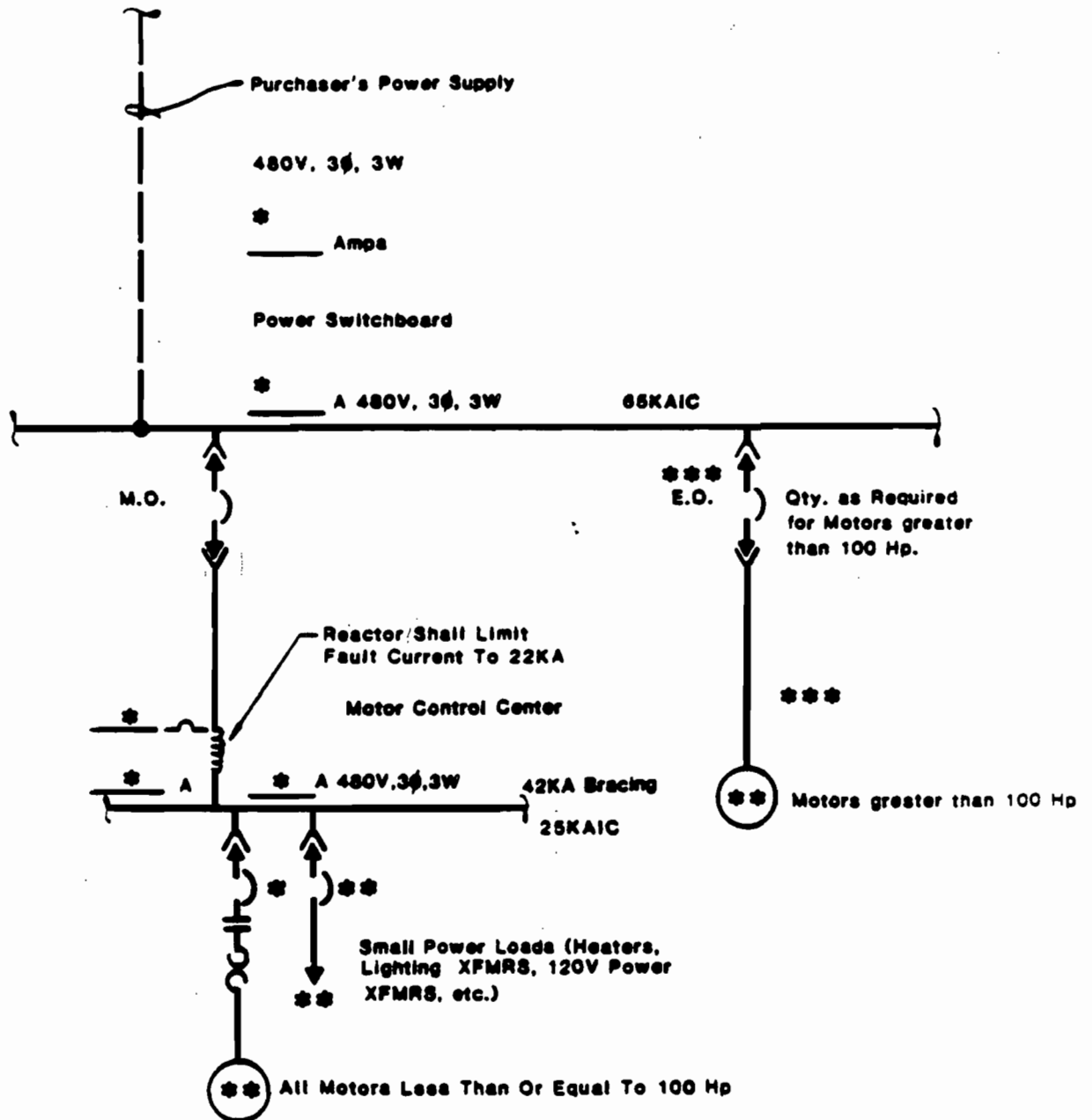
A3-3



FIGURE 1
EMISSIONS GUARANTEE CURVE

OGDEN PROJECTS, INC.	
APPROVED	DATE
DRG. No. SM-105	REV.

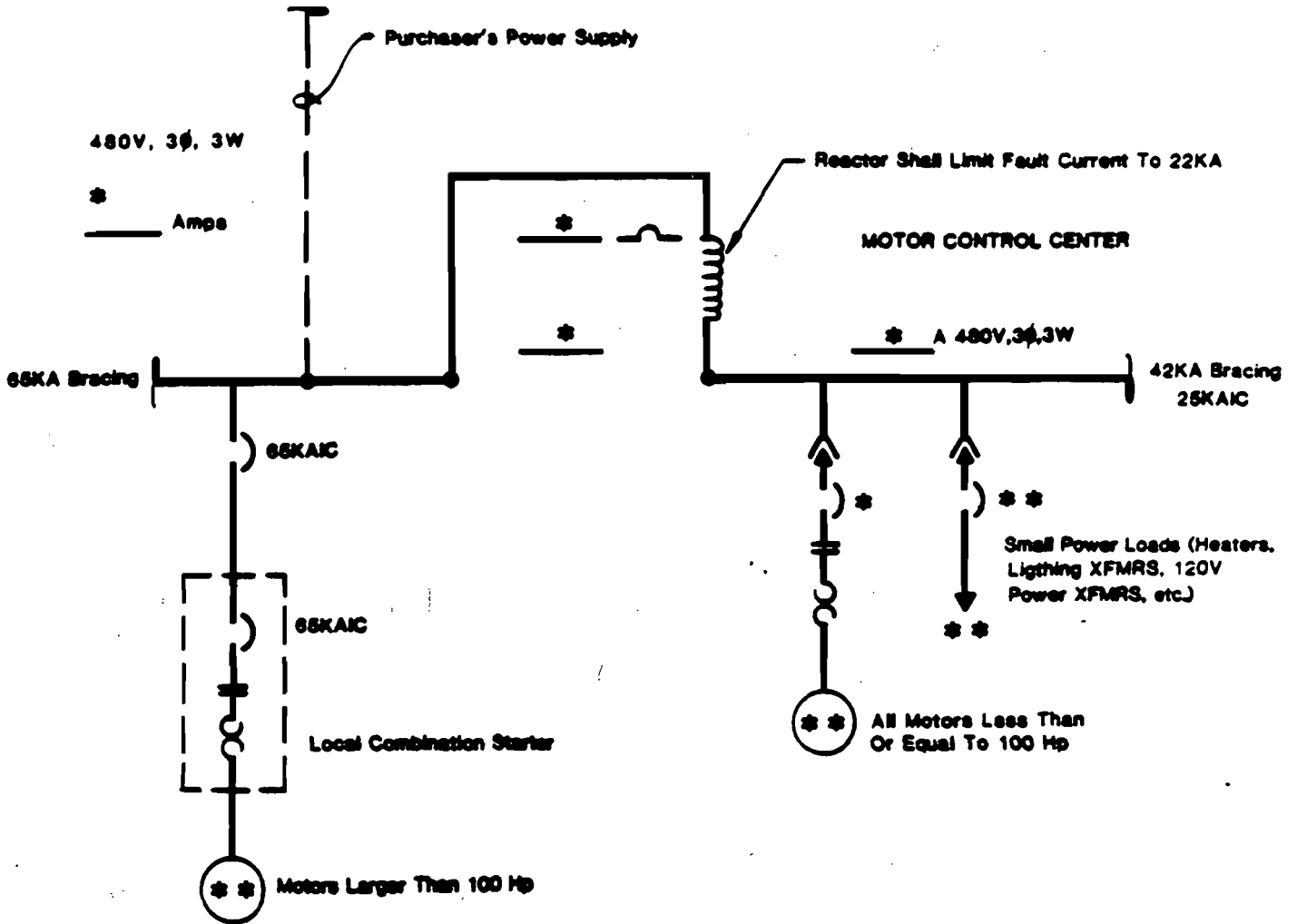
SUBJECT Typical Flue Gas Cleaning Online - Base
SPECIFICATION SM - 105



- * Ratings to be determined by Vendor.
- ** Quantity to be determined by Vendor.
- *** Breakers can be manually operated if Local Combination starter is provided. Equipment shown is typical for each combustion train.

ATTACHMENT - 4

SUBJECT: Typical Flue Gas Cleaning Outline - Alternate
SPECIFICATION SM - 105



- * Rating to be determined by Vendor.
- ** Quantity to be determined by Vendor.

ATTACHMENT 5
SERVICE WATER ANALYSIS

Milligrams Per Liter
(Except Where Units Are Indicated)

	Slaking Water	Scrubber/ Dilution Water
METHYL ORANGE Alkalinity (CaCO ₃)	<u>50</u>	<u>300</u>
Phenol Alkalinity (CaCO ₃)	<u> </u>	<u> </u>
Noncarbonate Hardness (CaCO ₃)	<u> </u>	<u> </u>
Total Hardness (CaCO ₃)	<u>100</u>	<u>800</u>
Calcium (Ca)	<u>50</u>	<u>400</u>
Magnesium (Mg)	<u>50</u>	<u>400</u>
Sodium (Na)	<u>720</u>	<u>15,000</u>
Chloride (Cl)	<u>300</u>	<u>10,600</u>
Fluoride (F)	<u>10</u>	<u>100</u>
Nitrate (N)	<u>5</u>	<u>50</u>
Total Phosphate (P)	<u>5</u>	<u>50</u>
Sulfate (SO ₂)	<u>500</u>	<u>5,000</u>
Total Cations (meq/l)	<u>820</u>	<u>15,800</u>
Total Anions (meq/l)	<u>820</u>	<u>15,800</u>
Total Dissolved Solids	<u> </u>	<u> </u>
Turbidity (NTU)	<u>-</u>	<u>-</u>
Silica (SiO)	<u>15</u>	<u>100</u>
Color (Pt-Co Color Units)	<u>5</u>	<u>5</u>
Conductivity (umhos/cm)	<u> </u>	<u> </u>
pH Value (pH Units)	<u>5-7</u>	<u>6-9</u>
Total THM's (ug/l)	<u> </u>	<u> </u>
Free Chlorine	<u> </u>	<u> </u>
Gpm available	<u> </u>	<u> </u>
Pressure/Temperature (psig/°F) (at supply point)	<u>/</u>	<u>/</u>

Potable water is available at the supply point at / /
GPM/psig/°F.

ATTACHMENT 5 (Cont'd)
TYPICAL SCRUBBER/DILUTION WATER ANALYSIS


<u>Component</u>	<u>Range in ppm as CaCO₃</u>	
Ca	100-1000	ppm as CaCO ₃
Mg	50-400	ppm as CaCO ₃
Na	1000-4000	ppm as CaCO ₃
SO ₄	2000	ppm as CaCO ₃
Cl	2500	ppm as CaCO ₃
NO ₃	25-100	ppm as CaCO ₃
HCO ₃	300	ppm as CaCO ₃
SiO ₂	200	mg/l
pH	6.5-8.5	
TDS	4000	
TSS	< 200	
Temperature	45-120	°F
Gpm available	_____	gpm
Pressure Available	_____	psig

Note: The above are based on using cooling tower blowdown from a zero discharge facility.

ATTACHMENT 6

INFORMATION REQUIRED WITH BID

Seller shall submit all equipment data and descriptive details which will facilitate evaluation of this proposal, and should include:

- 6.1 System heat and material balances for Expected Continuous operation and Design conditions (ref. note 3 page A2-2), including a schematic diagram clearly labeling each stream. Also provide mass balance. 
~~_____~~
- 6.2 General arrangement and elevation drawings(s)
- 6.3 Lime preparation equipment arrangement.
- 6.4 Complete description of proposed equipment including electrical equipment.
- 6.5 Complete description of proposed control system operation and hardware including P&IDs of all systems.
- 6.6 Foundation loading diagrams including I.D. fan and scrubber inlet duct at Boiler Building interface ("not to exceed") and column location plan. Also Seller to identify his requirements regarding use of Purchaser's foundations to resist overturning moments and uplift forces (Ref. section 2.8.2 item 4).
- 6.7 Motor list and electrical load summary, and ID, RA & Compressor motor data sheets.
- 6.8 Performance data including guarantee correction curves and listing of specific guarantees.
- 6.9 Estimated performance at 330°F and 70% of "Expected Continuous Operation" gas flow, including any operating constraints (see Page A2-2).
- 6.10 Completed Data Sheets in Attachment 7.
- 6.11 Detailed explanation of electrical distribution system including one line diagram, description of protective relaying scheme, system flexibility, interlocks, demand kW and KVA of each power feed, and essential power requirements.
- 6.12 Construction sequencing schedule including crane location and laydown area.
- 6.13 Priced list of all recommended spare parts and tools.
- 6.14 Statement of full compliance with this Specification with all exceptions listed in a dedicated section of Seller's proposal; listed exceptions shall include a detailed explanation as to why the exception was taken.

ATTACHMENT 6 (cont'd)

INFORMATION REQUIRED WITH BID

- 6.15 Complete pricing data including the following options (if offered).
- a. Deletion of current limiting reactors in MCC's (see Section 2.9.4)
 - b. Reverse air fan atmospheric inlet (see Section 2.3.3)
 - c. Bolted lime silo (see Section 2.2.4.1)
 - d. I.D. fans (see Section 4.4.3); Provide Break-out price
 - e. Test/instrument ports and access platform at I.D. fan inlet duct (see Section 4.4.5)
 - f. Option price for Seller's standard control system as shown in Attachment A10-3.
- 6.16 Bag dimensional drawing including calculation method of bag effective area.



ATTACHMENT 7

FLUE GAS CLEANING SYSTEM DATA SHEETS (18 Pages)

7.1	<u>Guarantees (1)</u>	<u>Expected Continuous Operation (2)</u>	<u>Design Conditions (2)</u>
a.	<u>Emission Guarantees</u>		
i	Particulate	0.010 gr/dscf at 7% O ₂	0.010 gr/dscf at 7% O ₂
ii	PM-10	0.010 gr/dscf at 7% O ₂	0.010 gr/dscf at 7% O ₂
iii	SO ₂	85% Removal or 30 ppmd @ 7% O ₂	85% Removal or 30 ppmd @ 7% O ₂
iv	HCl	95% Removal or 25 ppmd @ 7% O ₂	95% Removal or 25 ppmd @ 7% O ₂
v	HF	95% Removal or 1 ppmd @ 7% O ₂	95% Removal or 1 ppmd @ 7% O ₂
vi	Opacity	10%	10%
vii	Sulfuric Acid	≤ 8.95 lb/hr	≤ 8.95 lb/hr
b.	<u>Performance Guarantees</u>		
i	Static pressure drop from economizer outlet flange to Stack inlet, IWC (max/avg)	11.0/ 9.9	11.8/ 10.7
ii	Static pressure drop from economizer outlet flange to stack in- let, IWC (maximum)	10.7	(3)
iii	Stack Inlet, temp., °F	275	275
iv	Bag life, years	2	2
c.	<u>Utilities Guarantees (total for all trains)</u>		
i	* Power consumption, kW	148	171
ii	** Maximum power demand, kW	444	444
iii	Reagent consumption, lbs/hr	768	2,811
	lbs/hr CaO	691	2,530

* Consumption exclusive of HVAC, lighting, hopper heat, or I.D. Fans. Valves are based on 425 ° F SDA inlet temperature.
 ** Connected maximum power exclusive of HVAC, lighting, hopper heat, or I.D. Fans.

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iv	- Water consumption, gpm:	82	76
	- Scrubber/Dilution	9	31
	- Slaking	9	31
	- Potable	9	31
v	Instrument/pulse-jet air	90	90

Notes:

- (1) As per the requirements in Attachment 3 and Section 3.0.
- (2) Based on an APC System in-leakage of 3 % of the economizer outlet flow.
- (3) Reference section 3.2c of Attachment 3

7.2 Scrubber Vessel (Data per train)

a)	Manufacturer	<u>ABB ES</u>
b)	Type (rotary atomizer, dual fluid nozzle)	<u>Rotary Atomizer</u>
c)	Gas residence time (Expected/Design)	<u>17.43 / 15.23</u>
d)	Stoichiometric ratio (Expected/Design)	<u>1.28 / 1.33</u>
e)	Reagent flow rate, gpm (Expected/Design)	<u>41.3 / 47.9</u>
f)	Percent solids in slurry (Expected/Design)	<u>2.0 / 6.2</u>
g)	Minimum flue gas flow to meet guarantees, SCFM	<u>70% of Expected</u>
h)	Minimum total flue gas enthalpy to meet guarantees, Btu	<u>70% of Expected</u>
i)	Minimum flue gas flow and enthalpy required to start-up scrubber	<u>70% of Expected</u>
j)	Slurry droplet size, (microns)	<u>121</u>
k)	Maximum possible Ca(OH) ₂ injection (lb/hr)	<u>1,519</u>
l)	Estimated system response time to a step change in SO ₂ content of flue gas	<u>2 min. @ Expected Con.</u>

m)	SO ₂ control signal requirements	
	i. Inlet SO ₂ signal (Yes/No)	<u>Yes</u>
	ii. Outlet SO ₂ signal (Yes/No)	<u>Yes</u>
	iii. Flue gas flow feed forward (Yes/No) (expressed as steam flow or scrubber delta P)	<u>No</u>
	iv. Time between SO ₂ signal updates	<u>5 min.</u>
n)	Vessel diameter, Ft.	<u>36</u>
o)	Vessel straight side height, Ft.	<u>28</u>
p)	Vessel design pressure, IWC/temperature, °F	<u>± 25 / 600</u>
q)	Vessel wall material / thickness, in.	<u>A-36 / 1/4</u>
r)	Vessel insulation material / thickness	<u>Fiberglass / 4"</u>
s)	Insulation lagging material/thickness, in./ finish	<u>Al. / .04 / Vendor Std.</u>
t)	Penthouse	
	- Siding material / finish	<u>n/a /</u>
	- Insulation material / thickness	<u>n/a /</u>
	- Length / width / height, Ft.	<u>n/a / /</u>
	- Heating, kW	<u>n/a</u>
	- Type of crane / crane capacity	<u>Electric Hoist / 3 ton</u>
u)	Wall cleaner (if included, provide separate description)	<u>n/a</u>
v)	Scrubber outlet delumper included?	<u>No</u>
	- tons/hr.	<u>n/a</u>
	- hp	<u>n/a</u>
w)	Ash and spent lime to ash system, lbs./hr. (Expected/Design)	<u>353 / 682</u>
x)	Hoppers	
	i - Net operating capacity, cu. ft	<u>Continuous Evac.</u>
	ii - Net operating capacity, hrs.	<u>Continuous Evac.</u>

iii	- Heaters (Kw, manuf., type)	<u>6.5 /later/ blanket</u>
iv	- Poke holes (quantity, size)	<u>2 / 4</u>
v	- Level switch (manufacturer, type)	<u>later / capacitance</u>
vi	- Reinforced strike plates, quantity	<u>2</u>
vii	- Valley angle	<u>60</u>
viii	- Flange size	<u>12" x 12"</u>
ix	- Clearance below hopper flange	<u>10'</u>
x	- Hopper lower 1/3 portion temp. min./max., °F	<u>Min. - 150oF above minimum ambiet (w/o flue Gas) Maximum - 285oF</u>
xi	- Access doors (quantity, size)	<u>1 / 24" x 24"</u>
xii	- Vibrator (quantity, manuf. type)	<u>1 /later/</u>
y)	Compressor(s)	
i	- Manufacturer and Model No.	<u>n/a</u>
ii	- Quantity / train	<u>n/a</u>
iii	- Quantity, total	<u>n/a</u>
iv	- Type	<u>n/a</u>
v	- Flow each, cfm	<u>n/a</u>
vi	- Pressure, psig	<u>n/a</u>
vii	- Brake hp/rpm	<u>n/a /</u>
viii	- Motor hp/rpm	<u>n/a /</u>
ix	- Cooling water each, GPM	<u>n/a</u>
x	- Cooling water supply pressure required at interface, psig	<u>n/a</u>
xi	- Cooling water return pressure available at interface, psig	<u>n/a</u>
z)	Structural support steel surface prep. and finish	<u>SP6/1 coat primer</u>
aa	Instrumentation and controls description	<u>please provide as an attachment</u>

bb	Required scrubber water pressure at grade, psig	60
cc	Required slaking water pressure at grade, psig	40
dd	Required dilution water pressure, at grade, psig	40
ee	Required instrument air pressure, psig	80
ff	Centerline distance between two trains, ft.	53'-8"
gg	Distance from economizer outlet to stack centerline, ft.	177'-6"

7.2.1 Rotary Atomizer Design

1.	No. of atomizers per vessel	1
2.	Reagent Flow to Atomizer, gpm	41.3 (exp.)
3.	Maximum possible Reagent flow to Atomizer, gpm	47.9 (design)
4.	Atomizer manufacturer	Combustion Engineering
5.	Atomizer diameter	10" wheel
6.	Atomizer RPM	11,295
7.	Atomizer Hp	150
8.	Gear box manufacturer	Sundstrand
9.	Gear box: ratio / type	3.18 / 2-stage spur
	No bearings	6
	Bearing type	ball (4), journal (2)
	Lubrication system	Forced Oil Lubrication
10.	Drive motor manufacturer	later
11.	Drive motor: RPM / type	3550 / TEFC
	Voltage	480
	hp	150
	Heaters	no
	Bearings (type/lubrication)	

- | | | |
|-----|--|---|
| 12. | Can assembly be removed for inspection/repair without shutdown of the boiler | <u>Yes</u> |
| 13. | Expected life of atomizer wheel | <u>Body components -10 yrs</u>
<u>Wear components -3 yrs.</u> |
| 14. | Attach description of atomizer design including:
-Outline sketch with dimensions and weight
-Vibration monitoring instrumentation
-Atomizer wheel design features to minimize erosion, vibration, plugging
-Lubrication system
-Nozzle Material | <u>Wheel - 10" dia. x 4",
41 lbs.</u>
<u>Eddy current proximity
probe</u>
<u>Hardened tool steel &
silicon carbide wear
components</u>
<u>Internal and External
lube oil pumps</u>
<u>Hardened tool steel &
silicon carbide wear
components</u> |
| 15. | Cooling water user flow, GPM | <u>n/a</u> |
| 16. | Cooling water supply pressure required at interface point, psig | <u>n/a</u> |
| 17. | Cooling water return pressure available at interface, psig | <u>n/a</u> |
| 18. | Minimum Nozzle clearance for slurry flow | <u>n/a</u> |

7.2.2 Dual Fluid Nozzle Design

- | | | |
|----|--|------------|
| 1. | Number of nozzles | <u>n/a</u> |
| 2. | Nozzle material | <u>n/a</u> |
| 3. | Minimum nozzle flow clearance for lime slurry | <u>n/a</u> |
| 4. | Expected nozzle life | <u>n/a</u> |
| 5. | Can nozzles be removed for inspection / replacement without shutdown of the boiler | <u>n/a</u> |
| 6. | Number of inlet gas distributors / nozzle assemblies | <u>n/a</u> |
| 7. | Number of spare nozzles provided | <u>n/a</u> |
| 8. | Shield air blower, CFM | <u>n/a</u> |

9.	Shield air blower, Hp/Rpm	n/a /
10.	Shield air blower delta P, in. H ₂ O	n/a
11.	No. of shield air blowers	n/a
12.	Compressed air requirement (Expected/Design)	n/a /

7.3 Reagent Preparation System (common) (Data for all trains)

a.	Lime storage silo(s)	
i -	Diameter, ft.	13
ii -	Height(straight side/hopper), ft.	18' / 10'
iii -	Capacity, tons gross/net	78 / 62
iv -	Capacity, days @ Expected conditions	7.7
v -	Skirted silo (yes/no)	Yes
vi -	Equipment located inside skirted silo	Yes
vii -	Access doors size/no.	Vendor / Standard
viii -	Bin activator or vibrator, manuf./type	Later / Bin activator
ix -	Screw feeder, manuf./capacity	Later / 3,000 lb.hr (CaO)
xi -	Weigh feeder, manuf./capacity	n/a /
b.	Lime silo accessories	
i -	Dust collector, manuf./type	Later / Shaker
ii -	Level indicator, manuf./type	Later / Capacitance
iii -	Truck unloading equipment	sched. 40 fill pipe and control panel
c.	Slaker(s)	
i -	Manufacturer	Portec, Chemco, or equal
ii -	Quantity	2
iii -	Capacity, lbs/hr (each)	3,000 (CaO)
iv -	Motor hp	2

d.	Grit removal system, manuf./type no. screens/mesh	Sweco or equal / Vibrating Screening
		<u>2 / 40</u>
e.	Grit discharge chute to 3 ft. above outdoor grade level provided (Yes/No)	<u>Yes</u>
f.	Reagent storage tanks(s)	
	i - Quantity	<u>1</u>
	ii - Net flow leaving tank, gpm (without slakers operating)	<u>7.7 (Expected)</u>
	iii - Capacity, gallons gross/net*	<u>11,914 / 8,936</u>
	iv - Capacity (Design), hours-net	<u>8</u>
	v - Diameter/height, ft	<u>13 / 12</u>
	vi - Material/thickness	<u>C.S. / 1/4"</u>
	vii - Agitator (Quantity, manuf., type, hp)	<u>1 / later / 5.0</u>

* Net capacity shall not include the 2' freeboard and the volume below the low-low level switch.

g.	Reagent Mix/Head tank(s)	
	i - Quantity	<u>2</u>
	ii - Capacity, gal. (gross/net)	<u>70 / 47</u>
	iii - Residence time (Expected Continuous), minutes	<u>1</u>
	iv - Diameter/height, ft	<u>2 / 3</u>
	v - Material/thickness	<u>C.S. / 1/4"</u>
	vi - Agitator (Quantity, manuf., type, hp)	<u>2 / later / 1</u>

h.	Reagent Transfer Pumps	
	i - Type	<u>Centrifugal</u>
	ii - Quantity	<u>3</u>
	iii - Capacity, gpm	<u>42</u> RLT

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iv -	TDH, Ft.	137 137 -RUT	A
v -	RPM	1320 1320 -RUT	P
vi -	Type of gland (mech. or pressurized)	Pressurized	
vii -	Material, - casing - impeller	Cast Metal Lined See Cut Sheets	
viii -	Motor hp	15 15 -RUT	A
ix -	Brake, hp	11.2 11.2 -RUT	P
x -	Manufacturer and Model No.	Goulds/1-1/2 x 2-14	
i. Reagent feed pumps			
i -	Type	n/a	
ii -	Quantity	n/a	
iii -	Capacity, gpm	n/a	
iv -	TDH, Ft.	n/a	
v -	RPM	n/a	
vi -	Type of gland (mech/pressurized)	n/a /	
vii -	Material, - casing	n/a	
	- impeller	n/a	
viii -	Motor, hp	n/a	
ix -	Brake, hp	n/a	
x -	Manufacturer and model no.	n/a	
j. Water pumps			
i -	Type	Centrifugal	
ii -	Quantity	3	
iii -	Capacity, gpm	75 -RUT	A
iv -	TDH, Ft	130 -RUT	P

v -	RPM	<u>Later</u>
vi -	Material	<u>Cast</u>
vii -	Motor hp	<u>7.5, PWT</u>
viii -	Brake, hp	<u>4.1, PWT</u>
ix -	Manufacturer and Model No.	<u>Goulds/3196</u>
k.	Describe building (include Bldg. Manuf.)	<u>Skirted Silo</u>



l.	Describe if additional tanks and pumps are provided	<u>Yes - 1 dilution water tank</u>
m.	Lime slurry recirculation system (yes/no)	<u>Yes</u>
	i - orifice plate material	<u>n/a</u>
n.	Lime slurry Strainer	<u>Yes</u>
	i - Type	<u>Duplex</u>
	ii - location	<u>Feed tanks</u>
	iii - Basket Mesh	<u>Later</u>

7.4 Fabric Filter Option (Data per train)

a.	Manufacturer	<u>ABB ES</u>
b.	Type (pulse-jet/reverse air)	<u>Pulse Jet</u>
c.	Overall size	<u>60' x 33'</u>
d.	Structural design temp., °F	<u>600</u>
e.	Structural design pressure, IWC	<u>+ - 25</u>
f.	Gas volume, ACFM/Temp. °F (including in-leakage-3% min.)	
	i - Inlet at Expected Continuous *	<u>139,769 / 285</u>
	ii - Inlet at Design condition *	<u>160,147 / 285</u>
	iii - Outlet at Expected Continuous	<u>138,024 / 275.7</u>

*Use B.H. outlet flow from mass balance corrected to B.H. inlet temperature.

g.	Outlet gas volume (design), ACFM/Temp. °F (without in-leakage)	<u>156,081 / 275.8</u>
h.	Casing material/thickness	<u>A-36 / 3/16"</u>
i.	Exterior surface prep. and finish	<u>No / Paint</u>
	Interior surface prep. and finish	<u>No paint</u>
j.	Access doors (quantity per module, size)	<u>1 / 2' x 7'</u>
k.	Insulation, material/thickness	<u>Fiberglass / 4"</u>
	Lagging, material/thickness/finish	<u>Al / 0.040 / Vendor St</u>
l.	Bags/Cages	
	i - Bag Material, finish and manuf.	<u>Burlington / / 625-I</u>
	ii - Bag Diameter/length (actual, not nominal)	<u>6" / 14'-1-3/4"</u>
	iii - Cage Material, finish and manuf.	<u>c.s / n/a / later</u>
	iv - No. and gage of cage wires	<u>20 / 12</u>
	iv - No./guage/mat'l of rings	<u>n/a / /</u>
	v - Effective cleaning area per bag as specified in Section 2.3.	<u>21.6941</u>
	vi - Bag to tubesheet sealing method	<u>snap-ring</u>
m.	Number of bags per module	<u>320</u>
n.	Number of modules per baghouse	<u>8</u>
o.	Effective cleaning area per baghouse	<u>55,537 ft²</u>
p.	Air to cloth ratio (Expected/Design)	
	i - With all modules in service	<u>2.517 / 2.884</u>
	ii - With one module out of service	<u>2.876 / 3.296</u>
q.	Max. continuous operating temp. for bags, °F	<u>500</u>
r.	Excursion temp. for bags for 30 minutes, °F	<u>500</u>
s.	Bypass duct size	<u>50" dia.</u>

- | | | |
|----|--|--------------------------|
| t. | Bypass dampers | |
| | i - Quantity | <u>2 per FF</u> |
| | ii - Type and manufacturer | <u>poppet / later</u> |
| | iii - Size | <u>50" dia.</u> |
| | iv - Type of operator | <u>pneumatic</u> |
| u. | Inlet damper | |
| | i - Quantity | <u>1 per module</u> |
| | ii - Type and manufacturer | <u>betterfly / later</u> |
| | iii - Size | <u>later</u> |
| | iv - Type of operator | <u>manual chain</u> |
| v. | Outlet dampers | |
| | i - Quantity | <u>1 per module</u> |
| | ii - Type and manufacturer | <u>poppet / later</u> |
| | iii - Size | <u>later</u> |
| | iv - Type of operator | <u>pneumatic</u> |
| w. | Reverse gas fan | |
| | i - Manufacturer and Model No. | <u>n/a</u> |
| | ii - Quantity | <u>n/a</u> |
| | iii - Capacity, ACFM/static head, inches | <u>n/a /</u> |
| x. | Ventilation fan | |
| | i - Manufacturer and Model No. | <u>n/a</u> |
| | ii - Quantity, per train/total | <u>n/a /</u> |
| | iii - Capacity each, CFM | <u>n/a</u> |
| y. | Penthouse heating, ventilating
and lighting | <u>n/a</u> |
| z. | Hoppers | |
| | i - Type | <u>Pyramidal</u> |

ii -	Net operating capacity each, F ³	<u>continuous evacuatic</u>
iii -	Net operating capacity each, (Design), hrs.	<u>cont. evacuation</u>
iv -	Heaters (total kW, manuf., type)	<u>Bylin or 6 /equal/ blanket</u>
v -	Vibrator (quantity, manuf., type)	<u>1 /later / pneumatic</u>
vi -	Poke holes (quantity, size)	<u>2 / 4"</u>
vii -	Level switch, type and manuf.	<u>capacitance later</u>
viii -	Reinforced strike plates, quantity	<u>1</u>
ix -	Valley angle	<u>55</u>
x -	Flange size	<u>12" x 18"</u>
xi -	Clearance below hopper flange	<u>10'</u>
xii -	Hopper lower 1/3 portion temp. min./max, °F	<u>Min - 150°F above minimum ambient (w/o Flue Gas) Max. - 285°F</u>
xiii -	Access doors (quantity, size)	<u>1 / 24" x 24"</u>
aa.	Ash and spent lime to disposal, lbs/hr per FF	
i -	Expected Continuous Operation	<u>2,035</u>
ii -	Design condition	<u>4,063</u>
bb.	Monorail (quantity, manuf., type)	<u>n/a / /</u>
cc.	Hoist (quantity, manuf., capacity)	<u>n/a / /</u>
dd.	Structural support steel surface prep. and finish	<u>SP6 / 1 coat primer</u>
ee.	Instrumentation and controls description	<u>Please provide as an attachment</u>

7.5 Electrostatic Precipitator Option (Data per train)

a.	Manufacturer	<u>n/a</u>
b.	Volume, ACFM @ Expected Continuous	<u>n/a</u>

	@ Design condition	n/a
c.	Temperature, °F @ Expected Continuous	n/a
	@ Design condition	n/a
e.	Dust bulk density, lb/cu ft	n/a
f.	Actual Pressure drop across precipitator including gas distribution devices, IWC	
	- Expected Continuous	n/a
	- Design	n/a
g.	Gas velocity, ft/sec (Expected/Design)	n/a /
h.	Residence time, seconds (Expected/Design)	n/a /
i.	Chambers, quantity	n/a
j.	Fields, quantity and aspect ratio	n/a /
k.	Cells, quantity	n/a
l.	Casing material and thickness, inches	n/a
m.	Casing design pressure, IWC	n/a
n.	Hoppers	
	i - Type	n/a
	ii - Quantity	n/a
	iii - Net operating capacity each, ft ³	n/a
	iv - Net operating capacity each, hrs. (Design)	n/a
	v - Heaters (type/manuf., kw per hopper)	/ n/a /
	vi - Vibrators (quantity, manuf., type)	/ n/a /
	vii - Poke holes (quantity, type)	n/a /
	viii - Level switch, manuf. and type	n/a /
	ix - Reinforced strike plates, quantity	n/a
	x - Valley angle	n/a
	xi - Ash outlet Flange size	n/a
	xii - Clearance below hopper flange	n/a

xiii - Hopper lower 1/3 portion temp. min./max, °F	n/a /
xiv - Access doors (no., size)	n/a
xv - Access door safety interlock	n/a
o. Ash and spent lime to disposal, lbs./hr.	
i - Expected Continuous Operation	n/a
ii - Design Condition	n/a
p. Insulator compartment material and thickness, inches	n/a
q. Number of insulator compartments	n/a
r. Precipitator internal gas distr. devices	
i - Types/location	n/a
	n/a
	n/a
s. Access Doors (Quantity, type and size)	
i - Roof	n/a /
ii - Shell	n/a /
iii - Insulator compartments	n/a /
iv - Other	n/a /
t. Collecting System	
i - Number of gas passages	n/a
ii - Spacing of gas passages, Inches	n/a
iii - Collecting surface material and thickness	n/a /
iv - Collecting surface effective length, feet	n/a
v - Collecting surface effective height, feet	n/a
vi - Total collecting effective surface area, sq. ft.	n/a

vii - Maximum collecting surface area rapped at any instant, sq. ft.	n/a
viii - Collecting surface rappers, type	n/a
	n/a
ix - Number of collecting surface rappers	n/a
x - Specific rapping energy (ft./lbs) per lb. of system rapped per rapper maximum installed	n/a
operating design	n/a
u. Discharge Electrode	
i - Type/material/thickness	n/a
ii - Type discharge electrode rappers	n/a
iii - Total number of discharge electrode rappers per field	n/a
v. High Voltage Electrical Set	
i - Type transformer-rectifier	n/a
ii - Number transformer-rectifiers	n/a
iii - Size transformer-rectifier	n/a
- Voltage rating KV (DC) avg. (For pure resistive loads)	n/a
- Current rating mulliams (DC) Avg. (For pure resistive loads)	n/a
iv - Number of transformer-rectifier control cabinets	n/a
v - Construction of transformer-rectifier control cabinets	n/a
vi - Transformer-rectifier insulation fluid	n/a
vii - Wave form of high voltage	n/a
viii - Number and type high voltage switches	n/a
	n/a

ix - Key interlocks	
Control cabinets	n/a
Transformer-rectifiers	n/a
Access doors	n/a
x - Type transformer-rectifier controls	n/a
	n/a
	n/a
xi - Maximum ambient temperature for transformer-rectifier, °F	n/a
xii - Maximum ambient temperature for transformer-rectifier control cabinets, °F	n/a
w. Power Consumption, KVA	
i - Transformer-rectifier	n/a
ii - Rappers	n/a
iii - Insulator heaters and blowers	n/a
iv - Other	n/a
v - Total	n/a
x. Total connected load, KVA	n/a
y. Power distribution	
i - Individual breakers each control cabinet	n/a
ii - Central distribution panel	n/a
z. Heat insulation, type, thickness, and lagging	n/a
aa. Weather enclosure, material and thickness	n/a
bb. Weather enclosure heating, ventilating and lighting	n/a
cc. Insulator compartment blower system	n/a
dd. Model study	n/a

7.6 Auxiliaries (Data per train)

a. Ductwork

i -	Material and thickness	<u>A-36 / 3/16"</u>
ii -	Insulation type/thickness	<u>Fiberglass / 4"</u>
	Lagging type/thickness	<u>Al / .040</u>
iii -	Access doors (quantity size, location)	<u>24" X 24"</u> <u>See GAS</u>
iv -	Support steel	<u>A-36</u>
v -	Expansion joints	
	Quantity	<u>See GAS</u>
	Manufacturer and model	<u>RM type III or equal</u>
	Material	<u>Viton</u>
	Maximum continuous operating temperature, °F	<u>500</u>

b. Test ports

i -	Quantity	<u>as required</u>
ii -	Size	<u>4"</u>
iii -	Location	<u>Econ. outlet & FF outlet</u>

c. Piping material

-	Lime slurry	<u>C.S.</u>
-	Other	<u>C.S.</u>

d. Piping heat tracing

not required

e. Piping insulation type/thickness

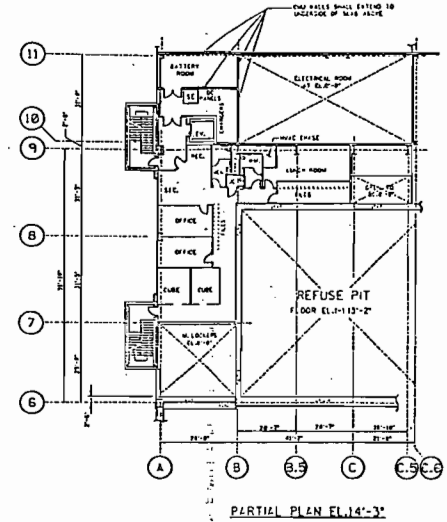
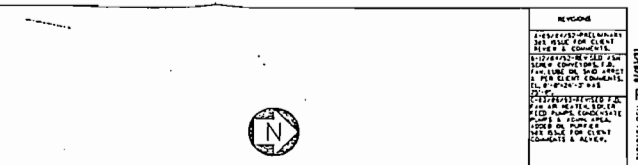
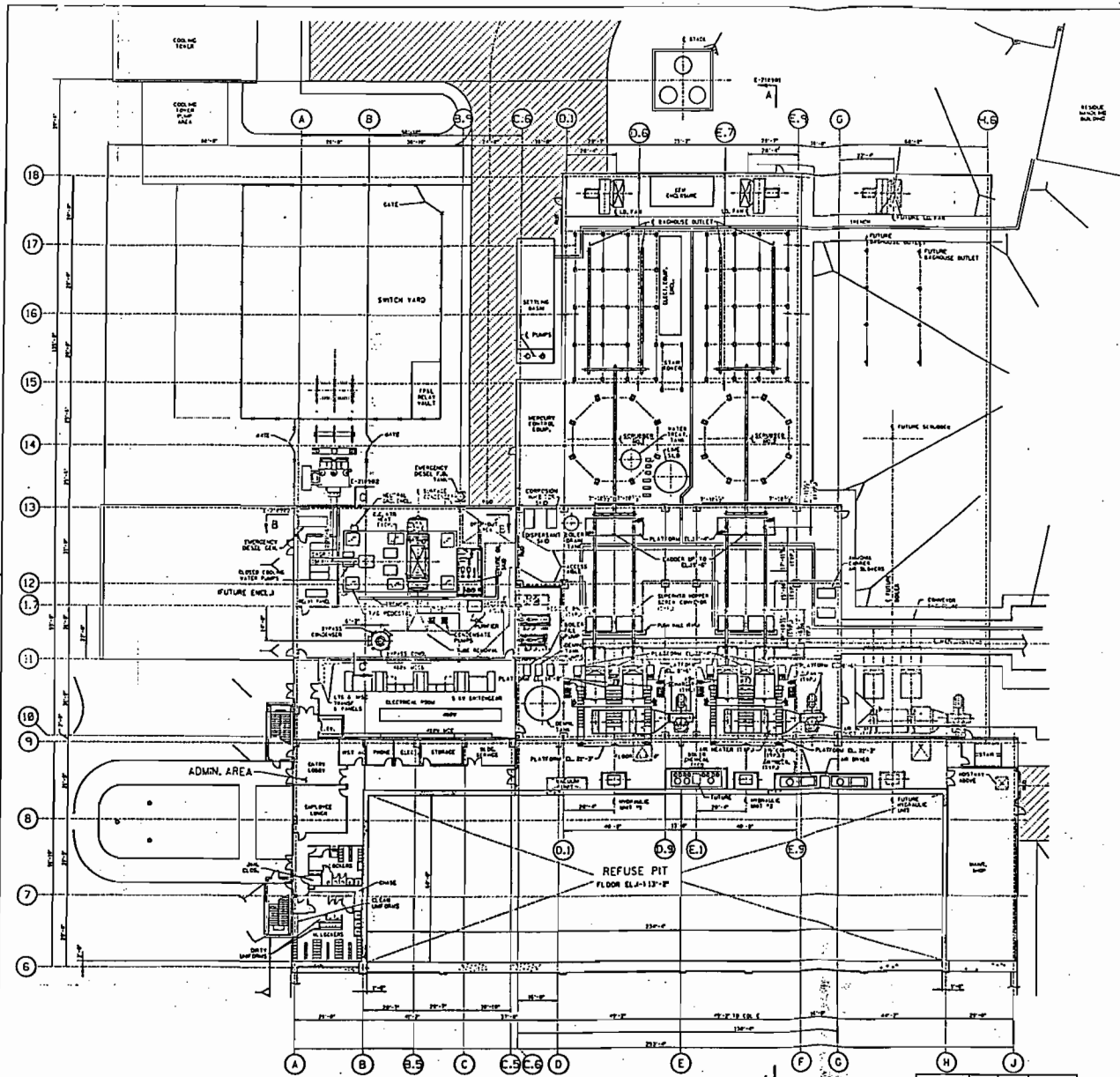
later /

Lagging type/thickness

later /

f. Describe Slurry Flushing System

manual



SM-105
ATTACHMENT 8
(SHEET 1 OF 2)

NO.	DATE	DESCRIPTION
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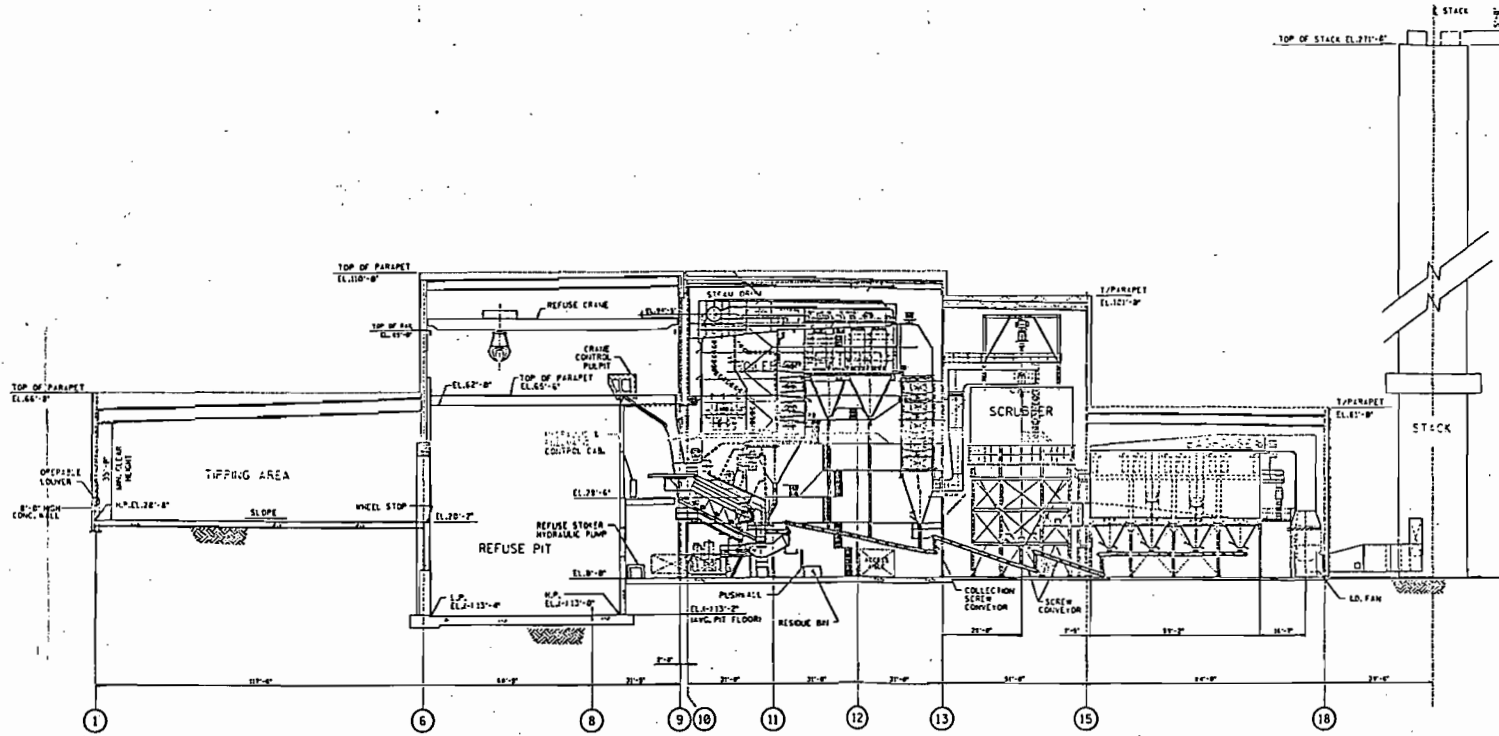
United Engineers & Constructors
A Registered Company

GENERAL ARRANGEMENT PLAN
FLOOR EL. 0'-0" & EL. 14'-3"
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

NO.	DATE	DESCRIPTION
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NO. 1010
L. BOLD FROM FLOOR EL. 0'-0" TO 1'-0"



SECTION A-A

SM-105
ATTACHMENT 8
(SHEET 2 OF 2)

REVISIONS

1	2/12/92	ADD COMMENTS FOR THE TOP OF GLEAT FLOOR & CONCRETE
2	2/12/92	ADD COMMENTS FOR THE TOP OF GLEAT FLOOR & CONCRETE
3	2/12/92	ADD COMMENTS FOR THE TOP OF GLEAT FLOOR & CONCRETE

NO.	DATE	BY	CHKD.	DESCRIPTION
1	1/15/92	JL	ML	ISSUED FOR PERMIT
2	2/12/92	JL	ML	REVISED FOR COMMENTS
3	2/12/92	JL	ML	REVISED FOR COMMENTS

SUBCONTRACT	FOR	FOR	FOR
NO.	NO.	NO.	NO.
1	2	3	4

COMPANY ENGINEERS
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Ogden Kirth Systems of Lee, Inc.
A Best Management Practice

GENERAL ARRANGEMENT
SECTION A-A
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN KIRTH SYSTEMS OF LEE, INC.

DATE	BY	CHKD.	NO.
2/12/92	JL	ML	C-1033
DATE	BY	CHKD.	NO.
2/12/92	JL	ML	7102-E-218901



ATTACHMENT 9

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:
Lee County Utilities
2178 McGregor Blvd.
Ft. Myers, FL 33902

Permit Number: PSD-FL-151

County: Lee
Latitude/Longitude: 26°37'54"N
81°45'41"W

Project: Lee County Waste to Energy
Recovery Facility Units
1 and 2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of the Lee County Solid Waste Energy Recovery Facility located at Buckingham Road and State Road 82, in Fort Myers, Florida consisting of two mass-burn Municipal Waste Combustors (MWC) with two units to be constructed initially and the third unit to be installed in the future. These mass-burn units shall have a maximum permitted capacity of 660 tons/day, each unit, for a total capacity for both units not to exceed 1320 tons/day; and a maximum heat input of 275 MMBtu/hr, per unit, for a total heat input for both units not to exceed 550 MMBtu/hr, based on a municipal solid waste average heating value of 5000 Btu/lb.

Each combustor unit shall be of Stoker Waterwall design (or equivalent) capable of generating 20 MW for a total of 40 MW from both units. Each unit shall be allowed to produce a maximum of 186,200 lbs of steam per hour at 865 psig and 830°F. Each combustor unit shall be equipped with auxiliary burners to be fired by only propane gas. Emissions from each combustor shall be controlled by a slaked lime scrubber followed by a baghouse. NO_x emissions shall be controlled by a SNCR System. Mercury emissions shall be controlled by injecting activated carbon.

The permittee must submit four copies of complete information prior to purchase and installation of any combustor and related equipment. Such information shall include the following: make and model numbers of each MWC and all pollution control and continuous emissions monitoring devices and related equipment.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

The power plant site certification number for this facility is PA90-30.

This source shall be constructed in accordance with the permit application; plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions:

Attachments are as follows:

Power Plant Site Certification package filed on June 29, 1990 and related correspondence.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allo-

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (x) Determination of Best Available Control Technology (BACT)
- (x) Determination of Prevention of Significant Deterioration (PSD)
- (x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. This facility shall be allowed to operate continuously (i.e. 8760 hours/year).

2. Emission Standards

Based on the permitted capacities mentioned in the project description the stack emissions from each unit shall not exceed any of the following limitations:

a. Particulate matter: Particulate emissions from the baghouse shall not exceed 0.010 grains/dry standard cubic

SPECIFIC CONDITIONS:

foot, corrected to 7% O₂; 5.34 lbs/hr per unit; and 21.3 tons/year per unit.

- b. PM₁₀: In no case shall PM₁₀ emissions exceed 0.010 gr/dry cubic standard foot, corrected to 7% O₂ for the fraction of particles less than 10 microns in diameter; 5.34 lbs/hr per unit; and 21.3 tons/year per unit.
- c. *Opacity: In no case shall visible emissions from each baghouse exhaust exceed 10% opacity (six minute average).
- d. *SO₂: 30 ppmdv corrected to 7% O₂, 24 hour daily geometric average or at least 80% removal efficiency, whichever is least restrictive. In no case shall SO₂ emissions exceed 0.150 lbs/MMBtu per unit, 41 lbs/hr/unit, and 163.3 tons/year, per unit.
- e. *NO_x: 180 ppmdv corrected to 7% O₂, 24 hour daily block average (midnight to midnight). In no case shall NO_x emissions exceed 0.290 lb/MMBtu, 80 lbs/hr per unit, and 320 tons/year, per unit.
- f. *Carbon Monoxide: 100 ppmdv at 7% O₂, 4-hour block average beginning at midnight. In no case shall CO emissions exceed .10 lb/MMBtu, 27.2 lbs/hr/unit, and 108 tons/year, per unit.
- g. *VOC (Hydrocarbons): 37 ppmdv at 7% O₂. In no case shall VOC emissions exceed 0.021 lb/MMBtu, 5.80 lbs/hr/unit and 23 tons/year, per unit.
- h. HCl: 25 ppmdv at 7% O₂, or at least 95% removal efficiency, which ever is least restrictive. In no case shall HCl emissions exceed 0.064 lb/MMBtu, 17.70 lbs/hr/unit, and 70.70 tons/year, per unit.
- i. H₂SO₄ (sulfuric acid mist): In no case shall H₂SO₄ emissions exceed 0.036 lb/MMBtu, 9.85 lbs/hr/unit and 39.3 tons/year per unit.
- j. *F (fluoride): 5.0 ppmdv at 7% O₂. In no case shall F emissions exceed 0.0035 lb/MMBtu, 0.96 lbs/hr/unit, and 3.8 tons/year, per unit.

SPECIFIC CONDITIONS:

- k. *Pb (lead): In no case shall lead emissions exceed 0.00060 lbs/MBtu, 0.165 lbs/hr/unit and 0.66 tons/yr., per unit.
- l. *Be (Beryllium): In no case shall Be emissions exceed 1.35×10^{-7} lbs/MMBtu, 3.70×10^{-5} lbs/hr/unit, and 1.47×10^{-4} tons/year, per unit.
- m. *Hg (Mercury): In no case shall mercury emissions exceed 0.000138 lbs/MMBtu, 0.0379 lbs/hr/unit, and 0.166 tons/yr per unit at 140 ug/dscm at 7% O₂ or at least 70 percent removal efficiency by weight.
- n. As (Arsenic): In no case shall arsenic emissions exceed 9.10×10^{-6} lbs/MMBtu, 2.50×10^{-3} lbs/hr/unit, and 0.01 tons/year, per unit.
- o. *Dioxins/Furans: In no case shall emissions of total (tetra thru octa-chlorinated dibenzo-p dioxins and dibenzofurans) exceed 30 ng/dscm @ 7% O₂, 2.54×10^{-8} lbs/MMBtu, 7.0×10^{-6} lbs/hr/unit, and 2.80×10^{-5} tons/year, per unit.
- p. *NH₃: In no case shall ammonia slip from exhaust gases exceed 50 ppmv.
- q. There shall be no visible emissions (less than 5% opacity) during the operations of the lime silo.
- r. In no case shall emissions from the ash handling building baghouse exceed a particulate limit of 0.010 grains/dscf and visible emissions of 5% opacity.
- * Pursuant to Rule 17-4.080 F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions for the pollutants CO, VOC, F, NH₃, SO₂, NO_x, Pb, Be, Hg, dioxins and furans, and visible emissions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time.

SPECIFIC CONDITIONS:

3. Test Methods/Continuous Emissions Monitoring System (CEMS)/Testing Frequency/Sampling Ports/Record Keeping/Reporting of Excess Emissions and Malfunctions.

a. Test Methods

Compliance with emission limiting standards mentioned in Specific Condition No. 2 shall be demonstrated using EPA Methods, as contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources), or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants), or any other method as approved by the Department, in accordance with F.A.C. Rule 17-2.700(3). A test protocol shall be submitted for approval to the South Florida District and to the Bureau of Air Regulation at least 90 days prior to testing. This protocol shall include details on how the weight percentage of used tires in the MSW stream will be accounted for during the compliance testing.

EPA Method

For Determination of

1	Selection of sample site and velocity traverses.
2	Stack gas flow rate when converting concentrations to or from mass emission limits.
3 or 3A	Gas analysis when needed for calculation of molecular weight or percent O ₂ .
4	Moisture content when converting stack velocity to dry volumetric flow rate for use in converting concentrations in dry gases to or from mass emission limits.
5	Particulate matter concentration and mass emissions.
201 or 201A	PM ₁₀ emissions.
6, 6C, or 19	Sulfur dioxide emissions from stationary sources.
7, 7C, or 19	Nitrogen oxide emissions from stationary sources.

PERMITTEE: Lee County

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SPECIFIC CONDITIONS:

- 9 Visible emission determination of opacity.
- At least three one hour runs to be conducted simultaneously with particulate testing for the emissions from dry scrubber/baghouse, and ash handling building baghouse.
 - At least one lime truck unloading into the lime silo (start to finish).
- 10 Carbon monoxide emissions from stationary sources.
- 12 Lead concentration from stationary sources.
- 13A or 13B Fluoride emissions from stationary sources.
- 23 Dioxin/furan concentration.
- 18 or 25 Volatile organic compounds concentration.
- 26, 26a HCl emissions or other methods approved by DER.
- 101A Mercury emissions based on an average of three runs.
- 29 Antimony, Cadmium
- 104 Beryllium emission rate and associated moisture content.
- 108 Arsenic

Note: The weight of MSW being fed to each combustor during the stack test shall be continuously monitored and recorded by a weighing device which is properly calibrated. Stack tests shall be conducted upstream and downstream of the applicable control device for SO₂, Hg and HCl. Soot blowers shall be operated in a mode consistent with the normal cleaning requirements of the system during the compliance testing.

b. Continuous Emissions Monitoring System (CEMS)

Continuous emission monitors with recorders shall be installed, calibrated, maintained and operated subject to approval by the Department for the following:

SPECIFIC CONDITIONS:

Carbon Monoxide, Oxygen, Nitrogen Oxide, Opacity, and Sulfur Dioxide (for SO₂ one monitor shall be located upstream of the scrubber and one shall be located downstream of the baghouse), as specified in 40 CFR 60, Appendix B; total steam production (lbs/hr, pressure, and temperature) and power generation (MW) for each unit; ammonia injection rate; slaked lime; activated carbon injection or usage rates; and thermocouple to measure temperature of combustion zone (to be specified by the vendor). The monitoring devices shall meet the applicable requirements of Chapter 17-2, Section 17-2.710, F.A.C. and 40 CFR 60.45, and 40 CFR 60.13, including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7 (a)(5). Data on monitoring equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location after the economizer or in the air pollution control equipment outlet duct shall be provided to the South District Office for review prior to installation together with and subject to the same provisions as submittal of air pollution control equipment as mentioned earlier.

c. Testing Frequency

Compliance with emission standards contained in Specific Condition 2 shall be determined by conducting stack tests within 120 days of completion of construction and initial operation and annually thereafter. In addition to the three test runs conducted under normal operation, three compliance test runs shall be conducted annually under soot blowing conditions for particulate and VE. Each soot blowing test run shall be a representative of normal soot blowing operation. The compliance tests may be staggered throughout the year with the approval of the Bureau of Air Regulation. Pursuant to Rule 17-2.700(2)(b), when the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in this permit is being violated, it may require the owner or operator of the source to conduct compliance tests which identify the nature and quantity of pollutant emissions from the source and to provide a report on the results of said tests to the Department. Compliance testing for the flyash handling building (baghouse) and the lime silo loading operation (V.E. test) shall be conducted within 120 days of completion of

SPECIFIC CONDITIONS:

construction and initial operation and annually thereafter. All notification requirements of 40 CFR parts 60 and 61 shall be complied with by the owner/operator of the SWERF.

d. Sampling Ports

The Permittee shall provide sampling ports in the air pollution control equipment outlet duct or stack and shall provide access to the sampling ports in accordance with Section 17-2.700, F.A.C. Drawings of testing facilities including sampling port locations as required by Section 17-2.700 shall be submitted to the South District Office for approval at least 60 days prior to construction of the sampling ports and stack.

e. Record Keeping

Lee County Solid Waste Energy Recovery Facility shall maintain a central file containing all measurements, records, and other data that are required to be collected pursuant to the various specific conditions of this permit. This file shall include but not be limited to:

- (i) the data collected from in-stack monitoring instruments,
- (ii) the records on MSW input rate,
- (iii) the amount of propane gas burned per unit,
- (iv) the results of all source tests or performance tests,
- (v) the amount of ammonia, activated carbon, or other chemicals used for NOx and mercury control,
- (vi) calibration logs for all instruments,
- (vii) maintenance/repair logs for any work performed which is subject to this permit.

All measurements, records, and other data required to be maintained by SWERF shall be retained for at least two years following the date on which such measurements, records, or data are recorded and made available to the Department upon request. The permittee shall keep accurate records of MSW being fired to each combustor along with the weight percent of used tires in the waste stream being combusted on an estimated weekly basis

SPECIFIC CONDITIONS:

for the entire life of this facility. The South District office of the Department and the Bureau of Air Regulation shall be notified in writing at least 30 days prior to any compliance testing.

f. Reporting of Excess Emissions and Malfunctions

(i) A malfunction means any sudden and unavoidable failure of air pollution control equipment or process equipment to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, any other preventable upset condition, or preventable equipment breakdown shall not be considered malfunctions.

(ii) Excess emissions resulting from startup, shutdown or malfunction of any source shall be permitted providing (1) best operational practices to minimize emissions are adhered to and (2) the duration of excess emissions shall be minimized but in no case exceed two hours in 24 hour period unless specifically authorized by the Department for longer duration (Rule 17-2.250(1), F.A.C.).

(iii) Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonable be prevented during startup, shutdown, or malfunction shall be prohibited (Rule 17-2.250(4), F.A.C.).

(iv) In case of excess emissions resulting from malfunctions, each source shall notify the Department or the appropriate Local Program in accordance with Section 17-4.130, Florida Administrative Code. A full written report on the malfunctions shall be submitted in a quarterly report (Rule 17-2.250(6), F.A.C.).

(v) The owner or operator shall submit excess emission reports for any calendar quarter during which there are excess emissions from the facility. If there are no excess emissions during the calendar quarter, the owner or operator shall submit a report quarterly stating that no excess emissions occurred during the quarterly reporting period. The report shall include the following:

(A) The magnitude of excess emissions computed in accordance with 40 CFR 60.13(h), any conversion factors used, and the

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

- date and time of commencement and completion of each period of excess emissions [40 CFR60.7(c)(1)].
- (B) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the furnace boiler system. The nature and cause of any malfunction (if known) and the corrective action taken or preventive measures adopted [40CFR60.7(c)(2)].
 - (C) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks, and the nature of the system repairs or adjustments [40CFR60.7(c)(3)].
 - (D) When no excess emissions have occurred or the continuous monitoring system has not been inoperative, repaired, or adjusted, such information shall be stated in the report [40CFR60.7(c)(4)].
 - (E) The owner or operator shall maintain a file of all measurements, including continuous monitoring systems performance evaluations; monitoring systems or monitoring device calibration; checks; adjustments and maintenance performed on these systems or devices; and all other information required by this permit recorded in a permanent form suitable for inspection [40CFR60.7(d)].

4. Miscellaneous Requirements

a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

SPECIFIC CONDITIONS:

b. Operating Procedures

Operating procedures shall include good combustion practices and proper training and certification of all operators. The good combustion practices shall meet the guidelines established in 40 CFR 60, Subpart Ea and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained and certified in accordance with the manufacturers guidelines. A list of all such certified personnel shall be submitted to the South District Office. The Permittee/Operator shall inform the District office of any planned training sessions so that Department staff may attend any such training sessions related to operation and maintenance of air pollution control devices.

The emission standards for this facility shall apply at all times, except during periods of start-up, shut-down, or malfunctions, provided that the duration of start-up, shut-down, or malfunction shall not exceed 2 hours within 24 hour period. The start-up period commences when the affected facility begins the continuous burning of MSW and does not include any warm-up period when the affected facility is combusting only propane gas and no MSW is being combusted. During all startups, shutdowns and malfunctions the owner/operator shall use best operational practices to minimize air pollutant emissions. Within 90 days prior to commencing commercial operations of this facility, the permittee shall submit to the South District Office for approval a operational procedures manual that identifies and describes best operational practices that will be used during startup, shutdown, and malfunctions of this facility.

c. Odor Control

No objectionable odors are allowed from this facility pursuant to F.A.C. Rule 17-2.620. The truck access doors to the facility shall remain closed except during normal working shifts when MSW is being received near the storage pit area to allow vehicle passage. To minimize odors at the facility, a negative pressure shall be maintained on the tipping floor and air from within the building will be used as combustion air.

SPECIFIC CONDITIONS:

d. Auxiliary Burners

Auxiliary burners for each unit shall be fired only by propane gas and shall not exceed the 10% capacity factor as determined by 40 CFR 60.44b(d).

e. Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

f. Restriction for Type of Wastes Combusted

No biological waste, medical waste, bio-hazardous waste, sewage sludge or hazardous or unauthorized wastes shall be received or combusted at this facility without obtaining proper modification to the power plant site certification and this permit. The Permittee may combust up to 3% (by weight) of used tires along with the MSW. If the applicant wishes to combust used tires in excess of 3% (by weight) a modification to the construction permit will be required prior to increasing the feed rate of the tires. The County shall establish a household battery collection program to be specified by the applicant prior to start of construction, to further minimize mercury emissions. Chromium compounds shall not be used as an additive in the cooling tower water.

g. Fugitive (Unconfined) Emissions

Fugitive emissions at this facility shall be adequately controlled at all times. All roads shall be adequately paved and vacuum swept if appropriate, to keep free of visible dust. Speed limit signs shall be posted. Residue from the grates, grate siftings, and ash from the combustor/boiler and fabric filter hoppers during normal operations shall be discharged into the ash quenching system so as to minimize visible dust. The ash/residue in the ash handling building shall remain sufficiently moist to prevent dust during storage and handling operations.

SPECIFIC CONDITIONS:

- h. The height of the boiler exhaust stack shall not be less than 275 feet above grade or the height determined to be Good Engineering Practice.
- i. The SWERF's boilers shall not be loaded in excess of their permitted capacity of 55,000 lb/hr. of MSW per unit, and 275×10^6 Btu per hour, each unit, and 186,200 lb/hour of steam, based on heating value of 5000 Btu/lb of MSW.
- j. The combustor boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, and rated capacity.
- k. Combustion efficiency shall be calculated by: $\%CE = (1/(1+(CO/CO_2))) \times 100$, and shall be at least 99.5% for an 8 hour average.

5. Emission Control Equipment

- a. The combustor's particulate control baghouse shall be designed, constructed and operated to achieve a maximum emission rate of 0.010 grains per dscf corrected to 7% O₂.
- b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppm_v at 7% O₂, 24 hour daily geometric average, which ever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).
- c. The Permittee shall submit to the South Florida District and to the Bureau of Air Regulation within thirty (30) days after it becomes available, copies of technical data pertaining to the selected emissions control systems. These data should include, but not be limited to, guaranteed efficiency and emission rates, and major design parameters.

6. Stack Test Reports

- a. Two copies of the results of the emissions tests for the pollutants listed in Specific Condition No. 2 shall be submitted within forty-five days of the last sampling run

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

to the South District Office, and one copy of the test results shall be submitted to the Bureau of Air Regulation in Tallahassee.

- b. Emissions monitoring shall be reported to the South District Office on a quarterly basis in accordance with Section 17-2.710, F.A.C., 40 CFR, part 60, Subsection 60.7 or 40 CFR part 61 as appropriate.
 - c. Notice of anticipated and actual start-up dates of each waste combustor boiler shall be submitted to the DER South District Office and the Bureau of Air Regulation.
7. Pursuant to Recommended Order on Remand (DOAH Case No. 90-3942 EPP), Appendix B, Exhibit 96, dated May 21, 1992, evaluation test methodology for the mercury control process at this facility shall be subject to the following:
- A. The permittee must operate the pollution control equipment at the facility under procedures designed to minimize emissions of mercury and maximize the removal of mercury from the flue gas of the facility. An activated carbon injection system for mercury control approved by the Department in accordance with Specific Condition No. 2 shall be operated continuously whenever MSW is burned at the facility. The emissions of mercury from the facility shall not exceed the standard established in Specific Condition No. 2(m).
 - B. The permittee shall determine through Department-approved operational testing the feed rate for activated carbon injection which provides the most effective mercury removal over the normal operating regime for the facility while achieving the levels stated hereafter. Following determination of this feed rate, the permittee shall not reduce it without specific written permission from the Department.
 - C. The permittee acknowledges and agrees that the 140 ug/dscm mercury emission standard established by Specific Condition No. 2(m) may be reduced to a level no lower than 70 ug/dscm at 7% O₂ or its equivalent upon written notice to the permittee that Departmental review of at least four operational test results (specified according to protocol) from the facility shows that a reduction of the 140 ug/dscm

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

standard is statistically achievable as determined by the student T-test at the 99 percent confidence limit and is in the public interest. If the Department elects to proceed under this provision, the procedures of Section 403.516(1), Florida Statutes, shall not apply unless the permittee disputes the factual basis for the Department's determination.

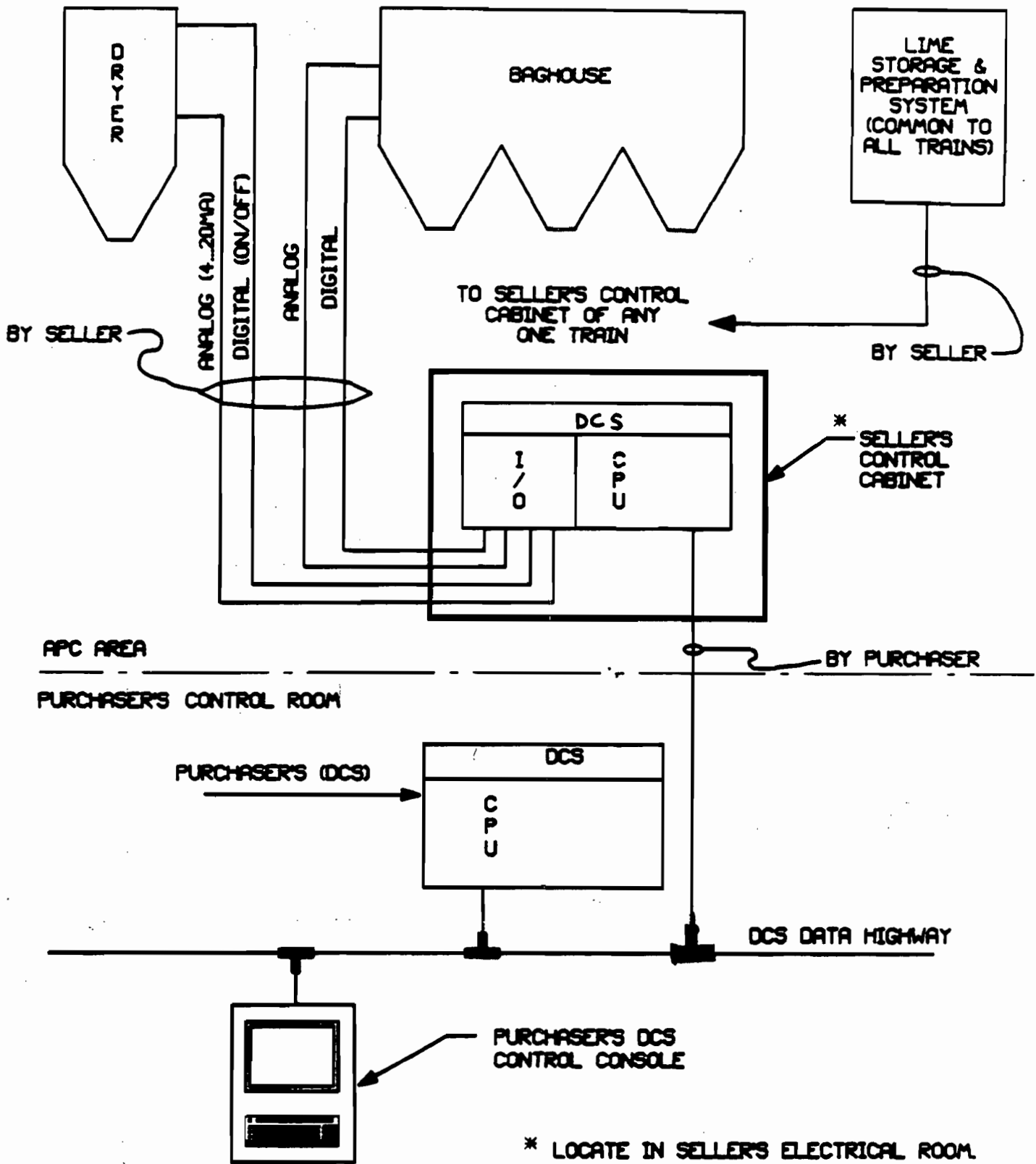
- D. If the Department proposes to reduce the 140 ug/dscm mercury emission standard for the facility to a level below 70 ug/dscm at 7% O₂ or its equivalent, it shall proceed in accordance with the provisions of Section 403.516(1), Florida Statutes.

Issued this 20th day
of July, 1992

**STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION**



Carol M. Browner, Secretary



A10-2



ATTACHMENT 10
TYP. INTERFACE WITH PLANT CONTROL SYSTEM
(DISTRIBUTED CONTROL SYSTEM)

OGDEN PROJECTS, INC.	
APPROVED:	DATE:
OWG. No. SM-105	REV. <i>5</i>

5

ATTACHMENT 11.1

OGDEN MARTIN SYSTEMS
of LEE, Inc.

SPEC NO. SA-550
ISSUE 002
DATE 08/15/90

TECHNICAL SPECIFICATION

FOR

PAINTING FERROUS METALS
INCLUDED IN SUBCONTRACTOR'S WORK

Facility Name: LEE COUNTY RESOURCE RECOVERY FACILITY

Location: LEE COUNTY, FLORIDA

This document and all information contained herein are the property of Ogden Martin Systems of LEE, Inc., and are not to be used except as expressly authorized in writing by said company.

Specification Prepared By: A/E Name: OMSL
Address: FAIRFIELD, NJ
Telephone: 201-882-9000

A/E Approved for Release:

	Printed Name	Signature	Date
1.	<u>K. WALLS</u>	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____

REVISIONS

001 Initial Issue.....08/16/89
002 Revision.....08/15/90

TECHNICAL SPECIFICATION
FOR
PAINTING FERROUS METALS
INCLUDED IN SUBCONTRACTOR'S WORK

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1.0 General

1.1 Scope

This Specification establishes the minimum requirements for the furnishing of all labor, materials, tools and equipment, the coordination of work with that of other trades, and the performing of services for the coating of ferrous metals as shown on the plans and specified herein, including both shop and field applied systems. This Specification shall be worked with Specification SA-502, Painting. Reference to other industry standards for compliance shall be interpreted as an integral part of this Specification.

1.1.1 Work Included

Work shall include but is not limited to the surface preparation and application of prime and finish coats and touch-up of paint systems on ferrous metals. Items receiving coatings shall include but are not limited to:

- Structural Steel
- Miscellaneous steel angles, channel, plates, braces, brackets, embedments, etc.
- Equipment Supports
- Ducts as required
- Pipes
- Stair stringers and pans
- Handrails and Guardrails
- Hollow metal doors and frames, and industrial doors
- Electrical cabinets
- Louvers
- Equipment furnished without shop finish

1.2 Related Work

Items of work related to work of this Specification, but not included within its scope shall be furnished or performed under the General Contractor's responsibilities. These items include, but are not limited to:

- Shop finished equipment
- Removal and reinstallation of fixtures, equipment and systems by others when required

Other specifications related to work in this Specification include but are not limited to the following:

SA-502 Painting

1.3 References

1.3.1 Abbreviations

Abbreviations listed below, when used in this Specification, shall have the following meanings:

ANSI American National Standards Institute
CFR Code of Federal Regulations
SSPC Steel Structures Painting Council

1.3.2 Codes and Standards

Work under this specification shall be performed in accordance with applicable sections of the following codes, standards, publications and practices, and to the extent referenced, form a part of this specification. Date of issue in effect at the time of Notice to Proceed shall apply.

ANSI A13.1	Scheme for the identification of piping systems
29 CFR 1910 & 1926	Occupational Safety and Health Act (OSHA)
SSPC-SP-1	Solvent Cleaning
SSPC-SP-3	Power Tool Cleaning
SSPC-SP-6	Commercial Blast Cleaning

1.4 Quality Assurance

All stages of work including surface preparation, priming and finish coating of surfaces, materials, equipment, workmanship, and touch-up shall be subject to inspection by a representative of Purchaser for conformance to the applicable SSPC specifications, the manufacturer's instructions, and this specification.

All components of each paint system, specified herein, shall be by one manufacturer. The paints of one manufacturer shall not be used over the paint of another and shall not be intermixed with each other unless approved by OMS.

1.5 Submittals

In compliance with all provisions and conditions of the Contract, the following items and documents shall be submitted per the document submittal schedule in Attachment 1.

1.5.1 Engineering Documents

- Technical data sheets on each product to be used.
- A paint schedule indicating the total system (material, thickness, etc) to be applied including surface preparation for each substrate type.

- Color selection charts with the full range of manufacturer's standard colors for selection by Purchaser.
- Material Safety Data Sheets for coatings, solvents, etc.
- Manufacturer's instructions for mixing, thinning, application and storage of the coating materials

1.5.2 Verification Documents

Written Certification that all coatings comply with the provisions of this specification. Alternate manufacturer's will only be considered upon submittal of complete technical and company data and approval by Purchaser.

1.6 Product Shipping, Handling and Storage

All coating materials shall be delivered to the job site in original, sealed and unopened containers bearing the Manufacturer's name, paint type designation, batch number, color and shelf life.

Coatings shall be stored in an area that is well ventilated and free from excessive heat, sparks, flame or the direct rays of the sun. Ambient temperature of storage areas shall be maintained within the range specified in the coating manufacturer's printed instructions unless otherwise specified.

1.7 Scheduling

It shall be the responsibility of the contractor to provide schedules for the painting of surfaces and to coordinate the coating work with the work of all other trades.

1.8 Safety

The Contractor shall observe all OSHA, state and local laws, ordinances and regulations pertaining to health and safety. The precautions indicated on the paint containers with regard to fire and safety, as well as the laws of the state in which the project is located, shall be observed.

2.0 Products

2.1 Acceptable Manufacturers

Subject to compliance with this specification and the painting schedule herein, the following coating manufacturers are acceptable to provide the materials for the work:

- a) Carboline Company
- b) Cook Paint and Varnish
- c) Glidden
- d) Hampel's Industrial Coatings
- e) Keeler and Long
- f) Pratt and Lambert
- g) Sherwin/Williams Company
- h) Tnemec

The above manufacturer's provide the quality of paint, and are of the stature to provide the specified coatings for this project. The brand names and designations used in the specified Paint systems indicate the required type and quality of the coatings to be furnished.

2.2 Materials

Materials supplied shall be per the Paint Systems as listed in section 3.12. When required, all coatings shall be mixed in strict accordance with the manufacturer's written instructions, and thinning shall not be permitted unless specified in those instructions. Thickness of coatings shall comply with manufacturer's recommendations. Where a range of thickness is presented in the technical data, the thicker coat shall be applied.

All tools and equipment necessary for surface preparation and application of coatings such as compressors, spray equipment, sandblaster, power tools, brushes, etc., shall be maintained in good working order.

Any false work (scaffolding, ladders, etc.) required for surface preparation and/or painting shall be designed by the Contractor for loads not less than those established by the state or local building codes and (OSHA) 29 CFR 1910 and 29 CFR 1926. The cable trays, conduit, piping, etc, shall not be used for support or access unless prior approval is obtained from OMS.

3.0 Execution

3.1 Coordination

It shall be the responsibility of the Contractor to coordinate with all material and equipment suppliers furnishing items that are to be shop primed and field finished in order to ensure compatibility of the prime and finish coats. It is imperative that the paint systems specified herein be followed.

3.2 Job Conditions

3.2.1 Atmospheric Conditions

Paint shall not be applied when the surfaces are at a temperature of over 120°F unless the paint is specifically formulated for application at elevated temperatures. When painting in hot weather, precautions shall be taken to assure that the specified dry film thickness (DFT) of paint is obtained.

Paint shall not be applied in rain, snow, fog or mist, or when the relative humidity is such as to cause condensation on surfaces. All surfaces shall be completely dry before, and while being painted.

Forced ventilation shall be provided to keep fume levels at safe levels and shall be exhausted outdoors. Spark producing motors or implements shall not be used in areas when fume concentrations may occur.

3.2.2 Fire Protection

Oily rags and other waste which may constitute a fire hazard, shall be removed daily or stored in U.L. labeled metal containers with automatic closing covers.

The Contractor shall provide portable fire extinguishers of suitable type and sufficient number to permit placing at least one (1) extinguisher in any area where coating with fume-creating or flammable products is in progress, and where coatings are stored and mixed. No smoking shall be permitted in these areas and the Contractor shall be responsible for policing the work.

3.3 Color Selection

With the exception of standard colors for pipe identification or designated safety hazards, the colors will be selected specifically for this project and shall be presented separately in a color schedule.

Regardless of the source utilized in the selection of colors for the Project, the Contractor shall be responsible for assuring that all finish paints match the specified colors. If required, the Contractor shall submit samples of the specified color and the color selected by the Contractor to the Purchaser for color match analysis.

3.4 Protection of Adjacent Surfaces

All hardware, hardware accessories, machined surfaces, nameplates, lighting fixtures and similar items on or in contact with surfaces to be painted shall be removed, masked or otherwise protected prior to surface preparation and painting operations. All protective covers shall be removed upon completion of paint application.

3.5 Surface Preparation

Surfaces shall be prepared for coating in accordance with SSPC specifications and preparation technique for each surface shall be indicated in the painting schedule by the Contractor.

The anchor profile provided on steel shall be not less than that specified by SSPC-SP-6.

After blast cleaning, dust, loose particles and spent abrasives shall be removed from the prepared surfaces by compressed air or vacuum cleaning, and the cleaned surfaces shall be primed as soon as possible after blasting and always before surface starts to rust. Cleaned surfaces shall not be allowed to stand overnight before coating.

Where applicable, dirt, dust, oil, grease and similar contaminants shall be removed by solvent cleaning in accordance with SSPC-SP-1.

3.6 Mixing

All ingredients shall be thoroughly mixed before use and agitated frequently during application to keep the paint in suspension. Mechanical mixers and agitated pressure pots shall be used as required.

Paints shall be thinned only when necessary for good application properties, and only with the recommended thinner, in amounts recommended by the paint manufacturer.

Catalysts or other types of multipackaged paints shall be mixed in strict accordance with manufacturer's recommendations and instructions.

3.7 Application

In general, the Manufacturer's specifications regarding the mixing, thinning, application, drying and general handling of the various materials shall be followed as being supplementary to this Specification.

Spray application may be used at the Contractor's option in non-enclosed areas when the spraying can be closely controlled to prevent spattering any other property.

Effective oil and water separators shall be used in all compressed air lines to remove oil or moisture from the air before it is used. Separators shall be placed as close as practical to the equipment. The effectiveness of the separators shall be tested by means of the "white blotter test." The test shall be performed prior to blasting or spray coating, and at intervals of four (4) hours during the work. Tests shall be at full operating pressure and velocity.

Nozzle sizes and pressure settings for spray equipment shall comply with the manufacturer's recommendations.

When coatings are applied by spraying, each coat shall be sprayed in two directions at right angles to each other, to obtain complete coverage. Care shall be exercised during spraying to avoid excessive evaporation of the volatile constituents, loss of material into the air, and the bridging over of crevices and corners.

Areas inaccessible to the spray gun shall be coated by brush and if not accessible by brush, daubers or sheepskins. Brushes shall be used to work coatings into cracks, crevices, and blind spots which cannot be adequately coated by spray.

When coatings are applied by brush or roller, the surface shall be cross-brushed or cross-rolled to secure uniformity of surface and the specified paint film thickness.

Film thickness of the coating being applied shall be periodically checked using a wet film thickness gauge. Dry film thickness shall be calculated from wet film thickness and volume solids and as recommended by the Coating Manufacturer. In addition, each coat shall be visually inspected for holidays and thin spots before the next coat is applied.

Steel which has been coated shall not be handled, worked on, or otherwise disturbed until the coating is completely set. Sufficient time shall elapse between coats to permit them to dry hard. All coats of coated surfaces shall be unscarred and completely integral at the time of application of all succeeding coats.

Prior to application of the finish coat, all visible rust resulting from construction damage, or other coating or surface defects, shall be removed and the surface prepared to the requirements of SSPC-SP3 Power Tool Cleaning and the prepared surface re-primed per Purchaser approved repair procedure.

3.8 Testing of Materials

The dry film thickness (dft) of non-metallic paints applied to magnetic surfaces shall be measured nondestructively using the "Elcometer" thickness gauge, as marketed by Gardner Laboratories, or similar magnetically operated testers. Non-metallic paints applied to nonmagnetic surfaces shall be measured using a battery powered, penetrating - needle type thickness gauge such as the "Gardner Thickness Gauge", also marketed by Gardner Laboratories.

3.9 Inspection

All work performed under this Contract shall be subject to inspection by Purchaser.

All deficiencies, defects and damage revealed by the inspection and caused by test methods used shall be promptly repaired or corrected, using the applicable type, grade and color of finish coat material, and preparation methods.

Any part of the paint system which is defective shall be corrected. The method of repairing damaged areas shall be in accordance with the requirements listed for the original system. Damage to adjacent systems painted by other shall be corrected in the same manner. Field touch-up of shop primer shall be with the same paint as the original primer.

3.10 Touch-Up

All shop-primed and shop-topcoated steel shall be touched up in the field as required, prior to final field, topcoating. Touch-up shall include any damaged or masked areas.

Field touchup shall be done after final erection or assembly, unless otherwise specified.

3.11 Clean-Up

All surfaces not coated under this specification, or those previously coated, shall be carefully protected during coating work.

Any unspecified coatings which are found during inspection shall be thoroughly cleaned and the original finish restored at the Contractor's expense.

Name and data plates on equipment shall not be painted and shall be left clean and legible upon completion of the project.

3.12 Paint System

The paint system descriptions provided herewith outline the generic paint system names. The paint system numbers are then utilized in the approved coating Manufacturer's system schedule and the Application Schedule to dictate the coating system for each type of substrate.

Ferrous Metal:	Prep:	SSPC-SP-6
	Prime:	Recoatable Polyamide Epoxy
	Topcoat:	100% Acrylic Gloss

Examples of Approved System:	Mfgr. - Sherwin Williams
	Prime: B67H5/B67V5
	Topcoat: B66 Series DTM Acrylic Gloss

3.13 Project-Specific Requirements

The attached Project Specific Requirements, if any, are additions, deletions and/or revisions to the requirements of this Specification and shall be considered a part of this Specification.

ATTACHMENT 1
DOCUMENTS SUBMITTAL SCHEDULE

<u>Documents for Approval</u>	<u>Engineering Need Date For Vendor Data*</u>	<u>Schedule Date For Certified Vendor Submittal**</u>
A. _____		
<u>Technical Data Sheets</u>	30	
<u>Color Charts</u>	30	
<u>Paint Schedule</u>	30	
<u>Mixing/Application Instructions</u>	30	

B. <u>Documents for Information</u>		
<u>Certificate of Compliance</u>	45	
<u>Material Safety Data Sheets</u>	30	

* Calendar days after award

** To be completed by seller and finalized prior to award

ATTACHMENT 11.2

(NOT
UTILIZED)

ATTACHMENT 11.3

(NOT
UTILIZED)

ATTACHMENT 11.4

(NOT
UTILIZED)

ATTACHMENT 11.5

OGDEN MARTIN SYSTEM
of LEE, Inc.

SPEC NO. SC-315
ISSUE 004
DATE 09/24/91

TECHNICAL SPECIFICATION
FOR
CONTROL PANELS

Facility Name: LEE COUNTY RESOURCE RECOVERY FACILITY
Location: LEE COUNTY, FLORIDA

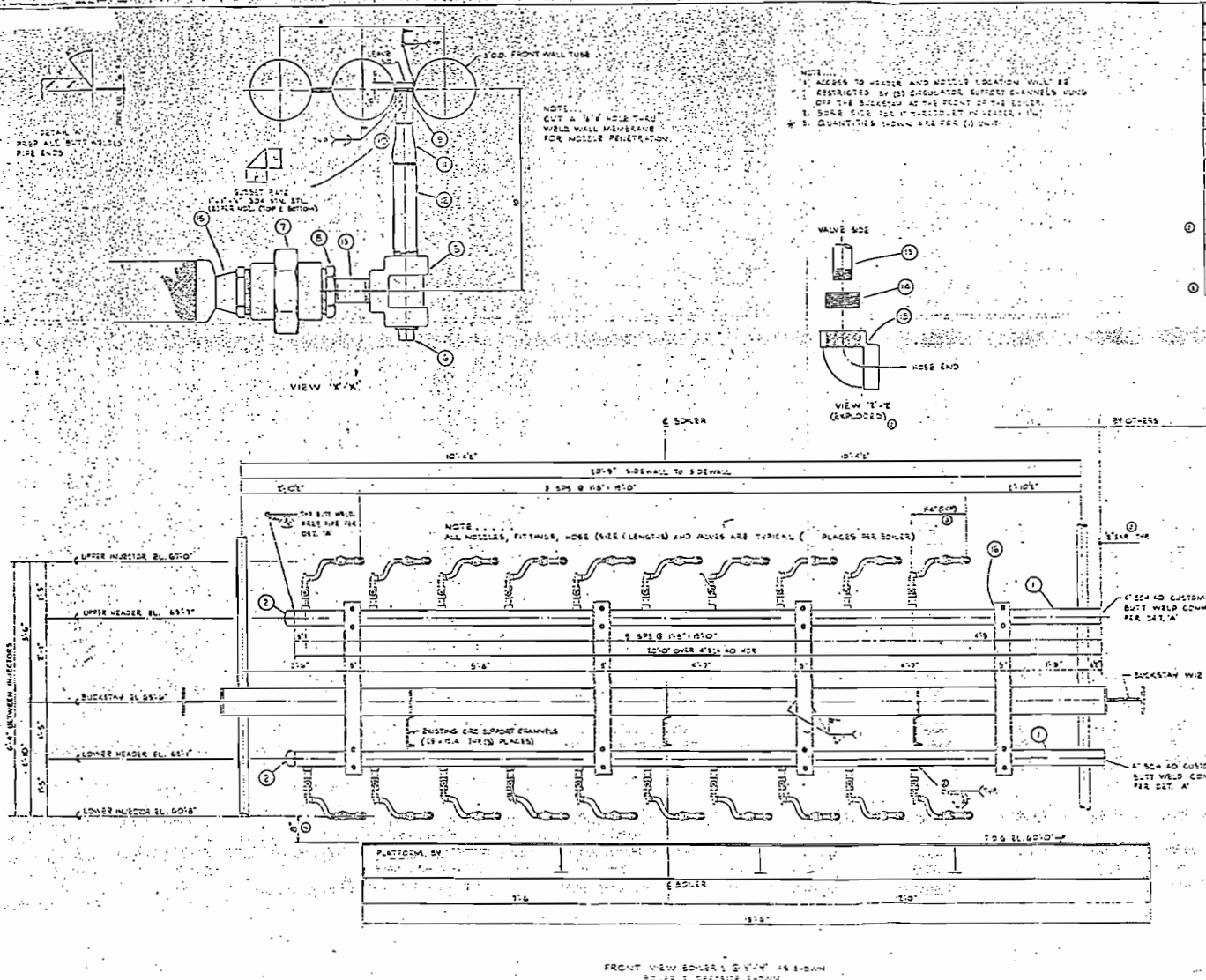
This document and all information contained
herein are the property of Ogden Martin Systems
of LEE, Inc., and are not
to be used except as expressly authorized in
writing by said company.

Specification Prepared By:

A/E Name: OMSL
Address: FAIRFIELD, NJ
Telephone: 201-882-7071

A/E Approved for Release:

	Printed Name	Signature	Date
1.	<u>R. TERRAMOCCHIA</u>	<u>R. Terramocchia</u>	<u>11/19/91</u>
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____



ITEM NO.	QTY	DESCRIPTION
1	2	PIPE (HEADER) 4" SCH 40 x 20'0" LG. SA-105-B
2	2	CAP 4" SCH 40. SA-105 WFB. BUTT WELD
3	10	T-RIDGELINE, 3/4" x 1" 3000' x 1/8" WFB
4	10	BALL VALVE, 1" ST. STEEL, ENDS 1/4" NPT, JAMESBURGH INDUST. OR EQV.
5	10	TEE, 1" 3000', 1/8" WFB
6	10	FLANGES, 1" 3000', 1/8" WFB
7	10	UNION, FRIGIDE, 1" 3000' x 1/8" WFB
8	10	BUSHING, 1/4" WFB, 1" 3000' x 1/8" WFB
9	10	PIPE, 1" SCH 40 316 STAINLESS STEEL, NOZZLE 1/2" LG.
10	40	SUSSET RINGS, 1/4" x 1/2" ST. STEEL
11	10	REDUCER, CONCENTRIC, 1/2" x 1/4" ST. STEEL OR 316 ST. STEEL, B/W
12	10	PIPE NIPPLE, 1" SCH 40 x 3/4" LG. SA-105-B (T-HEAD)
13	80	PIPE NIPPLE, 1" SCH 40 x 3/4" LG. SA-105-B (T-HEAD)
14	10	FLANGES, 1" 3000', 1/8" WFB
15	10	HOSE, FLEXIBLE, 1" ID. 100' LG. FLEXIBLE HOSE WITH 1/2" NPT END
16	4	CHANNEL, 2" x 1/2" x 1/8"
17	8	WELD WIPERS, FIGURE 104, 4" PIPE SIZE, POLYMER, OR EQV.
18	10	ELBOW, 1" 3000' 90° x 1/8" WFB. SCREWED

ATTACHMENT 14 *MA*

OGDEN MARTIN SYSTEMS OF LEE, INC.

40 LANE ROAD
P.O. BOX 2615
FAIRFIELD, NJ 07007-2615
(201) 882-9000



AN OGDEN
PROJECTS COMPANY

RECEIVED

FEB 22 1993

Division of Air
Resources Management

VIA FIRST CLASS MAIL

February 12, 1993

Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C.H. Fancy, P.E.

Reference: Lee County Solid Waste Resource Recovery Facility
Ft. Myers, Florida
Project C-1033, Our Ref. LE0300L

Subject: MUNICIPAL WASTE COMBUSTERS SPECIFICATION
POWER PLANT SITE CERTIFICATION (PPSC) NO. 90-3942EPP

Dear Mr. Fancy,

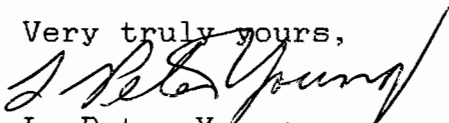
On behalf of Lee County, the permittee, Ogden Martin Systems of Lee, Inc. hereby submits four (4) copies of complete specification information for the Municipal Waste Combusters. This information is being submitted pursuant to the Power Plant Site Certification for the Lee County Solid Waste Resource Recovery Facility, Case No. 90-3942EPP, Appendix A, Item XIV.A.

This specification titled "TECHNICAL SPECIFICATION FOR MUNICIPAL SOLID WASTE STEAM GENERATORS SPEC NO. SM-101, ISSUE 011, DATE 10-31-91, REVISION 3, DATED 2/5/93" effectively provides the make and model number information as required.

pja/2666

Please contact me at (201) 882-7246 if you have any questions or require further information. Please note that the specification for the air pollution control equipment shall follow shortly. Specifications for continuous emissions monitoring and stack drawings will be submitted at a later date.

Very truly yours,



L. Peter Young
Assist. V.P. - Project Management

cc: P. Barbaccia/D. Knowles (w/att.) - South District
L. Sampson (w/att.) - Lee County
D. Markley (w/att.) - Malcolm Pirnie
D. Cerrato (w/att.) - Malcolm Pirnie
L. Ware (w/att.) - UE&C
J. Kowal
J. Treshler (w/att.)
pf 5.1 FDER

*B. Owen,
C. Wampler, EPA
D. Bunyak, NPS*

H. Rhodes/Air

CARLTON, FIELDS, WARD, EMMANUEL, SMITH & CUTLER, P. A.

ATTORNEYS AT LAW

ONE HARBOUR PLACE P.O. BOX 3239 TAMPA, FLORIDA 33601 (813) 223-7000 FAX (813) 229-4133	FIRSTATE TOWER P.O. BOX 1171 ORLANDO, FLORIDA 32802 (407) 849-0300 FAX (407) 648-9099	HARBOURVIEW BUILDING P.O. BOX 12426 PENSACOLA, FLORIDA 32582 (904) 434-0142 FAX (904) 434-5366	FIRST FLORIDA BANK BUILDING P.O. DRAWER 190 TALLAHASSEE, FLORIDA 32302 (904) 224-1585 FAX (904) 222-0398	ESPERANTE P.O. BOX 150 WEST PALM BEACH, FLORIDA 33402 (407) 659-7070 FAX (407) 659-7368	BARNETT TOWER P.O. BOX 2861 ST. PETERSBURG, FLORIDA 33731 (813) 821-7000 FAX (813) 822-3768
--	---	--	--	---	---

August 4, 1992

Honorable Lawton Chiles
Governor
The Capitol
Tallahassee, Florida 32399

RE: Lee County Resource Recovery Facility

Dear Governor Chiles:

Enclosed for your review is a letter dated July 31, 1992, from the United States Department of the Interior, Fish and Wildlife Service (Wildlife Service), concerning Lee County's resource recovery facility (Facility). In its letter, the Wildlife Service states that it has reviewed the environmental impacts of the County's Facility and concluded that "the operation of this Facility is not likely to adversely affect the Florida panther or other listed [threatened or endangered] species." The Wildlife Service has determined that the United States Environmental Protection Agency (EPA) and the Wildlife Service do not need to conduct a formal consultation under Section 7 of the Endangered Species Act (Act) for this project.

The Wildlife Service rejects the allegations that were made recently by Save The Panther, Inc., which contended a formal consultation under Section 7 of the Act is required. Save the Panther, Inc., also alleged that the Facility would adversely affect various threatened and endangered species.

You also may be interested in the Wildlife Service's determination that:

"Incineration appears to be the best alternative, even when considering composting, for the disposal of solid wastes generated by the residents of Lee and Hendry Counties. This is the one that will result in the least overall impact on Service trust resources."

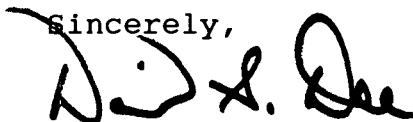
RECEIVED
AUG 06 1992
Division of Air
Resources Management

PLEASE REPLY TO:
Tallahassee
RECEIVED
AUG 10 1992
AUG 05 1992
D.E.R. OFFICE
OF THE SECRETARY

Honorable Lawton Chiles
August 4, 1992
Page Two

Please call me if you have any questions.

Sincerely,



David S. Dee

DSD:db

cc: Honorable Jim Smith
Honorable Bob Butterworth
Honorable Gerald Lewis
Honorable Tom Gallagher
Honorable Bob Crawford
Honorable Betty Castor
✓ Carol Browner
James Yaeger
James Antista
Richard Donelan
M. B. Adelson
Hamilton Oyen

D. Knowles, 5 Dist
D. Adelson

BEST AVAILABLE COPY



United States Department of the Interior

FISH AND WILDLIFE SERVICE

75 SPRING STREET, S.W.

ATLANTA, GEORGIA

30303

July 31, 1992



Mr. Greer C. Tidwell
Regional Administrator
Environmental Protection Agency
345 Courtland St., NE.
Atlanta, Georgia 30365

Dear Mr. Tidwell:

Several significant events regarding the Lee County, Florida Resource Recovery Facility (Facility) have occurred since you were notified by letter dated February 7, 1992, that the Fish and Wildlife Service (Service) was suspending consultation under Section 7 of the Endangered Species Act (Act). This letter is to apprise you of the current position of the Service regarding the need for consultation on this Facility.

Originally, the environmental analysis and ecological risk assessment provided by Lee County was based on annual mercury emissions in excess of 3,900 pounds. The Service held the opinion that this additional amount of mercury would cause a measurable impact on the environment of south Florida and could result in a may affect situation for the endangered Florida panther. This position was strengthened by the 1992 report of the Florida Panther Interagency Committee which linked mercury levels in the panther with consumption of raccoons and alligators from mercury contaminated areas. This was the primary reason for our request that formal consultation under Section 7 be initiated.

Since our last correspondence:

- o Lee County has stated that an activated carbon injection system will be installed in each unit for the removal of mercury from flue gasses and the carbon feed rates will be monitored on a continuous basis to assure optimal conditions for mercury removal from the flue gases;
- o Lee County has requested that the Florida Department of Environmental Regulation (DER) reduce the Facility's mercury emission limit by approximately 80 percent, from 700 ug/dscm (approximately 1,600 pounds/unit/year) to 140 ug/dscm or 70 percent removal, whichever is less restrictive. The Governor's order approving site certification (dated June 17, 1992) showed a change in wording; i.e., "mercury emissions shall not exceed 0.000138 pounds/MMBtu, 0.0379 pounds/hour/unit, and 0.166 tons/year/unit at 140 ug/dscm at 7 percent ϕ , or at least 70 percent removal efficiency by weight." Further, DER may reduce the emission limit by up to 50 percent (i.e., down to 70 ug/dscm and 0.083 tons/year/unit), based upon test results;

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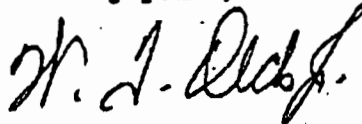
- o Lee County has provided modeling data which indicates that actual emissions should be below 70 ug/dscm (330 pounds/year);
- o Lee County has provided data indicating that mercury in the fly ash and mercury trapped by the activated carbon injection unit, will not be subject to leaching action or to volatilization, even at temperatures well beyond those that might be expected in a normal landfill;
- o Lee County is required to conduct a biomonitoring program to measure mercury content in the aquatic food chain for up to 2 years before and 5 years after the beginning of operations, with the stipulation that permit limits may be decreased by the DER (for good cause shown and after notice and an administrative hearing), if warranted;
- o Lee County has agreed to comply with the new mercury emission limits to be established by the State of Florida (the Florida House of Representatives adopted a moratorium on new incinerator construction until the mercury problem can be studied and more stringent emission limits established) and the Environmental Protection Agency (EPA), when adopted;
- o Lee County has implemented a mercury collection program designed to reduce mercury content in the preincineration waste stream by more than 88 percent;
- o The Service has determined that mercury use in the manufacture of dry cell batteries, the major source of mercury in solid waste streams, will be discontinued prior to the time that the Lee County Facility begins operations; and
- o The Service has determined that this is not a new source of mercury (i.e., solid wastes from Lee and Henry Counties are currently being disposed of by landfill; with the result that at least 70 percent more mercury is currently being emitted into the atmosphere than will be emitted from the incinerator). Incineration appears to be the best alternative, even when considering composting, for the disposal of solid wastes generated by the residents of Lee and Henry Counties. This is the one that will result in the least overall impact on Service trust resources.

The Service does have concerns about the cumulative effects of mercury on the south Florida ecosystem. To begin addressing this concern, the Service plans to continue monitoring raccoons in south Florida, to initiate a monitoring program for mercury deposition in Lee County prior to operation of the Facility, and to work with the EPA and DER to begin a monitoring program throughout the State. We believe this type of effort is necessary to begin to address this issue in a successful manner. Therefore, we continue to request your assistance and support in this area. Considering the above, it is the position of the Service that the operation of this Facility is not likely to adversely affect the Florida panther or other listed species.

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Although there continues to be a difference of opinion on the issue of the applicability of Section 7 of the Act to State issued PSD permits, this issue does not need to be resolved at present. Lee County has fully cooperated with the Service in its attempt to assess the effect of the project on threatened and endangered species and to find means to mitigate the impact of the project. During the past 10 months, the Service has analyzed information obtained from the EPA, the applicant, published literature, symposia, and a number of other sources. The Service has made a number of recommendations, including biomonitoring, which the applicant has adopted and has been incorporated in the DER PSD permit. The Service is, therefore, withdrawing its request for initiation of Section 7 consultation with the EPA on this particular permit.

Sincerely yours,



Warren T. Olds, Jr., C.W.B.
Assistant Regional Director



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

JUL 17 1992 RECEIVED

JUL 30 1992

Bureau of
Air Regulation

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Lee County Solid Waste Energy Recovery Facility (PSD-FL-151)

Dear Mr. Fancy:

This is to acknowledge receipt of the draft of the final Prevention of Significant Deterioration (PSD) permit for the above referenced facility, received in our office on July 8, 1992. The proposed facility will consist of three stoker waterwall combustion/steam generation units permitted to operate at a capacity of 660 tons per day (tpd) each, for a total facility capacity not to exceed 1980 tpd. Two units will be constructed initially, with the third unit being installed in the future. Each unit is capable of generating approximately 15 megawatts (MW), for a total of 45 MW net.

The permit provides for the use of a hydrated lime scrubber followed by a baghouse for the control of particulates, acid gases, and metals. NO_x emissions will be controlled by a Thermal de-NO_x (selective noncatalytic reduction) system. Mercury emissions will be controlled by injecting activated carbon into the flue gas prior to the scrubber and baghouse. In addition, the County will establish a household battery collection program to further minimize mercury emissions. VOC, CO, and dioxin/furan emissions will be controlled through proper combustion practices and combustion control techniques.

We have reviewed the draft permit as submitted and have the following comments. As discussed during a telephone conversation on July 9, 1992, between Mr. Mirza Baig of your staff and Mr. Scott Davis of my staff, we are recommending the following changes to the Test Methods portion of the Specific Conditions (reference page 9):

1. Delete Method 101A as an EPA test method for lead. The permit should read:

[Method] 12 Lead concentration from stationary sources

2. Delete the "0" in the EPA method "26, 26A0" for HCl emissions. The permit should read:

[Method] 26, 26A HCl emissions

3. Substitute these specific EPA methods for mercury, antimony, arsenic, and cadmium emissions. The permit should read:

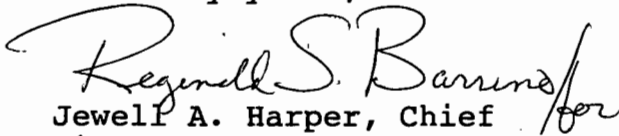
[Method] 29 Antimony and Cadmium emissions based on an average of three runs.

[Method] 101A Mercury emissions based on an average of three runs.

[Method] 108 Arsenic emissions based on an average of three runs.

Thank you for the opportunity to review and comment on this permit. If you have any questions or comments, please contact Mr. Scott Davis at (404) 347-5014.

Sincerely yours,



Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

Best Available Copy

Patty



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

SOURCE EVALUATION UNIT
AIR ENFORCEMENT BRANCH
FACSIMILE TRANSMISSION SHEET
Fax Number: FTS 257-5207 or 404/347-5207

DATE: 7/10/92 NUMBER OF PAGES (Including this sheet) _____

TO: Clarifancy PHONE: 904 488-1344

ADDRESS: IDEF FAX NUMBER: 904 932-6979

FROM: Brian L. Beals PHONE: (404) 347-5014

If the following pages are received poorly, please call Angela
at FTS 257-5014 or 404/347-5014.

SPECIAL INSTRUCTIONS FOR RECEIVER: _____

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

In the matter of an
Application for Permit by:

DER File No. PSD-FL-151
Lee County

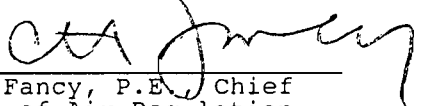
David S. Dee, Esquire
Carlton, Fields, Ward, Emmanuel,
Smith & Cutler, P.A.
Post Office Box 190
Tallahassee, FL 32302

Enclosed is Permit Number PSD-FL-151 to construct a waste to energy recovery facility comprised of Units No. 1 and 2 in Fort Myers, Lee County, Florida. This permit are issued pursuant to Section(s) 403, Florida Statutes.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION


C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of business on 7-20-92 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to
§120.52(11), Florida Statutes,
with the designated Department
Clerk, receipt of which is hereby
acknowledged.


(Clerk)

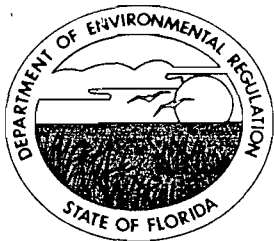
7-20-92
(Date)

Copies furnished to:

David Knowles, South District
Jewell Harper, EPA
Chris Shaver, NPS

FINAL DETERMINATION

The power plant site certification of Lee County Solid Waste resource recovery facility was approved by the Governor and the Cabinet sitting as the Siting Board on June 16, 1992. The Department is issuing a PSD air permit for this facility which is substantially identical to the terms of the Conditions of Certification contained in the power plant site certification. There are no changes in the process input or steam production rates. Revised mercury emission standards are contained in the PSD permit as were prescribed in the final power plant site certification approved by the Siting Board.



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:
Lee County Utilities
2178 McGregor Blvd.
Ft. Myers, FL 33902

Permit Number: PSD-FL-151

County: Lee

Latitude/Longitude: 26°37'54"N
81°45'41"W

Project: Lee County Waste to Energy
Recovery Facility Units
1 and 2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of the Lee County Solid Waste Energy Recovery Facility located at Buckingham Road and State Road 82, in Fort Myers, Florida consisting of two mass-burn Municipal Waste Combustors (MWC) with two units to be constructed initially and the third unit to be installed in the future. These mass-burn units shall have a maximum permitted capacity of 660 tons/day, each unit, for a total capacity for both units not to exceed 1320 tons/day; and a maximum heat input of 275 MMBtu/hr, per unit, for a total heat input for both units not to exceed 550 MMBtu/hr, based on a municipal solid waste average heating value of 5000 Btu/lb.

Each combustor unit shall be of Stoker Waterwall design (or equivalent) capable of generating 20 MW for a total of 40 MW from both units. Each unit shall be allowed to produce a maximum of 186,200 lbs of steam per hour at 865 psig and 830°F. Each combustor unit shall be equipped with auxiliary burners to be fired by only propane gas. Emissions from each combustor shall be controlled by a slaked lime scrubber followed by a baghouse. NO_x emissions shall be controlled by a SNCR System. Mercury emissions shall be controlled by injecting activated carbon.

The permittee must submit four copies of complete information prior to purchase and installation of any combustor and related equipment. Such information shall include the following: make and model numbers of each MWC and all pollution control and continuous emissions monitoring devices and related equipment.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

The power plant site certification number for this facility is PA90-30.

This source shall be constructed in accordance with the permit application; plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions:

Attachments are as follows:

Power Plant Site Certification package filed on June 29, 1990 and related correspondence.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (x) Determination of Best Available Control Technology (BACT)
- (x) Determination of Prevention of Significant Deterioration (PSD)
- (x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

GENERAL CONDITIONS:

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. This facility shall be allowed to operate continuously (i.e. 8760 hours/year).

2. Emission Standards

Based on the permitted capacities mentioned in the project description the stack emissions from each unit shall not exceed any of the following limitations:

a. Particulate matter: Particulate emissions from the baghouse shall not exceed 0.010 grains/dry standard cubic

SPECIFIC CONDITIONS:

- foot, corrected to 7% O₂; 5.34 lbs/hr per unit; and 21.3 tons/year per unit.
- b. PM₁₀: In no case shall PM₁₀ emissions exceed 0.010 gr/dry cubic standard foot, corrected to 7% O₂ for the fraction of particles less than 10 microns in diameter; 5.34 lbs/hr per unit; and 21.3 tons/year per unit.
 - c. *Opacity: In no case shall visible emissions from each baghouse exhaust exceed 10% opacity (six minute average).
 - d. *SO₂: 30 ppm_{dv} corrected to 7% O₂, 24 hour daily geometric average or at least 80% removal efficiency, whichever is least restrictive. In no case shall SO₂ emissions exceed 0.150 lbs/MMBtu per unit, 41 lbs/hr/unit, and 163.3 tons/year, per unit.
 - e. *NO_x: 180 ppm_{dv} corrected to 7% O₂, 24 hour daily block average (midnight to midnight). In no case shall NO_x emissions exceed 0.290 lb/MMBtu, 80 lbs/hr per unit, and 320 tons/year, per unit.
 - f. *Carbon Monoxide: 100 ppm_{dv} at 7% O₂, 4-hour block average beginning at midnight. In no case shall CO emissions exceed .10 lb/MMBtu, 27.2 lbs/hr/unit, and 108 tons/year, per unit.
 - g. *VOC (Hydrocarbons): 37 ppm_{dv} at 7% O₂. In no case shall VOC emissions exceed 0.021 lb/MMBtu, 5.80 lbs/hr/unit and 23 tons/year, per unit.
 - h. HCl: 25 ppm_{dv} at 7% O₂, or at least 95% removal efficiency, which ever is least restrictive. In no case shall HCl emissions exceed 0.064 lb/MMBtu, 17.70 lbs/hr/unit, and 70.70 tons/year, per unit.
 - i. H₂SO₄ (sulfuric acid mist): In no case shall H₂SO₄ emissions exceed 0.036 lb/MMBtu, 9.85 lbs/hr/unit and 39.3 tons/year per unit.
 - j. *F (fluoride): 5.0 ppm_{dv} at 7% O₂. In no case shall F emissions exceed 0.0035 lb/MMBtu, 0.96 lbs/hr/unit, and 3.8 tons/year, per unit.

SPECIFIC CONDITIONS:

- k. *Pb (lead): In no case shall lead emissions exceed 0.00060 lbs/MBtu, 0.165 lbs/hr/unit and 0.66 tons/yr., per unit.
- l. *Be (Beryllium): In no case shall Be emissions exceed 1.35×10^{-7} lbs/MMBtu, 3.70×10^{-5} lbs/hr/unit, and 1.47×10^{-4} tons/year, per unit.
- m. *Hg (Mercury): In no case shall mercury emissions exceed 0.000138 lbs/MMBtu, 0.0379 lbs/hr/unit, and 0.166 tons/yr per unit at 140 ug/dscm at 7% O₂ or at least 70 percent removal efficiency by weight.
- n. As (Arsenic): In no case shall arsenic emissions exceed 9.10×10^{-6} lbs/MMBtu, 2.50×10^{-3} lbs/hr/unit, and 0.01 tons/year, per unit.
- o. *Dioxins/Furans: In no case shall emissions of total (tetra thru octa-chlorinated dibenzo-p dioxins and dibenzofurans) exceed 30 ng/dscm @ 7% O₂, 2.54×10^{-8} lbs/MMBtu, 7.0×10^{-6} lbs/hr/unit, and 2.80×10^{-5} tons/year, per unit.
- p. *NH₃: In no case shall ammonia slip from exhaust gases exceed 50 ppmv.
- q. There shall be no visible emissions (less than 5% opacity) during the operations of the lime silo.
- r. In no case shall emissions from the ash handling building baghouse exceed a particulate limit of 0.010 grains/dscf and visible emissions of 5% opacity.
- * Pursuant to Rule 17-4.080 F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions for the pollutants CO, VOC, F, NH₃, SO₂, NO_x, Pb, Be, Hg, dioxins and furans, and visible emissions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time.

SPECIFIC CONDITIONS:

- 3. Test Methods/Continuous Emissions Monitoring System (CEMS)/Testing Frequency/Sampling Ports/Record Keeping/Reporting of Excess Emissions and Malfunctions.

- a. Test Methods

Compliance with emission limiting standards mentioned in Specific Condition No. 2 shall be demonstrated using EPA Methods, as contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources), or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants), or any other method as approved by the Department, in accordance with F.A.C. Rule 17-2.700(3). A test protocol shall be submitted for approval to the South Florida District and to the Bureau of Air Regulation at least 90 days prior to testing. This protocol shall include details on how the weight percentage of used tires in the MSW stream will be accounted for during the compliance testing.

<u>EPA Method</u>	<u>For Determination of</u>
1	Selection of sample site and velocity traverses.
2	Stack gas flow rate when converting concentrations to or from mass emission limits.
3 or 3A	Gas analysis when needed for calculation of molecular weight or percent O ₂ .
4	Moisture content when converting stack velocity to dry volumetric flow rate for use in converting concentrations in dry gases to or from mass emission limits.
5	Particulate matter concentration and mass emissions.
201 or 201A	PM ₁₀ emissions.
6, 6C, or 19	Sulfur dioxide emissions from stationary sources.
7, 7C, or 19	Nitrogen oxide emissions from stationary sources.

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

- 9 Visible emission determination of opacity.
- At least three one hour runs to be conducted simultaneously with particulate testing for the emissions from dry scrubber/baghouse, and ash handling building baghouse.
 - At least one lime truck unloading into the lime silo (start to finish).
- 10 Carbon monoxide emissions from stationary sources.
- 12 Lead concentration from stationary sources.
- 13A or 13B Fluoride emissions from stationary sources.
- 23 Dioxin/furan concentration.
- 18 or 25 Volatile organic compounds concentration.
- 26, 26a HCl emissions or other methods approved by DER.
- 101A Mercury emissions based on an average of three runs.
- 29 Antimony, Cadmium
- 104 Beryllium emission rate and associated moisture content.
- 108 Arsenic

Note: The weight of MSW being fed to each combustor during the stack test shall be continuously monitored and recorded by a weighing device which is properly calibrated. Stack tests shall be conducted upstream and downstream of the applicable control device for SO₂, Hg and HCl. Soot blowers shall be operated in a mode consistent with the normal cleaning requirements of the system during the compliance testing.

b. Continuous Emissions Monitoring System (CEMS)

Continuous emission monitors with recorders shall be installed, calibrated, maintained and operated subject to approval by the Department for the following:

SPECIFIC CONDITIONS:

Carbon Monoxide, Oxygen, Nitrogen Oxide, Opacity, and Sulfur Dioxide (for SO₂ one monitor shall be located upstream of the scrubber and one shall be located downstream of the baghouse), as specified in 40 CFR 60, Appendix B; total steam production (lbs/hr, pressure, and temperature) and power generation (MW) for each unit; ammonia injection rate; slaked lime; activated carbon injection or usage rates; and thermocouple to measure temperature of combustion zone (to be specified by the vendor). The monitoring devices shall meet the applicable requirements of Chapter 17-2, Section 17-2.710, F.A.C. and 40 CFR 60.45, and 40 CFR 60.13, including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7 (a)(5). Data on monitoring equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location after the economizer or in the air pollution control equipment outlet duct shall be provided to the South District Office for review prior to installation together with and subject to the same provisions as submittal of air pollution control equipment as mentioned earlier.

c. Testing Frequency

Compliance with emission standards contained in Specific Condition 2 shall be determined by conducting stack tests within 120 days of completion of construction and initial operation and annually thereafter. In addition to the three test runs conducted under normal operation, three compliance test runs shall be conducted annually under soot blowing conditions for particulate and VE. Each soot blowing test run shall be a representative of normal soot blowing operation. The compliance tests may be staggered throughout the year with the approval of the Bureau of Air Regulation. Pursuant to Rule 17-2.700(2)(b), when the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in this permit is being violated, it may require the owner or operator of the source to conduct compliance tests which identify the nature and quantity of pollutant emissions from the source and to provide a report on the results of said tests to the Department. Compliance testing for the flyash handling building (baghouse) and the lime silo loading operation (V.E. test) shall be conducted within 120 days of completion of

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

construction and initial operation and annually thereafter. All notification requirements of 40 CFR parts 60 and 61 shall be complied with by the owner/operator of the SWERF.

d. Sampling Ports

The Permittee shall provide sampling ports in the air pollution control equipment outlet duct or stack and shall provide access to the sampling ports in accordance with Section 17-2.700, F.A.C. Drawings of testing facilities including sampling port locations as required by Section 17-2.700 shall be submitted to the South District Office for approval at least 60 days prior to construction of the sampling ports and stack.

e. Record Keeping

Lee County Solid Waste Energy Recovery Facility shall maintain a central file containing all measurements, records, and other data that are required to be collected pursuant to the various specific conditions of this permit. This file shall include but not be limited to:

- (i) the data collected from in-stack monitoring instruments,
- (ii) the records on MSW input rate,
- (iii) the amount of propane gas burned per unit,
- (iv) the results of all source tests or performance tests,
- (v) the amount of ammonia, activated carbon, or other chemicals used for NOx and mercury control,
- (vi) calibration logs for all instruments,
- (vii) maintenance/repair logs for any work performed which is subject to this permit.

All measurements, records, and other data required to be maintained by SWERF shall be retained for at least two years following the date on which such measurements, records, or data are recorded and made available to the Department upon request. The permittee shall keep accurate records of MSW being fired to each combustor along with the weight percent of used tires in the waste stream being combusted on an estimated weekly basis

SPECIFIC CONDITIONS:

for the entire life of this facility. The South District office of the Department and the Bureau of Air Regulation shall be notified in writing at least 30 days prior to any compliance testing.

f. Reporting of Excess Emissions and Malfunctions

(i) A malfunction means any sudden and unavoidable failure of air pollution control equipment or process equipment to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, any other preventable upset condition, or preventable equipment breakdown shall not be considered malfunctions.

(ii) Excess emissions resulting from startup, shutdown or malfunction of any source shall be permitted providing (1) best operational practices to minimize emissions are adhered to and (2) the duration of excess emissions shall be minimized but in no case exceed two hours in 24 hour period unless specifically authorized by the Department for longer duration (Rule 17-2.250(1), F.A.C.).

(iii) Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonable be prevented during startup, shutdown, or malfunction shall be prohibited (Rule 17-2.250(4), F.A.C.).

(iv) In case of excess emissions resulting from malfunctions, each source shall notify the Department or the appropriate Local Program in accordance with Section 17-4.130, Florida Administrative Code. A full written report on the malfunctions shall be submitted in a quarterly report (Rule 17-2.250(6), F.A.C.).

(v) The owner or operator shall submit excess emission reports for any calendar quarter during which there are excess emissions from the facility. If there are no excess emissions during the calendar quarter, the owner or operator shall submit a report quarterly stating that no excess emissions occurred during the quarterly reporting period. The report shall include the following:

(A) The magnitude of excess emissions computed in accordance with 40 CFR 60.13(h), any conversion factors used, and the

SPECIFIC CONDITIONS:

- date and time of commencement and completion of each period of excess emissions [40 CFR60.7(c)(1)].
- (B) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the furnace boiler system. The nature and cause of any malfunction (if known) and the corrective action taken or preventive measures adopted [40CFR60.7(c)(2)].
 - (C) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks, and the nature of the system repairs or adjustments [40CFR60.7(c)(3)].
 - (D) When no excess emissions have occurred or the continuous monitoring system has not been inoperative, repaired, or adjusted, such information shall be stated in the report [40CFR60.7(c)(4)].
 - (E) The owner or operator shall maintain a file of all measurements, including continuous monitoring systems performance evaluations; monitoring systems or monitoring device calibration; checks; adjustments and maintenance performed on these systems or devices; and all other information required by this permit recorded in a permanent form suitable for inspection [40CFR60.7(d)].

4. Miscellaneous Requirementsa. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

SPECIFIC CONDITIONS:

b. Operating Procedures

Operating procedures shall include good combustion practices and proper training and certification of all operators. The good combustion practices shall meet the guidelines established in 40 CFR 60, Subpart Ea and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained and certified in accordance with the manufacturers guidelines. A list of all such certified personnel shall be submitted to the South District Office. The Permittee/Operator shall inform the District office of any planned training sessions so that Department staff may attend any such training sessions related to operation and maintenance of air pollution control devices.

The emission standards for this facility shall apply at all times, except during periods of start-up, shut-down, or malfunctions, provided that the duration of start-up, shut-down, or malfunction shall not exceed 2 hours within 24 hour period. The start-up period commences when the affected facility begins the continuous burning of MSW and does not include any warm-up period when the affected facility is combusting only propane gas and no MSW is being combusted. During all startups, shutdowns and malfunctions the owner/operator shall use best operational practices to minimize air pollutant emissions. Within 90 days prior to commencing commercial operations of this facility, the permittee shall submit to the South District Office for approval a operational procedures manual that identifies and describes best operational practices that will be used during startup, shutdown, and malfunctions of this facility.

c. Odor Control

No objectionable odors are allowed from this facility pursuant to F.A.C. Rule 17-2.620. The truck access doors to the facility shall remain closed except during normal working shifts when MSW is being received near the storage pit area to allow vehicle passage. To minimize odors at the facility, a negative pressure shall be maintained on the tipping floor and air from within the building will be used as combustion air.

SPECIFIC CONDITIONS:

d. Auxiliary Burners

Auxiliary burners for each unit shall be fired only by propane gas and shall not exceed the 10% capacity factor as determined by 40 CFR 60.44b(d).

e. Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1. Extra bags shall be maintained at the site for emergency purposes.

f. Restriction for Type of Wastes Combusted

No biological waste, medical waste, bio-hazardous waste, sewage sludge or hazardous or unauthorized wastes shall be received or combusted at this facility without obtaining proper modification to the power plant site certification and this permit. The Permittee may combust up to 3% (by weight) of used tires along with the MSW. If the applicant wishes to combust used tires in excess of 3% (by weight) a modification to the construction permit will be required prior to increasing the feed rate of the tires. The County shall establish a household battery collection program to be specified by the applicant prior to start of construction, to further minimize mercury emissions. Chromium compounds shall not be used as an additive in the cooling tower water.

g. Fugitive (Unconfined) Emissions

Fugitive emissions at this facility shall be adequately controlled at all times. All roads shall be adequately paved and vacuum swept if appropriate, to keep free of visible dust. Speed limit signs shall be posted. Residue from the grates, grate siftings, and ash from the combustor/boiler and fabric filter hoppers during normal operations shall be discharged into the ash quenching system so as to minimize visible dust. The ash/residue in the ash handling building shall remain sufficiently moist to prevent dust during storage and handling operations.

SPECIFIC CONDITIONS:

- h. The height of the boiler exhaust stack shall not be less than 275 feet above grade or the height determined to be Good Engineering Practice.
 - i. The SWERF's boilers shall not be loaded in excess of their permitted capacity of 55,000 lb/hr. of MSW per unit, and 275×10^6 Btu per hour, each unit, and 186,200 lb/hour of steam, based on heating value of 5000 Btu/lb of MSW.
 - j. The combustor boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, and rated capacity.
 - k. Combustion efficiency shall be calculated by: $\%CE = (1/(1+(CO/CO_2))) \times 100$, and shall be at least 99.5% for an 8 hour average.
5. Emission Control Equipment
- a. The combustor's particulate control baghouse shall be designed, constructed and operated to achieve a maximum emission rate of 0.010 grains per dscf corrected to 7% O₂.
 - b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppmdv at 7% O₂, 24 hour daily geometric average, which ever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).
 - c. The Permittee shall submit to the South Florida District and to the Bureau of Air Regulation within thirty (30) days after it becomes available, copies of technical data pertaining to the selected emissions control systems. These data should include, but not be limited to, guaranteed efficiency and emission rates, and major design parameters.
6. Stack Test Reports
- a. Two copies of the results of the emissions tests for the pollutants listed in Specific Condition No. 2 shall be submitted within forty-five days of the last sampling run

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

- to the South District Office, and one copy of the test results shall be submitted to the Bureau of Air Regulation in Tallahassee.
- b. Emissions monitoring shall be reported to the South District Office on a quarterly basis in accordance with Section 17-2.710, F.A.C., 40 CFR, part 60, Subsection 60.7 or 40 CFR part 61 as appropriate.
 - c. Notice of anticipated and actual start-up dates of each waste combustor boiler shall be submitted to the DER South District Office and the Bureau of Air Regulation.
7. Pursuant to Recommended Order on Remand (DOAH Case No. 90-3942 EPP), Appendix B, Exhibit 96, dated May 21, 1992, evaluation test methodology for the mercury control process at this facility shall be subject to the following:
- A. The permittee must operate the pollution control equipment at the facility under procedures designed to minimize emissions of mercury and maximize the removal of mercury from the flue gas of the facility. An activated carbon injection system for mercury control approved by the Department in accordance with Specific Condition No. 2 shall be operated continuously whenever MSW is burned at the facility. The emissions of mercury from the facility shall not exceed the standard established in Specific Condition No. 2(m).
 - B. The permittee shall determine through Department-approved operational testing the feed rate for activated carbon injection which provides the most effective mercury removal over the normal operating regime for the facility while achieving the levels stated hereafter. Following determination of this feed rate, the permittee shall not reduce it without specific written permission from the Department.
 - C. The permittee acknowledges and agrees that the 140 ug/dscm mercury emission standard established by Specific Condition No. 2(m) may be reduced to a level no lower than 70 ug/dscm at 7% O₂ or its equivalent upon written notice to the permittee that Departmental review of at least four operational test results (specified according to protocol) from the facility shows that a reduction of the 140 ug/dscm

PERMITTEE: Lee County

Permit Number: PSD-FL-151

SPECIFIC CONDITIONS:

standard is statistically achievable as determined by the student T-test at the 99 percent confidence limit and is in the public interest. If the Department elects to proceed under this provision, the procedures of Section 403.516(1), Florida Statutes, shall not apply unless the permittee disputes the factual basis for the Department's determination.

- D. If the Department proposes to reduce the 140 ug/dscm mercury emission standard for the facility to a level below 70 ug/dscm at 7% O₂ or its equivalent, it shall proceed in accordance with the provisions of Section 403.516(1), Florida Statutes.

Issued this 20th day
of July, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION



Carol M. Browner, Secretary



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To: _____	Location: _____
To: _____	Location: _____
To: _____	Location: _____
From: _____	Date: _____

Interoffice Memorandum

TO: Carol Browner
FROM: Howard L. Rhodes *[Signature]*
DATE: July 14, 1992
SUBJECT: Approval of Construction Permit PSD-FL-151
Lee County Waste to Energy Recovery Facility

Attached for your approval and signature is the construction permit for the above mentioned company to construct a waste to energy recovery facility comprised of Units No. 1 and 2. The facility will be located at Buckingham Road and State Road 82 in Fort Myers, Florida.

I recommend your approval and signature.

CF/MB/pa

Attachments

Lee County W-to E

4-1-92

Clair Fancy	FDIR/BAR	904 488 1344
Richard Dorelan	DER/OGC	(904) 488-9730
Dany Cur	OMS	201 882-7248
JR Freshner	Adrian Martin	813-684-5688
Donald E. Elias	RTP ENV. Assoc. Inc.	(908) 968-9600
David S. Dee	Carlton, Fields, et al.	(904) 224-1585
Paul Chrostowski	Clement	703 974 3480
Buck Owen	DER Siting	(904) 487-6472
Barry Andrews	DER/BAR	(904) 488-1344



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

JAN 22 1992

RECEIVED

JAN 28 1992

Division of Air
Resources Management

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Lee County, FL Energy Recovery Facility (PSD-FL-151)

Dear Mr. Fancy:

This is to acknowledge receipt of your Technical Evaluation and Preliminary Determination for the above referenced facility's proposed Prevention of Significant Deterioration (PSD) permit, received in our office on December 30, 1991. The proposed energy recovery facility will consist of three stoker waterwall combustion/steam generation units permitted to operate at a capacity of 660 tons per day (tpd) each, for a total facility capacity not to exceed 1980 tpd. Two units will be constructed initially, with the third unit being installed in the future. Each unit is capable of generating approximately 15 megawatts (MW) net.

Your determination proposes the use of a dry lime scrubber followed by a fabric filter (baghouse) for the control of particulates, acid gases and metals. NO_x emissions will be controlled by the selective noncatalytic reduction (SNCR) process. To limit emissions of dioxins/furans, your determination proposes the use of proper combustion practices. Mercury emissions will be controlled by injecting activated carbon, sodium sulfide, or a combination of both, into the flue gas prior to the dry scrubber and baghouse and through a battery collection program. Furthermore, Lee County has agreed to a biomonitoring program to evaluate the mercury content of fish and oysters in the vicinity of the proposed facility.

We have reviewed the package as submitted and are recommending the following changes to the Conditions of Certification (reference pages 8 and 9). These changes should alleviate any compliance/enforcement questions concerning emissions standards and are as follows:

- (4) SO₂: 30 ppm_v corrected to 7% O₂, 24 hour daily geometric average or at least 80% removal efficiency, whichever is least restrictive. In no case shall they exceed 0.150 lb/MMBtu per unit, 41 lbs/hr/unit, and 163.3 tons/year per unit.

This deletes the "or" in Line 4.

- (8) HCl: 25 ppm_v at 7% O₂, or at least 95% removal efficiency, whichever is least restrictive. In no case shall they exceed 0.0644 lb/MMBtu, 17.7 lbs/hr/unit, and 70.7 tons/year per unit.

This deletes the "or" in Line 3.

- (9) H₂SO₄ (sulfuric acid mist): In no case shall they exceed 0.0358 lb/MMBtu, 9.85 lbs/hr/unit and 39.3 tons/year per unit.

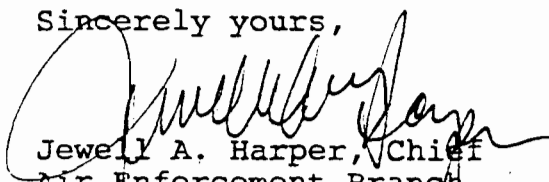
This deletes the "or" in Line 1.

- (10) *F (fluoride): 5.0 ppm_v at 7% O₂. In no case shall they exceed 0.0035 lb/MMBtu, 0.96 lbs/hr/unit and 3.8 tons/year per unit.

This deletes the "or" in Line 2.

Thank you for the opportunity to review and comment on this application. If you have any questions on these comments, please contact Mr. Scott Davis of my staff at (404) 347-5014.

Sincerely yours,


Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: M. Bennett
J. Rogers
D. Knowles, A. Dist.
C. Slower, NPS
D. Bell, CFWES&C
CHF/BH/PL



NOTICE OF CERTIFICATION HEARING ON LEE COUNTY'S APPLICATION TO CONSTRUCT AND OPERATE AN ELECTRICAL POWER PLANT (RESOURCE RECOVERY FACILITY) ON A SITE TO BE LOCATED NEAR FORT MYERS, FLORIDA

Lee County's proposed facility will be located on a site near Fort Myers in central Lee County, Florida. The site is located on Buckingham Road and is approximately 2.1 miles east of the intersection of Interstate 75 and State Road 82. The facility will include a mass burn resource recovery facility (waste-to-energy) facility that will burn municipal solid waste to produce electrical energy. The facility also will include a steam generator, electrical generator, waste unloading facilities, and cooling towers. The facility will burn municipal solid waste at a rate of 1,200 tons per day and will produce approximately 40 megawatts (MW) of electricity. The facility is designed to be expanded in the future, if necessary, to compost 1,800 tons per day and generate an ultimate use capacity of 60 MW of electricity. The project's associated linear facilities will include one 138 KV transmission line which will connect the resource recovery facility with the Florida Power and Light Company's existing Buckingham substation.

1. The application is available for public inspection and copying at the following addresses:
State of Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400
State of Florida Department of Environmental Regulation
South Florida Office
2269 Bay Street
Fort Myers, Florida 33901-2896
Lee County/Fort Myers Public Library
2050 Lee Street
Fort Myers, Florida 33901
Lee County Utilities Department
2178 McGregor Boulevard
Fort Myers, Florida 33901

2. The Department of Environmental Regulation (DER) and other agencies are evaluating the application for the proposed power plant. The report and recommendations of the Florida Department of Environmental Regulation concerning this project will be available for inspection at the locations identified in paragraph no. 3, above, on or about August 1, 1991.

3. Certification of this power plant would allow construction and operation of a new source of air pollution which would consume an increment of air quality resources. The Department's review will result in an assessment of the prevention of significant deterioration (PSD) impacts and a determination of the best available control technology (BACT) necessary to control the emission of air pollutant from this source. The County has proposed to use good combustion practices, a dry scrubber, a filter fabric baghouse, and a selective noncatalytic reduction system as BACT. The County also will use a mercury control device to further reduce facility emissions.

4. Pursuant to Section 403.508, Florida Statutes, a certification hearing will be conducted by the Division of Administrative Hearings at the Sheraton Harbor Place, 2500 Edwards Drive, Fort Myers, Florida beginning on September 9, 1991, at 10 AM. The hearing will continue from day-to-day until completed. The Hearing Officer will receive comments and testimony from the parties, the public, and the affected agencies at the certification hearing. The Hearing Officer will take written or oral testimony on the effects of the proposed electrical power plant or any other matter appropriate to the consideration of the site. Need for the facility has been predetermined by the Florida Public Service Commission in a separate hearing.

5. The Hearing Officer will accept comments from the public beginning at 6:30 PM in the evening of Tuesday, September 10, 1991. This portion of this certification hearing also will be conducted at the Sheraton Harbor Place, 2500 Edwards Drive, Fort Myers, Florida.

8. Sections 403.508(4) and (5), Florida Statutes, provide as follows:
- (a) Parties to the proceeding shall include:
 - 1. The applicant.
 - 2. The State Service Commission.
 - 3. The Department of Community Affairs.
 - 4. The Department of Natural Resources.
 - 5. The Game and Fresh Water Fish Commission.
 - 6. The water management district.
 - 7. The department.
 - 8. The regional planning council.
 - 9. The local government.
 - (b) Any party listed in paragraph (a) other than the department or the applicant may waive its right to participate in these proceedings. If such listed party fails to file a notice of its intent to be a party on or before the 90th day prior to the certification hearing, such party shall be deemed to have waived its right to be a party.
 - (c) Upon the filing with the hearing officer of a notice of intent to be a party at least 15 days prior to the date of the land use hearing, the following shall also be parties to the proceeding:
 - 1. Any agency not listed in paragraph (a) as to matters within its jurisdiction.
 - 2. Any domestic nonprofit corporation or association (armed, in whole or in part, to promote conservation of natural beauty; to protect the environment, personal health, or other biological values; to preserve historical sites; to promote conservation interests; to represent labor, commercial, or industrial groups; or to promote comprehensive planning or orderly development) that is organized in whole or in part to be located on the site.
 - (d) Notwithstanding paragraph (c), failure of an agency described in subparagraph (c), to file a notice of intent to be a party within the time provided herein shall constitute a waiver of the right of that agency to participate as a party in the proceeding.
 - (e) Other parties may include any person, including those persons enumerated in paragraph (c) who have filed to timely file a notice of intent to be a party, whose substantial interests are affected and being determined by the proceeding and who timely file a motion to intervene pursuant to chapter 120 and applicable rules. Intervention pursuant to this paragraph may be granted at the discretion of the designated hearing officer and upon such conditions as he may prescribe any time prior to 30 days before the commencement of the certification hearing.
 - (f) Any agency, including those whose properties or works are being affected pursuant to s. 403.509(4), shall be deemed a party upon the request of the department or the applicant.
 - (g) When appropriate, any person may be given an opportunity to present oral or written communications to the designated hearing officer. If the designated hearing officer proposes to consider such communications, then all parties shall be given an opportunity to cross examine or challenge or rebut such communications.

9. Those wishing to intervene in these proceedings should be represented by an attorney or other person who can be determined to be qualified to appear in administrative proceedings pursuant to Chapter 120, Florida Statutes, or Chapter 17-103.020, Florida Administrative Code.

10. If any party intends to use written direct testimony at the certification hearing, the written testimony must be made available for public inspection at the locations identified in paragraph no. 3, above, at least five days before the hearing.

11. Written comments, notices or petitions filed prior to the hearing may be sent to the Hearing Officer, Ms. Diana Kestling, of the Division of Administrative Hearings, 1230 Apalachee Parkway, DeSoto Building, Tallahassee, Florida 32399. All submissions should refer to DOAH Case No. 90-3742E. Copies of such submissions should be forwarded by U.S. Mail to all the other parties to this proceeding, including the Environmental Regulation and Lee County. For a list of parties and further information concerning the power plant siting process, contact Mr. Hamilton S. Owen, Jr., at the Florida Department of Environmental Regulation, 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Florida 32399-2400 or call 904/488-1344.

12. Lee County's application for the proposed electrical power plant also is subject to U.S. Environmental Protection Agency (EPA) regulations for the prevention of significant deterioration (PSD) of air quality, which are codified at 40 CFR 52.21 and Florida Administrative Code Chapter 17-2. In general, these regulations provide that a permit must be obtained from DER before construction may begin on a source of air pollution that is subject to PSD review. The permit can be issued only if the new construction has been determined by DER to comply with the requirements of the PSD regulations. These PSD regulations include a restriction on incremental increases in air quality due to the new source. The PSD regulations also require the application of Best Available Control Technology (BACT).

13. The DER has been granted a delegation of authority from EPA for the purpose of conducting the PSD review of this and other sources. Acting pursuant to the delegation of authority, the DER will prepare a draft permit which will be included in the DER final analysis and report. DER cannot issue the permit until DER makes a preliminary determination that the proposed construction will comply with all applicable PSD regulations.

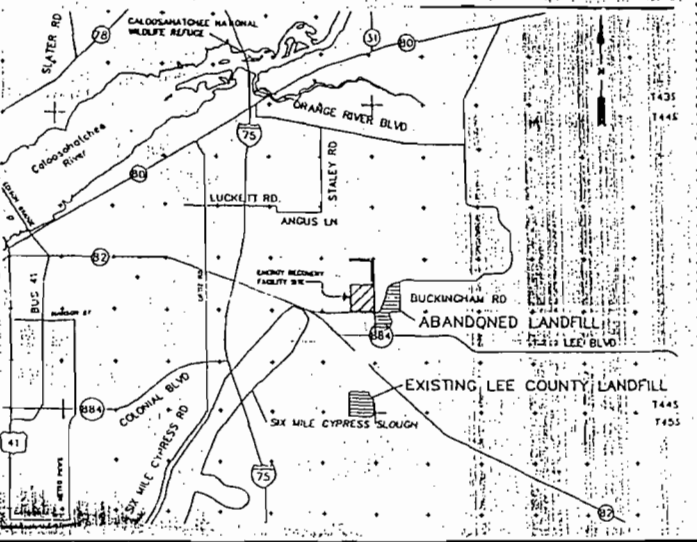
14. The County's application indicates that the proposed power plant will consume less than 3% of any applicable Class II PSD increment, as shown in the following table.

Pollutant	Averaging Period	Total Impact As a Percent of Class II Increment
Sulfur Dioxide (SO ₂)	Annual	1.0
	24-hour	2.4
Total Suspended Particulate Matter (TSP)	Annual	0.13
	24-hour	0.9
Particulate Matter (PM ₁₀)	Annual	0.2
	24-hour	0.2
Nitrogen Dioxide (NO ₂)	Annual	0.2
	24-hour	0.2

15. The proposed facility will be located approximately 88 kilometers from the nearest Class I area (the Everglades National Park). The application indicates that the proposed facility's maximum impact on the nearest Class I area will be less than 4% of the applicable Class I increments, as shown in the following table.

Pollutant	Averaging Time	Percent of PSD Class I Increment
SO ₂	Annual	0.3
	24-hour	2.4
TSP	Annual	0.2
	24-hour	0.2
PM ₁₀	Annual	0.02
	24-hour	0.2
NO ₂	Annual	0.2
	24-hour	0.2

16. Lee County's application states that the construction and operation of the proposed facility will not cause a violation of any ambient air quality standard nor will it cause an exceedance of any PSD increment and, therefore, the DER should recommend approval of this project. Persons wishing to comment on this issue may do so at the certification hearing or by submitting written comments to the Hearing Officer and DER within 30 days after DER's report is received in the DER office in Fort Myers, Florida. As previously noted, the DER report and recommendations should be available for inspection at the DER office in Fort Myers and at the other locations identified in paragraph number 3, above, on or about August 1, 1991.





State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To: _____	Location: _____
To: _____	Location: _____
To: _____	Location: _____
From: _____	Date: _____

Interoffice Memorandum

TO: Hamilton S. Oven
THRU: Clair Fancy *CHF*
FROM: Mirza Baig *MB* *ARC*
DATE: January 10, 1992
SUBJ: Lee County Resource Recovery Facility
DER Case No. PA 90-30

This is in regards to a request received on December 30, 1991, from Mr. David Dee to amend Section XIV A of the conditions of certification, specifically to increase steam production from 152,000 lbs/hour at 865 psig and 830°F to 186,197 lbs/hour at 865 psig and 830°F.

The ^{Bureau}Department has reviewed their request (letter dated December 17, 1991) and will have no objections to an increase in steam production rate provided this change in the steam production rate simply reflects the selection of a specific boiler vendor's equipment and the improved efficiency their equipment affords, and does not reflect any changes in predicted and allowable emissions as previously submitted and approved by the Department.

Accordingly, Section XIV A of the proposed conditions of certification shall read as follows:

"Each combustor unit is designed to produce a maximum of 186,197 lbs of steam per hour at 865 psig and 830°F."

All other permit conditions of certification remain as issued.

If you have any questions, please feel free to contact me.

CHF/MB/t

cc: D. Knowles, S. District
R. Donelan, OGC

Kevin L. Erwin Consulting Ecologist, Inc.

Ecologists • Biologists • Computer Scientists

January 8, 1992

Mr. David Ferrell
U.S. Fish & Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32961-2676

Dr. Charles Facemire
U.S. Fish & Wildlife Service
4401 North Fairfax Drive, Suite 330
Arlington, Virginia 22203

Re: Lee County Resource Recovery Facility
Biomonitoring Protocol
DER File Number PA 90-30

Pursuant to the December 18, 1991 meeting between the U.S. Fish and Wildlife Service (USFWS) and representatives of Lee County in Vero Beach, Florida we are transmitting to you the requested Biomonitoring Protocol for the proposed Lee County Resource Recovery Facility. A draft copy of the protocol was sent to you last week and we received comments from Dr. Charles Facemire on January 7, 1992. We have revised the draft per the changes recommended by Dr. Facemire.

It is our understanding that the USFWS concerns about the Resource Recovery Facility would be satisfactorily addressed if Lee County conducted a biomonitoring program. The Biomonitoring Protocol outlines the biomonitoring program to evaluate the mercury content of fish and oysters in the vicinity of the proposed facility. The monitoring program would provide the USFWS with a data base to use when determining whether there may be any adverse impacts caused by the Resource Recovery Facility.

A prompt review process is very important to Lee County. Upon receipt of the enclosed Biomonitoring Protocol we hope the USFWS will take action as soon as possible so that Lee County can stay on schedule for the construction of the facility.

If there are any questions, please call me as soon as possible.

Sincerely,

KEVIN L. ERWIN CONSULTING ECOLOGIST, INC.

William R. Cox
William R. Cox
Ecologist

WRC:bb
Enclosure

cc: David Dee, w/encl. George Riley, w/encl. Lindsay Sampson, w/encl.
Bruce Miller, w/encl. Buck Oven, w/encl. John Hall, w/encl.
Don Elias, w/encl. Paul Chrostowski, w/encl. Joe Treshler, w/encl.

RESOURCE RECOVERY SITE BIOMONITORING PROTOCOL

Lee County has proposed to construct a 1,200 ton-per-day waste-to-energy (WTE) facility on a site located approximately one mile east of Fort Myers, Florida. The site is near the headwaters of Six Mile Cypress Slough. The air emissions from the facility are expected to be far below any level that might result in adverse impacts on human health or the environment.

Clement International Corporation (CIC) determined that there would be no adverse ecological impacts from emissions from the facility (CIC 1991). However, during a recent meeting on December 18, 1991, in Vero Beach with the U.S. Fish and Wildlife Services (USFWS) and the permit applicant, concerns were voiced by the USFWS for certain listed wildlife species. The species of concern discussed at the meeting were the Florida panther (*Felis concolor coryi*), wood stork (*Mycteria americana*), and bald eagle (*Haliaeetus leucocephalus leucocephalus*). The USFWS stated that these species may be affected by potential mercury emissions from the facility. The basis for this statement by the USFWS is that elevated mercury concentrations have been reported in environmental media throughout Florida and mercury baseline data are lacking in the Fort Myers area.

The USFWS stated that the applicant should provide biomonitoring for mercury for both pre-and post-construction periods for indicator wildlife species. During the December 18, 1991 meeting between the USFWS, the applicant, and the applicant's consultants, it was agreed that the biomonitoring would be conducted at Six Mile Cypress Slough and Tarpon Bay at Sanibel Island. It was discussed and agreed upon at the meeting that the biomonitoring program would provide background and trend data, but would not necessarily provide "cause-effect" relationships. The proposed biomonitoring program is described below.

METHODS

Biomonitoring will be conducted by the use of indicator species such as shellfish and fin-fish. Indicator species were selected to provide baseline and trend data for mercury in the local environment. Indicator species selected are the coon oyster (*Crassostrea virginica*)¹, the largemouth bass (*Micropterus salmoides*), and the mosquitofish (*Gambusia affinis*). The coon oyster would be collected for analysis at three sampling stations at Tarpon Bay on Sanibel Island and the fin-fish would be collected at Six Mile Cypress Slough. Shellfish, such as the coon oyster, are long-lived, bottom-dwelling filter-feeders that can accumulate toxic metals, pesticides and other hazardous substances from the sediment and surrounding water even when these pollutants are present at concentrations below the levels detectable by chemical analysis of grab water samples.

¹ A positive identification of the oyster to be used for mercury tissue analysis at Sanibel Island was not made at the time of writing of this protocol. The scientific name of the oyster currently being monitored for toxic analysis by the USFWS at Sanibel Island will be confirmed prior to sample collection to maintain continuity of the USFWS biomonitoring program.

For fin-fish biomonitoring, a predator fish (largemouth bass) and an intermediate trophic level fish (mosquitofish) were selected. Predator fish represent the highest trophic level in the aquatic ecosystem and are likely to have the highest biomagnification of toxicants (i.e., mercury) which are passed up through the food chain. Analysis of indicator species will provide useful information for baseline and long-term trends in the presence of mercury in biota in local surface waters.

Shellfish and fin-fish would be sampled in March and September. The coon oyster would be sampled from three sampling stations at Tarpon Bay on Sanibel Island. Five coon oysters would be collected from each sampling location for total mercury analysis. The largemouth bass and mosquitofish would be collected from Six Mile Cypress Slough. A total of 10 bass at a minimum of 10 inches to 12 inches in length, would be collected each time. A total of 10 grams of mosquitofish will be collected per sample for a total of 10 samples per season. Consequently, a total of 35 samples would be collected each sampling period as follows:

<u>STATION</u>	<u>SEPTEMBER</u>	<u>MARCH</u>
TARPON BAY on SANIBEL ISLAND		
Refuge Manager Home	5 oysters	5 oysters
Water Control Structure #1	5 oysters	5 oysters
Water Control Structure #6	5 oysters	5 oysters
SIX MILE CYPRESS SLOUGH		
	10 largemouth bass	10 large- mouth bass
	10 mosquitofish samples (10 g. each)	10 mosquito- fish samples (10 g. each)
<hr/>		
Total Samples Per Season	35	35

Sanibel Island (Tarpon Bay) oyster samples will be collected by wildlife refuge personnel. Oyster samples will be manually collected at low tide and placed in a labeled ziplock bag and placed on ice in the field. These collected samples will be immediately taken to the laboratory, shucked, and frozen. After shucking the oyster, samples should be placed in ziplock bags or glass jars and double labeled. A label should be placed on the outside and inside of the bags or jars. Six Mile Cypress Slough fin-fish will be collected by Lee County personnel. Fin-fish samples will be collected by electrofishing or some other suitable collecting method for largemouth bass and by dip netting for mosquitofish. Fin-fish samples will be placed on ice following collection. These collected samples will be immediately returned to the laboratory and either placed in 1-gallon ziplock bags or double wrapped in aluminum foil with the shiny side of the foil facing outward. The samples will be double labeled. One label will be placed inside of the plastic bag or aluminum foil wrapping and one label will be placed on the outside of the plastic bag or aluminum foil.

The samples will be immediately frozen and shipped in an ice chest with dry ice to the USFWS office in Vero Beach, Florida. The samples will be sent with a chain of custody form. The USFWS will ship the samples from Vero Beach to the Patuxant Analytical Control Facility for total mercury laboratory analysis. Total mercury will be measured at a detection limit of 0.05 ppm or less using a method which requires digestion either by microwave in a sealed container, or by reflux using water condensers. After digestion by one of these methods, analysis will be performed by cold vapor atomic absorption.

Pre-construction sampling will be initiated within 6 months after the County commences construction of the facility and will be conducted each September and March until the facility starts operation. Post-construction monitoring and analysis will be conducted twice each year (September and March) for up to five years. Thereafter, the County and USFWS will evaluate the data and determine whether the biomonitoring should be reduced or eliminated.

DATA ANALYSIS AND REPORTING

The USFWS will conduct the laboratory analysis for total mercury at approximately fifty dollars (\$50.00) per sample. Lee County will pay for all shipping costs associated with sample collection and analysis. The Lee County Solid Waste Division will promptly reimburse the USFWS for the cost of the laboratory analysis upon receipt of an appropriate billing statement from the USFWS. The USFWS will prepare any appropriate data summary or analysis and will provide such data each year to Lee County Solid Waste Division. Data will be placed in the STORET data base for public access. Data will be transformed (\log_{10} transformation) prior to analysis (Facemire 1991).

REFERENCES

Clement International Corporation (CIC). 1991. Lee County Board of County Commissioners, Ecological Assessment For The Proposed Lee County Waste-To-Energy Facility. December, 1991.

Facemire, C.F. 1991. Toxicologist, Environmental Contaminants Division, U.S. Fish and Wildlife Service, Arlington, Virginia. Telephone Communication. December 23, 1991.


OGDEN MARTIN SYSTEMS, INC.

P.O. BOX 0709
BRANDON, FL 33509-0709

JOSEPH R. TRESHLER
GENERAL MANAGER
MARKETING AND OPERATIONS
SOUTHEASTERN UNITED STATES

(813) 684-5688
FAX (813) 684-7964

*Patty
for file and
Distribute, if
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done*



AN OGDEN PROJECTS
COMPANY

RECEIVED *Preston*
JAN 9 1992
1/10/92

Division of Air
Resources Management

January 3, 1992

Mr. Preston Lewis
Central Air Permitting
Bureau of Air Quality Management
Florida DER
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee FL 32301

**Re: Lee County Resource Recovery Facility
DER Case No. PA90-13**

Dear Mr. Lewis,

As a follow-up to our conversation of January 2, 1992, I am writing to confirm to you our intention to select Lancaster Distral as our boiler equipment vendor for the Lee County Project. For your convenience, I have attached a copy of my letter sent December 17, 1991 to David Dee, Esq. (Permitting Attorney for Lee County Florida) notifying him of specific information regarding our intended boiler equipment vendor.

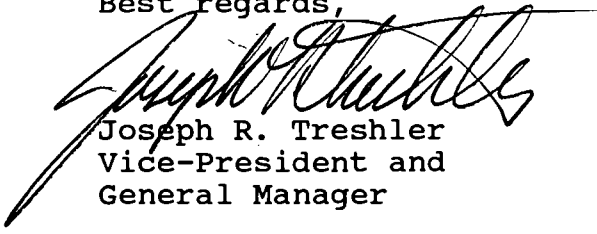
Ogden Martin Systems, Inc. competitively bids the supply of boiler equipment for each Resource Recovery Facility (RRF) project on an individual project basis. Once proposals are received from pre-qualified boiler equipment vendors, the performance characteristics of each vendors equipment is evaluated and compared to the other vendor proposals received. Compliance with the primary technical and environmental requirements established within the equipment specifications are verified and individual differences within a vendor's proposal which directly effects the performance efficiency of their equipment are noted. For our initial submittal to the client on a given project, we take the most conservative approach and utilize the most conservative steam production guarantee supplied to us of all proposals received in compliance with the balance of all technical specifications for the boiler equipment. We do this because we do not award a contract for boiler equipment at the point in time when we are submitting a proposal for an RRF project.

Mr. P. Lewis
January 2, 1992
Page 2

Once awarded an RRF project, we base our selection and award of the boiler equipment contract on a comprehensive review of all aspects of the vendor's proposal, including equipment efficiency, price, contractual terms, past performance on similar projects, etc., to arrive at the best overall equipment selection capable of meeting all technical and environmental requirements of the project.

I hope this further explanation answers your question on our notification to Mr. Dee. Please feel free to contact me at any time with any further information requests.

Best regards,



Joseph R. Treshler
Vice-President and
General Manager

JRT/ejs
Attachment

cc: G. Crane
D. Dee
J. Kowal
D. Owen
L. Montresor
P. Young

lewis.ltr

OGDEN MARTIN SYSTEMS, INC.

P.O. BOX 0709
BRANDON, FL 33509-0709

JOSEPH R. TRESHLER
GENERAL MANAGER
MARKETING AND OPERATIONS
SOUTHEASTERN UNITED STATES
(813) 684-5688
FAX (813) 684-7904



December 17, 1991

David Dee, Esquire
Carlton Fields
PO Drawer 190
Tallahassee, Florida 32302

Re: Lee County Resource Recovery Facility
DER Case No. PA 90 - 13

Dear Mr. Dee:

Ogden Martin Systems, Inc. is pleased to advise you that we have completed our evaluation of potential boiler vendors for the Lee County Solid Waste Resource Recovery Facility Project. We wish to notify you of more specific information regarding one of the proposed Conditions of Certification for this Project. Section XIV.A of the Conditions provides that:

"Each combustor unit is designed to produce a maximum of 152,000 lbs of steam per hour at 865 psig and 830° F."

Based on our final negotiations with the various boiler vendors and our ultimate selection of the best qualified firm, the vendor has advised us that he will guarantee a steam production rate of 169,270 lbs per hour at 100% of the Maximum Continuous Rating (MCR) for each combustion (combustor) unit. At 110% of MCR, the guaranteed steam production rate for each unit would be 186,197 lbs/hr. Accordingly, we request that Section XIV.A be revised to reflect 186,197 lbs of steam/hr per combustion unit rather than 152,000 lbs per hour. This change in the steam production rate simply reflects the selection of a specific boiler vendor's equipment and the improved efficiency their equipment affords. Specific establishment of this guaranteed steam production rate does not reflect any change in any predicted emissions from the Facility so long as the individual combustion units are operated within the 110% MCR value stated herein.

Best Available Copy

David Dee
December 17, 1991
Page 2

Thank you for your help in resolving this issue. Please advise me of any questions you may have regarding this subject.

Best regards,

Joseph R. Treshler (es)

Joseph R. Treshler
Vice-President and
General Manager

JRT/ejs

jrt91138

**OGDEN MARTIN SYSTEMS
OF HILLSBOROUGH, INC.**

P.O. BOX 709
BRANDON, FLORIDA 33509-0709
(813) 684-5688
FAX NO: 813-684-7964



To: Mr Preston Lewis LOCATION: FDER - Bureau of Air Quality Mgmt.
Telecopy Number: 904-922-6979
From: JR Treshler / G Stoff
Date: 1/3/92 Time: 5:00 pm
Pages to Follow: 4

Message:

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P.O. BOX 709
BRANDON, FLORIDA 33509-0709
(813) 684-5688
FAX NO: 813-684-7964

To: Mr. Guston Lewis LOCATION: FDER - Bureau of Air Quality Mgmt.

Telecop Number: 904-922-6979

From: JR Traskler / E Stoff

Date: 1/3/92 Time: 5:00 pm

Pages to Follow: 4

Message:

Note: I have made a copy of this letter for my file. Mirza

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11/3/92



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

December 26, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Jewell A. Harper
Air Enforcement Branch
U.S. EPA, Region IV
345 Courtland Street, NE
Atlanta, GA 30365

Dear Ms. Harper:

Re: Lee County Solid Waste Energy Recovery Facility
Mass Burn - New Facility
Federal Number: PSD-FL-151

Enclosed for your review and comment is a copy of the Technical Evaluation and Preliminary Determination for the above referenced project. Please submit any comments or questions within 30 days to Tom Rogers or Barry Andrews at the above address or call (904)488-1344 at your earliest convenience.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/MH/mh

Enclosure

c: David Knowles, South Dist.
Tom Rogers, BAMA
Chris Shaver, NPS
David Dee, CFWES&C, P.A.

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- Complete items 3, and 4a & b.
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- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

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2. Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
 Ms. Jewell A. Harper, Chief
 Air Enforcement Branch
 U.S. EPA, Region IV
 345 Courtland Street, N.E.
 Atlanta, Georgia 30308

4a. Article Number:
 P 832 538 757

4b. Service Type

Registered Insured

Certified COD

Express Mail Return Receipt for Merchandise

7. Date of Delivery

5. Signature (Addressee)

6. Signature (Sender)

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PS Form 38, October 1990 U.S. GPO: 1990-279-861

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Mailed: 12-17-91	
Permit: PSD-FL-151	

PS Form 3800, June 1990

Technical Evaluation
and
Preliminary Determination

Lee County Solid Waste Energy Recovery Facility
Mass Burn MSW Facility
Lee County, Florida

Permit No. PSD-FL-151

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

December 26, 1991

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**State of Florida Department of Environmental Regulation
Lee County Solid Waste Energy Recovery Facility Electric Power
Plant Site Certification Review Case No. PA 90-30**

I. SUMMARY

Facilities Overview

Lee County has requested certification of a power plant site that would have an ultimate capacity of 50 megawatts (MW), consisting of three 600 tons per day (tpd), mass burn solid waste-to-energy resource recovery units. The facility would use municipal solid waste as fuel. The first phase of the Lee County Solid Waste Energy Recovery Facility would have a capacity of 1,200 tpd and an installed generating capacity of approximately 35 megawatts (MW). The second phase would include another 600 tpd waste burning unit and an ultimate generating capacity of approximately 50 MW. The generating units would be tied into the FPL transmission network using a new 138 kV transmission line to FPL's existing Buckingham Substation located approximately one-half mile north of the site. Municipal solid waste would be trucked to the site. Ash from the facility would be disposed of off site in a licensed landfill.

Approximately 155 acres would be required for the waste-to-energy facility and associated transmission line.

Air Impacts

Based on the proposed air pollutant control technologies, it is expected that the Lee County Solid Waste Energy Recovery Facility (SWERF) would use the Best Available Control Technology to limit both stack and fugitive air emissions. Analysis of the predicted effects of the proposed facilities emissions indicates that no significant ambient air quality impacts would occur, and all applicable specific emission limiting standards would be met.

With respect to other possible adverse environmental effect, the possible adverse effects of the bio-accumulation of mercury in fish and wildlife is the principal concern. To address this concern the Department is recommending that state-of-the-art emissions control for mercury (carbon adsorption) be installed at the facility. In addition, Lee County will be initiating a county-wide battery collection program. Batteries are the principle source of mercury in the waste stream. As such, the Lee County facility will emit less mercury to the atmosphere than any similar facility in the state.

VI. FACILITY SPECIFIC CONCERNS

A. Air Quality

1. Selected Fuel

The primary fuel for the Lee County SWERF is municipal solid waste. Propane will be used during startup, shutdown, and when required for temperature maintenance.

2. Air Quality Impact Analysis

a. Introduction

The proposed Lee County Energy Recovery Facility (ERF), will emit in PSD-significant amounts eleven pollutants. These pollutants include the criteria pollutants carbon monoxide (CO), lead (Pb), nitrogen oxides (NOx), ozone (O₃) (as volatile organic compounds), particulate matter (PM and PM₁₀), and sulfur dioxide (SO₂), and the non-criteria pollutants beryllium (Be), fluoride (F), mercury (Hg), and sulfuric acid mist (H₂SO₄).

The air quality impact analysis required by the PSD regulations for these pollutants includes:

- * An analysis of existing air quality;
- * A PSD increment analysis (NO₂, PM, and SO₂ only);
- * An Ambient Air Quality Standards (AAQS) analysis;
- * An analysis of impacts on soils, vegetation, and visibility and of growth-related air quality impacts; and
- * A "Good Engineering Practice" (GEP) stack height determination.

The analysis of existing air quality generally relies on preconstruction monitoring data collected with EPA-approved methods. The AAQS analysis depends on the air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on the required analyses, the Department has reasonable assurance that the proposed sources at the Lee County ERF, as described in this report and subject to the conditions of approval proposed herein, would not cause or contribute to a violation of any ambient air quality standard or PSD increment. A discussion of the modeling methodology and required analysis follows.

b. Modeling Methodology

For the screening modeling analysis, model results were calculated for a range of operating conditions for which the maximum ground-level impacts would be expected to occur. A total of 14 operating conditions for waste throughput and waste heat content were considered. On the basis of the modeling results, two worst-case operating conditions were selected for the prediction of maximum air quality impacts. These operating conditions were:

- * 1,800-tpd throughput with a refuse heat content of 5,000 Btu/lb (design capacity, or 100 percent of the design heat release) for long-term (annual average) periods; and

- * 1,650-tpd throughput with a refuse heat content of 6,000 Btu/lb for short-term (24 hours or less) periods. (This condition results in minimum flue gas flow rate which was coupled with the maximum emission rates calculated at 110 percent of the design heat release.)

The EPA-approved Industrial Source Complex Short-Term (ISCST) dispersion model was used in all phases of the air quality impact analysis. This model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, Gaussian dispersion, and pollutant removal mechanisms such as deposition and transformation. The ISCST model allows for the separation of sources, building wake downwash, and various other input and output features.

Initially, a rectangular "coarse" receptor grid was developed based on the screening modeling results, and on guidance contained in Guidelines on Air Quality Models (EPA, 1986). The grid was extended outward from the stack location to 10 km in each of the four directions. Screening modeling had indicated the maximum impacts were likely to occur within 5 km. Half-kilometer spacing of gridlines in each direction was initially used. Receptor points were placed at each gridline crossing, for a total of 1,681 receptors. Terrain elevations were selected for each receptor point from the appropriate U.S. Geologic Survey topographic maps (7.5-minute quadrangles) of the area. The maximum terrain within 250 meters of each receptor was assigned to that receptor.

Fine resolution grids (with 100 meter resolution) were centered around receptor locations where the highest, and the highest of the second-highest ground-level impacts for each pollutant averaging period occurred for each of the five years modeled. Fine grids spanned at least a 1.1 km square area centered on each coarse-grid receptor.

Additional discrete receptors were positioned at the nearest boundary of the Everglades National Park PSD Class I area, located 88 km from the proposed facility. Receptors were also placed at the nearest boundary of the Big Cypress National Preserve, 61 km from the proposed facility. Even though the Big Cypress National Preserve is not a PSD Class I area, it is considered to be an area that is sensitive to air quality impacts because of its pristine nature and the presence of unusual or endangered plant species.

Meteorological data used in the modeling consisted of five years (1982-1986) of hourly surface data taken at Ft. Myers, Florida. Mixing heights used in the modeling were based on upper air data from Ruskin (near Tampa), Florida.

Table 1 lists the significant and net emission rates for the proposed facility. Table 2 lists the stack parameters and emission rates for the proposed facility for the operating conditions that produced the highest ground-level concentrations (110% load for short-term operation).

Table 1. Significant and Net Emission Rates (Tons per Year)

Pollutant	Significant Emission Rate	Existing Emissions	Proposed Maximum Emissions	Net Emissions	PSD Applicable Pollutant (Yes/No)
CO	100	0	324	324	Yes
NO ₂	40	0	959	959	Yes
SO ₂	40	0	490	490	Yes
PM	25	0	64	64	Yes
PM ₁₀	15	0	64	64	Yes
O ₃ (VOC)	40	0	69	69	Yes
Lead	0.6	0	2.0	2.0	Yes
Be	4.0E-4	0	4.4E-4	4.4E-4	Yes
Hg	0.1	0	2.0	2.0	Yes
Fluoride	3.0	0	11.5	11.5	Yes
H ₂ SO ₄	7	0	118	118	Yes
HCl	NA	0	212	212	NA
Dioxins	NA	0	8.3E-5	8.3E-5	NA
As	NA	0	0.03	0.03	NA

Table 2. Stack Parameters and Emission Rates for Proposed Sources.

	Short-term Case	Annual Case
	-----	-----
Building Height (m)	33.53	33.53
Max. Projected Width (m)	>33.53	>33.53
GEP Stack Height (m)	83.82	83.82
Modeled Stack Height (m)	83.82	83.82
Stack Exit Diameter (m)	3.26	3.26
Stack Exit Velocity (m/s)	21.6	19.8
Stack Exit Temp. (K)	389	389
SO ₂ Emissions (g/s)	19.36	14.08
NOx Emissions (g/s)	30.35	27.59
CO Emissions (g/s)	41.03*	10.26*
PM Emissions (g/s)	2.01	1.83
PM ₁₀ Emissions (g/s)	2.01	1.83
VOC Emissions (g/s)	2.18	1.98
Pb Emissions (g/s)	0.063	0.057
F Emissions (g/s)	0.364	0.331
H ₂ SO ₄ Emissions (g/s)	3.72	3.38
HCl Emissions (g/s)	6.69	6.08
Hg Emissions (g/s)	0.084	0.076
Be Emissions (g/s)	1.41E-5	1.28E-5
As Emissions (g/s)	9.46E-4	8.60E-4
Dioxin Emissions (g/s)	1.70E-7	1.50E-7

* For CO the short-term emission rate is a 1-hour emission rate at 110 percent load. The "annual" emission rate is an 8-hour emission rate at 110 percent load. CO does not have an annual air quality standard.

c. Analysis of Existing Air Quality

Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review. In general, one year of quality assured data using an EPA reference, or the equivalent monitor must be submitted. Sometimes less than one year of data, but no less than four months, may be accepted when Departmental approval is given.

An exemption to the monitoring requirement can be obtained if the maximum air quality impact, as determined by air quality modeling, is less than a pollutant-specific "de minimus" concentration. In addition, if current monitoring data exists and these data are representative of the proposed source area, then at the discretion of the Department these data may be used.

The predicted ambient impact of the proposed facility for those pollutants subject to PSD review are listed in Table 3. Sulfuric acid mist, As, HCl, and dioxins are not listed in this Table 3 because there are no de minimus levels for these pollutants. However, these pollutants were modeled and their respective predicted impacts are less than their acceptable ambient concentrations, as defined by the Department (See Section "e" AAQS Analysis for details). Based on the modeling results and the fact there are no known industrial sources of these pollutants within 10 km of the proposed facility no additional monitoring was required for these pollutants.

The predicted maximum impacts for CO, NO₂, PM, PM₁₀, SO₂, VOC, Pb, Be, Hg, and F are less than their respective de minimus impact levels. Therefore, no additional monitoring is required for these pollutants.

Table 3. Maximum Air Quality Impacts for Comparison to the Significant Impact and De Minimus Ambient Levels.

Pollutant	Avg. Time	Predicted Impact (ug/m3)*	Sign. Impact Level (ug/m3)	De Minimus Level (ug/m3)
CO	1-hour	46.92	2000.0	N/A
	8-hour	4.03	500.0	575.0
NO ₂	Annual	0.36	1.0	14.0
PM	24-hour	0.33	5.0	10.0
	Annual	0.024	1.0	N/A
PM ₁₀	24-hour	0.33	5.0	10.0
	Annual	0.024	1.0	N/A
SO ₂	3-hour	12.46	25.0	N/A
	24-hour	2.52	5.0	13.0
	Annual	0.19	1.0	N/A
Pb	3-month	0.012*	N/A	0.1
Be	24-hour	2.79E-6*	N/A	0.001
Hg	24-hour	0.017*	N/A	0.25
F	24-hour	0.072*	N/A	0.25
VOC	Annual	69 TPY	N/A	100 TPY

* For Pb, Be, Hg, and F the applicant chose to list the highest predicted impact instead of the highest, second-highest as is permitted.

d. PSD Increment Analysis (NO₂, PM, PM₁₀, and SO₂)

i. Class II Area

The proposed facility is located in a Class II area. This area is also designated as an attainment area for NO₂, PM and SO₂. Therefore, a PSD increment analysis was performed to show compliance with the Class II NO₂, PM, PM₁₀, and SO₂ increments.

The PSD increment represents the amount that new sources in an area may increase ambient ground-level concentrations of a pollutant. At no time, however, can the increased loading of a pollutant cause or contribute to a violation of the ambient air quality standard.

Atmospheric dispersion modeling, as previously described, was performed to quantify the amount of PSD increment consumed. The modeling results are summarized in Table 4.

Based on these modeling results, the impacts from the proposed facility will not violate any of the Class II increments.

Table 4. PSD Class II Increment Analysis

Pollutant	Averaging Time	Max. Pred. Impact (ug/m ³)	Allowable Increment (ug/m ³)
SO ₂	3-hour	12.46	512
	24-hour	2.52	91
	Annual	0.19	20
NO _x	Annual	0.36	25
PM	24-hour	0.33	37
	Annual	0.02	19
PM ₁₀ *	24-hour	0.33	30*
	Annual	0.02	17*

* EPA proposed maximum allowable increases (increments) for PM₁₀.

ii. Class I Area

A proposed source subject to PSD review must conduct a dispersion modeling analysis of its impacts on any PSD Class I areas located within a 100 km radius. In this case, there is one applicable Class I area, the Everglades National Park, located 88 km south-southeast of the proposed facility. Though not required, the applicant performed a similar analysis for the Big Cypress National Preserve, a Class II area located 61 km southeast of the proposed facility. As a conservative

comparison, highest annual and highest short-term impacts at both areas were compared to the Class I PSD increments. Table 5 summarizes the PSD increment consumption at the Everglades National Park.

Table 5. PSD Class I Increment Analysis

Pollutant	Averaging Time	Max. Pred. Impact (ug/m ³)	Allowable Increment (ug/m ³)
SO ₂	3-hour	0.802	25
	24-hour	0.120	5
	Annual	0.006	2
NO _x	Annual	0.012	2.5
PM	24-hour	0.016	10
	Annual	0.001	5
PM ₁₀ *	24-hour	0.016	8
	Annual	0.001	4

* Proposed maximum allowable increases (increments) for PM₁₀.

Based on these modeling results, the impacts from the proposed facility will not violate any Class I increment. In addition, all predicted impacts for the Big Cypress National Preserve are also below the PSD Class I allowable increment levels. A complete listing of this later analysis can be found in the proposed facility's application package.

e. AAQS Analysis

Given existing air quality in the area of the proposed facility, emissions from the proposed facility are not expected to cause or contribute to a violation of an AAQS. The results of the AAQS analysis are summarized in Table 6.

Of the pollutants subject to review, only CO, NO₂, Pb, PM, PM₁₀, SO₂ and O₃ have an AAQS. Except for O₃, dispersion modeling was performed as detailed earlier for the proposed facility. The modeling results indicate that for each of these pollutants the maximum predicted impacts were less than the significant impact levels defined in Rule 17-2.100 (170), FAC (Table 3). As such, no modeling of other sources were necessary for these pollutants.

For each of the pollutants subject to an AAQS review, the total impact on ambient air is obtained by adding a "background" concentration to the maximum modeled concentration. This "background" concentration takes into account all sources of a particular pollutant that are not explicitly modeled. The "background" concentrations are taken from areas that are much

more industrialized than the proposed facilities location. Therefore, these background values are considered to be conservative. The 1989 monitoring results for monitors closest to the proposed site were used to determine the background concentrations.

Table 6. Ambient Air Quality Impact

Pollutant and Averaging Time	Maximum Impact of Proposed Project (ug/m ³)	Predicted Total Impact (ug/m ³)	Florida AAQS (ug/m ³)
CO (1-hour)	46.92	10351.90	40000
(8-hour)	4.03	6874.00	10000
NO ₂ (Annual)	0.36	42.36	100
Pb (3-month)	0.01	0.21	1.5
SO ₂ (3-hour)	12.46	214.46	1300
(24-hour)	2.52	50.52	260
(Annual)	0.19	8.19	60
PM (24-hour)	0.33	58.33	150
(Annual)	0.02	31.02	60
PM ₁₀ (24-hour)	0.33	58.33	150
(Annual)	0.02	31.02	50

There is currently no acceptable method to model VOC's for ozone formation. Consequently, the control of the VOC emissions are addressed in the BACT review.

Dioxins, Hg, Be, F, H₂SO₄, As, and HCl do not have an AAQS. However, these pollutants were modeled and the results were compared to the Department's acceptable ambient air concentrations (No Threat Levels). Table 7 summarizes the results of this analysis. The predicted concentrations for each of these pollutants is less than their respective No Threat Levels.

Table 7. No Threat Level Analysis (Direct Inhalation Risk)

Pollutant	Averaging Time	Max. Pred. Impact (ug/m ³)	No Threat Level (ug/m ³)
Hg	8-hour	0.041	0.5
	24-hour	0.017	0.12
Be	Annual	1.7E-7	4.0E-4
F	8-hour	0.177	25
H ₂ SO ₄	8-hour	1.81	10
	24-hour	0.74	2.4
As	Annual	1.1E-5	2.0E-4
HCl	Annual	0.08	7
Dioxins	Annual	1.0E-9	2.2E-8

f. Additional Impacts Analysis

i. Impacts on Soils and Vegetation

The maximum ground-level concentration predicted to occur for each pollutant as a result of the proposed project, including a background concentration, will be below the applicable AAQS including the national secondary standard developed to protect public welfare-related values. As such, this project is not expected to have a harmful impact on soils and vegetation.

ii. Mercury accumulation in Fish

An issue of public concern in recent years is the high concentration of mercury being found in fish and wildlife in various parts of Florida. This problem has been especially acute in the South Florida area near the Everglades where fish consumption advisories have been issued by HRS. Limited advisories have also been issued for many of the other lakes and streams throughout the state. Because of this mercury contamination the Department has initiated several research and assessment studies to better understand the problem and to help direct the Department in addressing its solution.

The Lee County facility will emit mercury to the atmosphere as a result of the combustion of mercury-containing waste. The complex nature of mercury cycling in the environment makes it difficult to accurately quantify source-receptor relationships. Therefore, accurate estimates of the amount of mercury emitted from the Lee County facility that will end up in edible fish in nearby lakes and streams cannot be made. However, reasonable analogies between the Lee County area and other areas of the state with local mercury emissions sources can be made. For example, the Tampa Bay area contains many more sources of

mercury, including three municipal solid waste facilities and two large coal-burning power plants. Mercury concentrations in the lakes and streams near the Tampa Bay area are similar to those in remote areas of Florida which are far from any known man-made sources of mercury.

The Lee County facility will emit less mercury to the atmosphere than any similar facility in the state. The Department is requiring that state-of-the-art emissions control for mercury (carbon adsorption) be installed at the facility. In addition, Lee County will be initiating a county-wide battery collection program. Batteries are the principle source of mercury in the waste stream. The Department is reasonably assured that mercury emissions from the proposed facility will not significantly increase mercury concentrations in edible fish in local lakes and streams.

Due to the prevailing trade winds, the predominate windflow in the Lee County area is from east to west. On an annual average the majority of the mercury emitted from the SWERF will be transported west away from the Everglades and the Big Cypress Swamp. Due to the distance from the Everglades to the proposed facility, deposition of air pollutants in the Everglades will be extremely small on any given day. Since regional meteorology would result in winds towards the Everglades for a small percentage of days in any year, the Department therefore concludes the SWERF will have minimal adverse impacts on the Everglades.

iii. Impact on Visibility

Visual Impact Screening and Analysis (EPA 450/4-88-015) known as VISCREEN (Nov. 22, 1988), the EPA-approved Level I visibility computer model was used to estimate the impact of the proposed facility's stack emissions upon visibility in the Everglades National Park and the Big Cypress National Preserve. Results of the Level I visibility impairment analysis for each area demonstrate that all contrast parameters have values much less than the 0.05 threshold value. Thus, emissions from the proposed facility will not have a significant impact on visibility at either of these areas.

iv. Growth-Related Air Quality Impacts

The proposed facility is not expected to significantly change employment, population, housing or commercial/industrial development in the area to the extent that an air quality impact will result.

v. GEP Stack Height Determination

Good Engineering Practice (GEP) stack height means the greater of: (1) 65 meters or (2) the maximum nearby building height plus 1.5 times the building height or width,

whichever is less. Of the boiler building designs likely to be proposed, the shortest one is 110 feet (33.53 meters) tall. This structure is expected to be a squat building, one for which the height is the lesser dimension in comparison with the width. Therefore, the GEP stack height equation, as applied to this facility, is two and one-half times the building height. The GEP stack for this building is calculated to be 275 feet (83.82 meters).

3. Best Available Control Technology

On June 29, 1990, Lee County filed a Power Plant Siting Act application with the Department to build a mass-burn energy recovery facility. On May 1, 1991, the county decided to proceed with a facility smaller than originally proposed. The current proposal is to build a facility initially with two units, with a permitted capacity of 660 ton/day, per unit, (the design/rated capacity is 600 tons/day, per unit), based on a heat input of 5,000 Btu/lb of MSW, and capable of generating 15 Mw, per unit. At a future date, the facility as currently proposed will have an ultimate permitted capacity of 1980 tons/day and a total electrical generating capacity of approximately 45 megawatts (net) from all three units. Lee County has selected Ogden Martin as the vendor for the construction and operation of the facility. Ogden Martin has proposed to initially install two stoker water wall combustion steam generation units. The site for the proposed energy recovery facility is approximately two and one half miles east of the intersection of Interstate 75 and state road 82.

Projected Emissions:

Table 8 represents a list of pollutants and estimated emissions along with the respective PSD significant emission rates. The mass burn units will have a combined heat input of 750 MMBtu/hr for three 660 TPD units. Each unit will be permitted to operate at 27.5 tons/hour and 8760 hours/year. However, the plant is expected to operate about 85% of the time. Auxiliary burners fired by propane gas will be used during startup, shutdown, and when required for temperature maintenance. The 10% capacity factor as determined by 40 CFR 60.44b(d) will not be exceeded.

Table 8
Lee County Energy Recovery Facility

Pollutant	PSD Significant	
	Emission Rate tons/yr	Emission Rate tons/yr
Particulate (PM)	64	25
Sulfur Dioxide (SO ₂)	490	40
Nitrogen Dioxides (NO ₂)	959	40
Carbon Monoxide (CO)	324	100
Hydrocarbons (VOC)	69	40
Lead (Pb)	2.0	0.6
Arsenic (As)	0.03	Any Amount
Mercury (Hg)	2.0	0.1
Beryllium (Be)	4.4 x 10 ⁻⁴	4.0 x 10 ⁻⁴
Fluoride (as HF)	11.5	3
Sulfuric Acid (H ₂ SO ₄)	118	7
Hydrogen Chloride (HCl)	212	-
Dioxin/Furans	8.3 x 10 ⁻⁵	-

BACT Determination Requested by the Applicant

The applicant has proposed a dry scrubber followed by a fabric filter (baghouse) for the control of particulates, acid gases and metals. NOx emissions will be controlled by the selective non-catalytic reduction (SNCR) process in which a nitrogen containing reagent, such as ammonia or urea is brought into contact with flue gas NOx in the boiler through the use of injectors located in the boiler's wall. Overall mercury emissions will be reduced by at least 70% first by injecting activated carbon, sodium sulfide, or a combination of both into the flue gas prior to the dry scrubber and/or baghouse and secondly, the county will operate a household battery collection program. According to the applicant, the proposed mercury control exceeds BACT, and is not proposed as BACT by the applicant. BACT for VOC's, CO and organics was determined by the applicant to be proper furnace design and operation and combustion control techniques.

The applicant has requested BACT emission rates on a pollutant-by-pollutant basis as shown below. This combination of controls and emission rates represents the state of the art for energy recovery facilities.

- a) PM (Total Suspended Particulate Matter)
0.010 grains/dry standard cubic foot
corrected to 7% oxygen or
0.019 lbs/MBTU
- b) PM₁₀
0.010 grains/dry standard cubic foot corrected to
7% oxygen or 0.019 lbs/MBTU
- c) SO₂
Least stringent of 30 ppmdv corrected to 7% O₂ or 80%
removal efficiency and not to exceed 66 ppmdv at 7% O₂ (24
hour daily geometric average)
- d) NO_x
180 ppmvd @ 7% O₂
or 0.292 lb NO_x per MMBtu (24 hr daily block avg.)
- e) CO
100 ppmdv @ 7% O₂
or 0.099 lb CO per MMBtu (4 hr block avg)
- f) VOC (Hydrocarbons)
37.3 ppmdv @ 7% O₂
or 0.0210 lbs VOC/MMBtu (1 hr avg)
- g) HCl
Least stringent of 25 ppmdv at 7% O₂
or 0.0643 lb HCl/MMBtu
- h) H₂SO₄
0.0358 lb/MMBtu
- i) F (Fluorides)
5.0 ppmdv @ 7% O₂
or 0.0035 lb HF/MMBtu
- j) Pb (Lead)
0.0006 lbs of Pb/MMBtu

- k) Be (Beryllium)
1.35 x 10⁻⁷ lbs of Be/MMBtu
- l) Hg (Mercury)
8.0 x 10⁻⁴ lb Hg/MMBtu
- m) As (Arsenic)
9.1 x 10⁻⁶ lbs As/MMBtu
- n) Dioxins and Furans
Total tetra-octa dioxins/furans
30 ng/NM³ @ 7% O₂
Equivalent to
2.54 x 10⁻⁸ lb/MMBtu

BACT Determination Procedure:

According to DER rules, a BACT determination requires the Department to consider for each pollutant emitted, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, and determine the maximum degree of reduction which is achievable through application of production processes and available methods, systems and techniques. The applicable regulations also require the Department to consider:

- a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant, to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).
- b) All scientific engineering and technical material and other information available to the Department.
- c) The emission limiting standards or BACT determinations of any other state.
- d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in

question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique, technical, environmental, or economic objections. Emissions from resource recovery facilities can be grouped into categories based upon what control equipment and techniques that are available to control emissions from these facilities. Using this approach, the air emissions can be classified as follows:

- o Combustion products (Particulates and Heavy Metals)
Controlled generally by particulate control devices.
- o By-products of incomplete combustion (CO, VOC, toxic organic compounds). Control is largely achieved by proper combustion techniques
- o Acid Gases (SO₂, NO_x, HCl, F, H₂SO₄)
Controlled generally by gaseous control devices.

Grouping the pollutants in this manner facilitates the BACT analysis because it enables the equipment available to control the type or group of pollutants emitted and the corresponding energy, economic, and environmental impacts to be examined on a common basis. Although all of the pollutants addressed in the BACT analysis may be subject to a specific emission limiting standard as a result of PSD review, the control of "nonregulated" air pollutants is considered in potentially imposing a more stringent BACT limit on "regulated" pollutants (i.e., particulates, SO₂, fluorides, sulfuric acid mist, etc)., if a reduction in "nonregulated" air pollutants can be directly attributed to the control device selected as BACT for the abatement of the "regulated" pollutants. This policy was reaffirmed by the EPA Administrator in a 1986 remand of a PSD permit for the North County Resource Recovery Facility in San Marcos, California. Two additional similar remands for resource recovery PSD permits occurred in EPA Region V.

BACT Analysis

Combustion Products:

The estimated emissions from this facility exceeds the PSD significant rate for particulates and heavy metals as contained in Rule 17-2.500, Table 500-2, F.A.C. In addition, since the charging rate of Municipal Solid Waste (MSW) is greater than 250 tons per day for each unit, the recently promulgated Subpart Ea of the New Source Performance Standards would also apply. Based on information now available, vendors can use either electrostatic precipitator or fabric filter (baghouse) technology to achieve grain loadings of 0.010 grains/dscf corrected to 7% O₂. This level for particulates is currently

in use in several states and is considered to be the best available control technology.

The use of dry scrubbers employing hydrated lime has been shown to effectively remove heavy metals except mercury in combination with a fabric filter. Enhanced control of heavy metals results from a reduction in the flue gas temperature caused by the dry scrubbers allowing the metals to cool and condense onto the particulate matter. To control mercury emissions the facility has proposed an overall removal efficiency of 70%, first by injecting activated carbon, sodium sulfide or a combination of both, into the flue gas prior to the dry scrubber and/or baghouse, and secondly the county will operate a household battery collection program.

Products of Incomplete Combustion:

Carbon monoxide is a product of incomplete combustion resulting from insufficient air. Incomplete combustion will also cause the emission of solid carbon particulates in the form of smoke or soot, and unburned and/or partially oxidized hydrocarbons. Incomplete combustion also results in the loss of heat energy to the boiler thus producing less steam and power for sale.

Hydrocarbon emission, like carbon monoxide emissions, result from incomplete oxidation of carbon compounds. Control of CO and HC can be mutually reinforcing processes.

Toxic organic compounds such as dioxins/furans (tetra-through octa-chlorinated dibenzo-p-dioxins and dibenzofurans) and polycyclic organic matter are considered to be hazardous to some animal species and may pose a threat to public health. Recent studies have shown that the emissions of toxic compounds such as dioxins/furans can be adequately controlled by proper combustion practices and maintaining proper temperatures in the combustion and post-combustion zones.

This reliance on good combustion serves as part of the basis for Subpart Ea of the New Source Performance Standards (NSPS) which contains emission limitations for both carbon monoxide and toxic organic compounds. For carbon monoxide the standard is equivalent to that proposed as BACT by the applicant (100 ppmv, 4 hour block average). This level is also consistent to that established as BACT for other waste-to-energy facilities, and is judged to represent BACT for the Lee County facility.

The applicant has proposed, and the EPA now requires that emissions not exceed 30 ng/dscm (measured as total dioxins/furans) corrected to 7 percent oxygen. As this is the

case, BACT for the Lee County facility will be established as meeting the NSPS.

Acid Gases:

Emissions of sulfur dioxide, nitrogen oxides, fluorides, hydrogen chlorides and sulfuric acid mist as well as other acid gases which are not "regulated" under the PSD rule, represent significant potential pollutants which must be subjected to appropriate control.

Sulfur dioxide emissions from resource recovery facility facilities are directly related to the sulfur content contained in the refuse incinerated. MSW components that appear to be major contributors of sulfur include rubber, plastics, food wastes, yard wastes and paper. Some of the sulfur dioxide emitted from the combustion of the sulfur containing refuse is oxidized to SO_3 which then combines with water vapor to produce sulfuric acid mist.

Hydrogen chloride, according to the applicant, is the predominant equilibrium chlorine product from the combustion of refuse. The excess quantity of hydrogen present during the combustion process readily reacts with the chlorine in the refuse to form hydrogen chloride. Chlorinated plastics and bleached paper products are major contributors of chlorine in refuse and, therefore, have been considered as the primary sources of HCl emissions at refuse-burning facilities.

Fluoride emissions from refuse combustion are primarily from fluorinated plastics and other fluorocarbon products such as teflons, polyvinyl fluoride films, and fluorinated aerosol propellants. The mechanism which governs fluorine release and HF formation from refuse combustion are considered much the same as HCl due to the chemical similarities between fluorine and chlorine.

Nitrogen oxides (NOx) are products of all air-oxidized combustion processes including refuse combustion. The predominant form of NOx which is produced during combustion is nitric oxide (NO). Nitrogen dioxide (NO₂) is also produced in lesser amounts. Upon exiting the stack essentially all of the NO formed during the combustion is further oxidized to form NO₂. The resulting NO₂ is a brownish-red gas which in the presence of sunlight and hydrocarbons, can react to form ozone (photochemical smog) and other secondary pollutants.

The facility proposes to use a dry scrubber (hydrated/slaked lime) to control SO₂ and other acid gas emissions and to install a selective noncatalytic reduction (SNCR) process by injecting ammonia to control the NOx emissions. The "Good Combustion Practices" shall include a

design roof temperature (to be specified by the vendor) at fully mixed height; overfire air capacity (to be specified by the vendor); and the number of separately adjustable plenums for underfire air control (to be specified by the vendor) to control the CO, VOC's and NOx emissions.

The Department agrees that this control strategy represents BACT provided that the NSPS for these pollutants is achieved. The NSPS levels are 80 percent control or 30 ppmv (24 hour daily geometric average) for sulfur dioxide, 95% control or 25 ppmv for hydrogen chloride based on a stack test, and 180 ppmv (24 hour daily block average) for nitrogen oxides, each corrected to 7 percent oxygen.

Energy Impacts:

According to the applicant, the total energy required for the dry scrubber system for SO₂ removal along with reduction of other acid gases including HCl consists of: a) I.D. fan to overcome the pressure drop across the dry scrubber, b) the compressed air for the atomizing system and, c) the motors required for the lime handling and atomizing systems. The power consumption of dry scrubber systems designed to achieve 90% SO₂ removal is about 924 kw.

Economic Impacts:

The applicant estimates the annual capital and operating costs for dry scrubbing systems which include a) amortized (20 years at 9%) installed capital equipment cost with bond burden included; b) consumption of power, water and lime; c) preventive maintenance; and, d) scrubber related disposal costs designed to achieve a 90% SO₂ removal is about \$3,929,700. With regard to economic impacts, the Department believes that the applicant is using the best control technology available, thereby dismissing the need to evaluate the cost of higher efficiency controls.

Environmental Impacts:

According to the applicant, the use of a dry scrubber has positive environmental impacts. It greatly reduces the SO₂, NOx, HCl, HF, and other acid gases. The dry scrubber operation will also ensure that the facility will not cause or contribute to a violation of the NAAQS, the PSD allowable increments and the PSD significance levels for applicable acid gas pollutants and SO₂. Here again, the Department believes the applicant is using the best control technology available and no additional measures can be taken to reduce environmental impacts from the facility.

BACT Determination by DER

The Department has determined that a thermal DeNOx (SNCR) along with a dry lime scrubber followed by a fabric filter (baghouse) represents BACT for this facility. In addition, "proper combustion practices" will minimize the dioxin/furan emissions. Mercury emissions shall be controlled by injecting activated carbon, sodium sulfide or a combination of both into the flue gas prior to the dry scrubber and baghouse. In accordance with Rule 17-2.500(5)(f) and (g), F.A.C., the Department may require the owner or operator of the proposed facility to provide it with preconstruction and post construction "Air Quality Monitoring and Analysis." The Department has determined that the highest predicted ground-level air pollutant impacts from this facility are below de minimis monitoring levels, and that sufficient background monitoring data exists to exempt the facility from pre-construction ambient air monitoring. The Department recommends stack testing within 120 days of completion of construction and operation and annually thereafter. Pursuant to Rule 17-2.700(b), F.A.C., when the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in this permit is being violated, it may require the owner or operator of the source to conduct compliance tests which identify the nature and quantity of pollutant emissions from the source and to provide a report on the results of said tests to the Department. Compliance and monitoring issues and good combustion practices will be addressed in the draft permit's specific conditions.

Based on the information presented in the preceding analysis, and information obtained from other states for similiar facilities, the emission limits for each pollutant are established as follows:

PM (Particulate Matter):

0.010 grains/dry standard Ft³; corrected to 7% O₂, or 5.34 lbs/hour, per unit and 64 tons/yr from all three units.

PM₁₀:

0.010 gr/dscf, corrected to 7% O₂

* VE (Visible Emission):

Visible emissions from each stack shall not exceed 10% opacity. (6 minute average)

SO₂:

30 ppmdv corrected to 7% O₂, (24 hour daily geometric average), or 80% removal efficiency, or 40.98 lbs/hr, per unit and 490 tons/yr from all three units.

NO_x:

180 ppmdv @ 7% O₂ (24 hour daily block average, midnight to midnight), or 80.3 lbs/hr, per unit and 959 tons/yr from all three units.

* CO:

100 ppmdv at 7% O₂ (4-hour block avg, at midnight) or 27.23 lbs/hr; per unit and 324 tons/year from all three units.

* VOC: (Hydrocarbons)

0.0210 lbs/MMBtu or 5.80 lbs/hr, per unit, and 69 tons/yr. from all three units and 37.3 ppmdv at 7% O₂.

HCl:

25 ppmdv corrected to 7% O₂, or 17.68 lbs/hr, permanent and 212 tons/yr from all three units, and 95% removal efficiency.

H₂SO₄ (Mist):

0.0358 lbs H₂SO₄/MMBtu, or 9.85 lbs/hr/unit and 118 tons/yr from all 3 units.

* Fluorides:

5.0 ppmdv corrected to 7% O₂
or 0.0035 lb HF/MMBtu, or 0.96 lbs/hr/unit and 11.5 tons/year from all three units.

* Lead (Pb):

0.0006 lbs of Pb/MMBtu, or 5.80 lbs/hr/unit and 69 tons/year from all these units.

*Beryllium (Be):

1.35 x 10⁻⁷ lb of Be/MMBtu, or 3.7 x 10⁻⁵ lbs/hr/unit and 4.4 x 10⁻⁴ tons/yr from all these units.

* Mercury (Hg):

6.0×10^{-4} lbs/MMBtu, or 0.165 lbs/hr/unit and 2.0 tons/yr from all three units.

Arsenic (As):

9.1×10^{-6} lbs As/MMBtu, or 2.5×10^{-3} lbs/hr/unit and 0.03 tons/yr from all three units.

*Dioxins/Furans:

Total (tetra-octa)

30 ng/dscm @ 7% O₂ (total dioxins/furans), or 7.0×10^{-6} lbs/hr/unit and 8.3×10^{-5} tons/yr from all three units.

Ammonia (NH₃):

Ammonia slip from exhaust gases shall not exceed 50 ppmv.

*Pursuant to Rule 17-4.080 F.A.C., for good cause and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions (for the pollutants CO, VOC, Pb, Be, Hg, dioxins/furans and visible emissions). The Department shall allow the permittee a reasonable time to conform to the new or additional conditions and on application of the permittee the Department may grant an additional time.

B. Availability of Water

During normal operation, water will be supplied to the energy recovery facility from public sources. Process cooling water will be treated wastewater effluent (reclaimed water) drawn from the City of Fort Myers Central Advanced Wastewater Treatment Plant. The wastewater treatment plant is located approximately four miles west of the site. Cooling tower blowdown water will be used in the facility, for ash quenching, lime slaking, and other miscellaneous uses. Potable water will be obtained from the Lee County Utilities. It will be used for process and drinking purposes. An on-site well will be used for back-up cooling water needs. No process or sanitary wastewater will be discharged to surface water or groundwater bodies.

The central AWT plant has a capacity of 11 million gallons per day (mgd). Since the cooling tower for an 1,800 ton per day facility will require 1.1 mgd of cooling

9/30/91

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
LEE COUNTY SOLID WASTE ENERGY RECOVERY FACILITY
CASE NO. PA 90-30

CONDITIONS OF CERTIFICATION

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Department and SFWMD.

B. Environmental Control Program

An environmental control program shall be established under the supervision of a Florida registered professional engineer to assure that all construction activities conform to applicable environmental regulations and the applicable Conditions of Certification. If a violation of standards, harmful effects or irreversible environmental damage not anticipated by the application or the evidence presented at the certification hearing are detected during construction, the Permittee shall notify the South District Office as required by Condition II.

C. Reporting

1. Notice of commencement of construction shall be submitted to the South District Office within 15 days of initiation. Starting three (3) months after construction commences, a quarterly construction status report shall be submitted to the South District Office. The report shall be a short narrative describing the progress of construction.

2. Upon or immediately prior to completion of construction of the Energy Recovery Facility or a phase thereof and upon or immediately prior to completion of all necessary preparation for the operation of the off-site landfill, the South District Office will be notified of a date on which a site or facility inspection can be performed in accordance with Condition V.

XIV. OPERATION

A. Air

The operation of the Solid Waste Energy Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-256, and 17-702, Florida Administrative Code.

The construction of the Lee County Solid Waste Energy Recovery Facility in Fort Myers, Florida shall consist of three mass-burn Municipal Waste Combustors (MWC) with two units to be constructed initially and the third unit to be installed in the future. These mass-burn units shall be of Stoker Waterwall Combustor design (or equivalent) with a maximum heat input of 275 MMBtu per hour per unit or a total heat input for the facility of 825 MMBtu per hour based on a municipal solid waste average heating value of 5000 Btu per pound.

Each combustor unit is designed to produce a maximum of

152,000 pounds of steam per hour at 865 psig and 830°F. Each combustor shall be equipped with auxiliary burners to be fired by propane gas only. Emissions from each combustor shall be controlled by a slaked lime scrubber followed by a baghouse. NO_x emissions shall be controlled by a Selective Non-Catalytic Reduction (SNCR) system. Mercury emissions shall be controlled by injecting activated carbon and/or sodium sulfide or other appropriate reagent. This facility shall be allowed to operate continuously (8,760 hrs/yr).

The permittee shall submit at least four copies of complete information as to the make and model numbers of Municipal Waste Combustors, all pollution control and continuous emissions monitoring devices and related equipment, to the Bureau of Air Regulation prior to purchase and installation. The permittee shall also submit detailed stack drawings showing sampling locations, operation and maintenance manuals and calibration procedures at least 90 days prior to commencing operations to the Bureau of Air Regulation.

In addition to the foregoing the Permittee shall comply with the following specific Conditions of Certification:

1. Emission Standards

a. Based on a permitted capacity of 275 MMBtu/hr. and a Btu content of 5000 Btu/lb of MSW, per unit, the stack emissions from each unit shall not exceed any of the following limitations:

- (1) Particulate matter: Particulate emissions from the baghouse shall not exceed 0.010 grains/dry standard ft³, corrected to 7% O₂; 5.34 lbs/hr per unit, and 21.3 tons/year per unit.
- (2) PM₁₀: 0.010 gr/dcsf, corrected to 7% O₂ for the fraction of particles less than 10 microns in diameter; 5.34 lbs/hr per unit, and 21.3 tons/year per unit.
- (3) * Opacity: Visible emission from each baghouse exhaust shall not exceed 10% opacity. (Six minute average)
- (4) SO₂: 30 ppm_dv corrected to 7% O₂, 24 hour daily geometric average or at least 80% removal efficiency, whichever is least restrictive (not to exceed 0.150 lbs/MMBtu per unit), or 41 lbs/hr/unit, and 163.3 tons/year per unit.
- (5) NO_x: 180 ppm_dv corrected to 7% O₂, 24 hour daily

block average (midnight to midnight), 0.29 lb/MMBtu, 80 lbs/hr per unit, and 320 tons/yr per unit.

- (6) *Carbon Monoxide: 100 ppm_{dv} at 7% O₂, 4-hour block average beginning at midnight, 0.099 lb/MMBtu, 27.23 lbs/hr/unit, and 108 tons/year per unit.
- (7) *VOC (Hydrocarbons): 37 ppm_{dv} at 7% O₂, 0.0211 lb/MMBtu, 5.80 lbs/hr/unit and 23 tons/yr. per unit.
- (8) HCl: 25 ppm_{dv} at 7% O₂, or at least 95% removal, which ever is least restrictive (not to exceed 0.0644 lb/MMBtu or 17.7 lbs/hr/unit), and 70.7 tons/yr per unit.
- (9) H₂SO₄ (sulfuric acid mist): 0.0358 lb/MMBtu, or 9.85 lbs/hr/unit and 39.3 tons/year per unit.
- (10) *F (fluoride): 5.0 ppm_{dv} at 7% O₂, 0.0035 lb/MMBtu, or 0.96 lbs/hr/unit, and 3.8 tons/year per unit.
- (11) *Pb (lead): Lead emission shall not exceed 0.0006 lbs/MMBtu, .165 lbs/hr/unit and .66 tons/yr per unit.
- (12) *Be: Beryllium emissions shall not exceed 1.35 x 10⁻⁷ lbs/MMBtu, 3.7 x 10⁻⁵ lbs/hr/unit, and 1.47 x 10⁻⁴ tons/yr per unit.
- (13) *Hg: Mercury emissions shall not exceed .0006 lbs/MMBtu, 0.165 lbs/hr/unit, and .66 tons/yr per unit.
- (14) As: Arsenic emissions shall not exceed 9.1 x 10⁻⁶ lbs/MMBtu, 2.5 x 10⁻³ lbs/hr/unit, and 0.01 tons/yr per unit.
- (15) *Dioxins/Furans: Emissions of total (tetra thru octa-chlorinated dibenzo-p dioxins and dibenzofurans) shall not exceed 30.0 ng/dscm @ 7% O₂, 2.54 x 10⁻⁸ lbs/MMBtu, 7.0 x 10⁻⁶ lbs/hr/unit, and 2.8 x 10⁻⁵ tons/yr per unit.
- (16) NH₃: Ammonia slip from exhaust gases shall not exceed 50 ppm_v.
- (17) There shall be no visible emissions during the lime silo loading operations (i.e., less than 5% opacity).

- (18) Visible emissions from the ash handling building baghouse shall not exceed a particulate limit of 0.010 grains/dscf nor visible emissions of 5% opacity.

* Pursuant to Rule 17-4.080 F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions for the pollutants CO, VOC, F, Pb, Be, Hg, dioxins and visible emissions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time.

2. Stack Testing/Continuous Emissions Monitoring/Record Keeping Requirements

a. Test Methods

Compliance with emission limitation standards mentioned in Specific Condition No. 1 shall be demonstrated using EPA Methods, as contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources), or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants), or any other method as approved by the Department, in accordance with F.A.C. Rule 17-2.700. A test protocol shall be submitted for approval to the Bureau of Air Regulation at least 90 days prior to testing.

<u>EPA Method</u>	<u>For Determination of</u>
1	Selection of sample site and velocity traverses.
2	Stack gas flow rate when converting concentrations to or from mass emission limits.
3	Gas analysis when needed for calculation of molecular weight or percent O ₂ .
4	Moisture content when converting stack velocity to dry volumetric flow rate for use in converting concentrations in dry gases to or from mass emission limits.
5	Particulate matter concentration and mass emissions.
201 or 201A	PM ₁₀ emissions.
6, 6C, or 19	Sulfur dioxide emissions from stationary

sources.

- 7, 7C, or 19 Nitrogen oxide emissions from stationary sources.
- 9 Visible emission determination of opacity.
- At least three one hour runs to be conducted simultaneously with particulate testing for the emissions from dry scrubber/baghouse, and ash handling building baghouse.
 - At least one lime truck unloading into the lime silo (from start to finish).
- 10 Carbon monoxide emissions from stationary sources.
- 12 or 101A Lead concentration from stationary sources.
- 13A or 13B Fluoride emissions from stationary sources.
- 23 Dioxin/furan concentration.
- 18, or 25, Volatile organic compounds concentration.
- 26 HCl emissions or other methods approved by EPA or DER.
- 101A or 108 Mercury, Antimony, Arsenic, and Cadmium emissions.
- 104 Beryllium emission rate and associated moisture content.

Note: The weight of MSW being fed to each combustor during the stack test shall be continuously monitored and recorded by a weighing device which is properly calibrated. Stack test shall be conducted upstream and downstream of the applicable control device for the following pollutants, SO₂, Hg and HCl. Soot blowers shall be operated in a mode consistent with normal cleaning requirements of the system during the compliance testing.

b. Continuous Emissions Monitoring

Continuous emission monitors with recorders shall be installed, calibrated, maintained and operated subject to approval by the Department for the following:

Carbon Monoxide, Oxygen, Nitrogen Oxide,

Opacity, and Sulfur Dioxide (for SO₂ one monitor shall be located upstream of the scrubber and one shall be located downstream of the baghouse), as specified in 40 CFR 60, Appendix B; total steam production (lbs/hr, pressure, and temperature) and power generation (MW) for each unit; ammonia injection rate; slaked lime; activated carbon and/or sodium sulfide injection or usage rates; and thermocouple to measure temperature of combustion zone (to be specified by the vendor and one second residence time). The monitoring devices shall meet the applicable requirements of Chapter 17-2, Section 17-2.710, F.A.C. and 40 CFR 60.45, and 40 CFR 60.13, including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7 (a)(5). Data on monitoring equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location after the economizer or in the air pollution control equipment outlet duct shall be provided to the South District Office for review prior to installation together with and subject to the same provisions as submittal of air pollution control equipment pursuant to paragraph XIII hereof.

c. Testing Frequency

Compliance with emission standards contained in Condition No. XIV.A.1.a. shall be determined by conducting stack tests within 120 days of completion of construction and initial operation and annually thereafter. These tests may be staggered throughout the year with the approval of the Bureau of Air Regulation. Pursuant to Rule 17-2.700(2)(b), when the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in this permit is being violated, it may require the owner or operator of the source to conduct compliance tests which identify the nature and quantity of pollutant emissions from the source and to provide a report on the results of said tests to the Department. Compliance testing for the flyash handling building (baghouse) and the lime silo loading operation (V.E. test) shall be conducted within 90 days of completion of construction and initial operation and annually thereafter. All notification requirements of 40 CFR parts 60 and 61 shall be complied with by the owner/operator of the SWERF.

d. Sampling Ports

The Permittee shall provide sampling ports in the air pollution control equipment outlet duct or stack and shall provide access to the sampling ports in accordance with Section 17-2.700, F.A.C. Drawings of testing facilities including sampling port locations as required by Section 17-2.700 shall be submitted to the South District Office for

approval at least 60 days prior to construction of the sampling ports and stack.

e. Record Keeping

Lee County Solid Waste Energy Recovery Facility shall maintain a central file containing all measurements, records, and other data that are required to be collected pursuant to the various specific conditions of this permit. This file shall include but not be limited to: i) the data collected from in-stack monitoring instruments, ii) the records on MSW input rate, iii) the amount of propane gas burned per unit, iv) the results of all source tests or performance tests, v) the amount of ammonia, activated carbon, sodium sulfide or other chemicals used for NOx and mercury control, vi) calibration logs for all instruments, vii) maintenance/ repair logs for any work performed which is subject to this permit. All measurements, records, and other data required to be maintained by SWERF shall be retained for at least two years following the date on which such measurements, records, or data are recorded and made available to the Department upon request. The South District office of the Department shall be notified in writing at least 15 days prior to any testing of any instrument to allow witnessing.

3. Miscellaneous Requirements

a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

b. Operating Procedures

Operating procedures shall include good combustion practices and proper training and certification of all operators. The good combustion practices shall meet the guidelines established in 40 CFR 60, Subpart Ea and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained and certified in accordance with the manufacturers guidelines. A list of all such certified personnel shall be submitted to the South District Office.

Department staff may attend any training sessions related to operation and maintenance of air pollution control devices.

The emission standards for this facility shall apply at all times, except during periods of start-up, shut-down, or malfunctions, provided that the duration of start-up, shut-down, or malfunction shall not exceed 3 hours per occurrence. The start-up period commences when the affected facility begins the continuous burning of MSW and does not include any warm-up period when the affected facility is combusting only propane gas and no MSW is being combusted. During all startups, shutdowns and malfunctions the owner/operator shall use best operational practices to minimize air pollutant emissions. Within 90 days prior to commencing commercial operations of this facility, the permittee shall submit to the South District Office a operational procedures manual that identifies and describes best operational practices that will be used during startup, shutdown, and malfunctions of this facility.

c. Odor Control

No objectionable odors are allowed from this facility pursuant to F.A.C. Rule 17-2.620. The truck access doors to the facility shall remain closed except during normal working shifts when MSW is being received near the storage pit area to allow vehicle passage. To minimize odors at the facility, a negative pressure shall be maintained on the tipping floor and air from within the building will be used as combustion air.

d. Auxiliary Burners

Auxiliary burners for each unit shall be fired only by propane gas and shall not exceed the 10% capacity factor as determined by 40 CFR 60.44b(d).

e. Baghouse Operations

All baghouses (except for lime silo dust collector) shall be equipped with pressure drop monitoring equipment. Baghouses shall have a maximum air to cloth ratio of 4:1.

f. Restriction for Type of Wastes Combusted

No biological waste, medical waste, bio-hazardous waste, sewage sludge or hazardous wastes shall be received or combusted at this facility without obtaining proper modification to the power plant site certification conditions from the Department. The County shall establish a household battery collection program to be specified by the applicant

prior to start of construction, to further minimize mercury emissions. Chromium compounds shall not be used as an additive in the cooling tower water.

g. Fugitive (Unconfined) Emissions

Fugitive emissions at this facility shall be adequately controlled at all times. All roads shall be adequately paved and vacuum swept if appropriate, to keep free of visible dust. Speed limit signs shall be posted. Residue from the grates, grate siftings, and ash from the combustor/boiler and fabric filter hoppers during normal operations shall be discharged into the ash quenching system so as to minimize visible dust. The ash/residue in the ash handling building shall remain sufficiently moist to prevent dust during storage and handling operations.

h. The height of the boiler exhaust stack shall not be less than 275 feet above grade or the height determined to be Good Engineering Practice.

i. The SWERF's boilers shall not be loaded in excess of their permitted capacity of or 275 x 10⁶ Btu per hour, each unit, based on heating value of 5000 Btu/lb of MSW.

j. The combustor boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, and rated capacity.

k. Combustion efficiency shall be calculated by: $\%CE = (1 / (1 + (CO/CO_2))) \times 100$, and shall be at least 99.5% for an 8 hour average.

4. Emission Control Equipment

a. The combustor's particulate control baghouse shall be designed, constructed and operated to achieve a maximum emission rate of 0.010 grains per dscf corrected to 7% O₂.

b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppm_{dv} at 7% O₂ which ever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).

c. The Permittee shall submit to the Bureau of Air Regulation within thirty (30) days after it becomes available, copies of technical data pertaining to the selected emissions control systems. These data should include, but not be limited to, guaranteed efficiency and emission rates, and major design parameters.

5. Reporting

a. Two copies of the results of the emissions tests for the pollutants listed in XIV.A.1.a. shall be submitted within forty-five days of the last sampling run to the South District Office.

b. Emissions monitoring shall be reported to the South District Office on a quarterly basis in accordance with Section 17-2.710, F.A.C., 40 CFR, part 60, Subsection 60.7 or 40 CFR part 61 as appropriate.

c. Notice of anticipated and actual start-up dates of each waste combustor boiler shall be submitted to the DER South District Office.

B. Fuel

The SWERF shall utilize refuse such as garbage and trash (as defined in Chapter 17-7, F.A.C.) as its fuel. Use of alternate fuels except for distillate fuel oil or natural gas in start-up burners would necessitate modification of these Conditions of Certification. Refuse as fuel shall not include "hazardous waste" as defined in Chapter 17-30, F.A.C. The alternate fuel, which may be used distillate oil, shall not contain more than 0.3% sulfur by weight and shall not be used more than required during boiler startup or shutdown.

C. Wastewater Disposal

A complete submittal of plans, drawings and specifications for leachate collection systems, pumps, lift stations, sewage collection systems, and wastewater collection systems in accordance with appropriate DER rules shall be furnished to the South District Office for approval at least 90 days prior to start of construction for the particular of such component. In order to obtain approval, the receiving sewage treatment plant shall indicate its ability and willingness to accept the wastewater. Also plans and specifications for connections to off-site sewage and wastewater transmission systems shall be furnished to the South District Office for approval 90 days prior to start of construction. Review shall be accomplished in accordance with Condition XIII.

D. Water Discharges

1. Surface Water

Any discharges from the site stormwater system via the emergency overflow structure which results from an event LESS than a ten-year, 24-hour storm (as defined by the U.S.



Kary

State of Florida
Division of Administrative Hearings

Sharyn L. Smith
Director

The DeSoto Building, 1230 Apalachee Parkway
Tallahassee, FL 32399-1550

Ann Cole
Clerk

RECEIVED

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December 9, 1991

CARLTON FIELDS - TALLAHASSEE
DAVID S. UEE

Honorable Lawton Chiles
Governor
State of Florida
The Capitol
Tallahassee, FL 32399

Honorable Jim Smith
Secretary of State
State of Florida
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Tallahassee, FL 32399-0250

Honorable Robert A. Butterworth
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Honorable Tom Gallagher
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Honorable Bob Crawford
Commissioner of Agriculture
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Honorable Gerald A. Lewis
Comptroller
State of Florida
The Capitol, Plaza Level
Tallahassee, FL 32399-0350

Honorable Betty Castor
Commissioner of Education
State of Florida
The Capitol
Tallahassee, FL 32399

Re: Application for power plant site certification of
Lee County solid waste resource recovery facility,
DOAH Case No. 90-3942EPP

Dear Siting Board:

Enclosed is my Recommended Order in the site certification hearing of the referenced case. Exhibits received in evidence and the transcript of the certification hearing have been delivered to Richard T. Donelan, Jr., at the Department of Environmental Regulation.

As required by Section 120.58(5), Florida Statutes, please provide the Division of Administrative Hearings a copy of your final order in this case within 15 days of rendition.

Sincerely,

Diene K. Kiesling
DIANE K. KIESLING
Hearing Officer

DKK:dw
Enclosure

cc: Richard T. Donelan
David S. Dee
William W. Deane
Steve Pfeiffer
John Fumero
Ken Plante
Jim Antista
Susan Clark
Wayne Daltry
Jim Yeager
Hamilton S. Oven

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

In Re:)
)
)

APPLICATION FOR POWER PLANT)
SITE CERTIFICATION OF LEE)
COUNTY SOLID WASTE RESOURCE)
RECOVERY FACILITY)

CASE NO. 90-3942EPP

RECOMMENDED ORDER

Pursuant to notice, a formal hearing was held in this case on September 9-11, 1991, in Fort Myers, Florida, before the Division of Administrative Hearings, by its designated Hearing Officer, Diane K. Kiesling.

APPEARANCES

For Lee County
(the County):

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Assistant General Counsel
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Tallahassee, FL 32399

For S.F.C.A.R.E.,
Inc. (SFCARE):

William W. Deane
Attorney at Law
Suite 102
8855 Ninth Street North
St. Petersburg, FL 33702

STATEMENT OF THE ISSUES

The ultimate issues for determination in this case are:

(a) whether Lee County's application for certification of a

On August 30, 1991, a Prehearing Stipulation was filed by the County, DER, the Department of Community Affairs (DCA), the Department of Natural Resources (DNR), the Florida Game and Fresh Water Fish Commission (FGFWFC), and the South Florida Water Management District (SFWMD). The signatories to the Prehearing Stipulation agreed that the County demonstrated an entitlement to certification of its proposed facility, subject to the conditions of certification. On September 9, 1991, the first day of the certification hearing, SFCARE filed a prehearing statement which identified two legal issues to be resolved in this proceeding: 1) whether Best Available Control Technology (BACT) has been achieved for mercury emissions and 2) whether BACT can be determined by DER without an examination of source separation as a means of reducing emissions.

At the certification hearing, the County presented the testimony of Daniel E. Strobridge, Donald F. Elias, Ruth A Dickinson, Michael G. Cullum, Paul C. Chrostowski, William R. Cox, Lee S. Casey, and Robert Hauser, Jr. Lee County also presented the deposition testimony of Clair Fancy. Lee County's Exhibits 1-65 were admitted in evidence.

DER presented the testimony of Tom Rogers and Hamilton S. Oven, Jr. DER's Exhibits 1 and 2 were admitted in evidence. "Buck"

SFCARE presented the testimony of W. Dexter Bellamy, Craig Volland, and Richard J. Cook. SFCARE's Exhibits 1-5 were admitted in evidence.

The DCA, DNR, FGFWFC, and SFWMD did not participate in the certification hearing.

landfilling, and the use of a resource recovery (waste-to-energy) facility.

2. In June 1990, Lee County filed an application for site certification with the Florida Department of Environmental Regulation (DER) for the proposed resource recovery facility (Facility). The County also filed an application with DER for a Prevention of Significant Deterioration (PSD) permit for the Facility.

3. Lee County's Facility will produce electricity from municipal solid waste that otherwise would be discarded in a landfill. Solid waste will be brought into the Facility by truck and deposited in a large concrete pit. The refuse will be thoroughly mixed in the pit and then placed by crane in a charging hopper, which will lead into a furnace. The combustion of refuse in the furnace will create heat, which will be used to produce steam, which will be used in a steam turbine to generate electricity.

4. The County's Facility will include the energy recovery system, a scale house, cooling tower, a stack, a 138 kV transmission line, and a stormwater management system. The Facility will have two combustion units with a combined processing capacity of approximately 1200 tons per day (tpd). Theoretically, the Facility could be expanded in the future with a third 600 tpd combustion unit to reach an ultimate site capacity of 1800 tpd.

5. The Facility will generate approximately 40 megawatts (MW) of electricity at 1200 tpd and approximately 60 MW

10. The Facility will have positive economic impacts. Over 325 people will be employed during the Facility's construction. The Facility will provide jobs for 54 full-time employees during normal operations. The annual payroll of \$2.5 million will contribute more than \$33 million to the local economy over 20 years. The construction costs of approximately \$130 million will result in a positive regional economic impact of approximately \$398 million.

11. The site is undeveloped. It has been heavily impacted by past logging and agricultural activities, including ditching and cattle grazing. The site has been extensively invaded by exotic tree species such as melaleuca and Brazilian pepper. Vegetative diversity is low, offering few habitat niches for feeding or reproduction by wildlife. As a result, the numbers and diversity of wildlife on the site are extremely low due to the poor habitat conditions.

12. There are no DER jurisdictional wetland areas on the site. There are isolated wetlands within the jurisdiction of SFWMD. No jurisdictional wetlands will be affected by the construction of the resource recovery facility structure, which will be constructed in a previously disturbed sector of the site which is vegetated with wax myrtle. No more than 2.7 acres of wetlands will be affected by the construction of the new 138 kV transmission line, which is necessary to connect the Facility to FPL's adjacent Buckingham substation. The proposed location of the new transmission line next to an existing dirt road minimizes potential wetland impacts from the transmission line.

SFWMD. This wet detention area is supplemented by a dry pretreatment system approximately 4.5 times larger than required. After treatment, stormwater will be discharged into a currently stressed wetland area for additional treatment; the discharge will assist in restoring the original hydroperiod of the area.

16. The primary source of water to be used in the Facility will be the City of Fort Myers' domestic wastewater treatment plant, which currently discharges advanced-treated wastewater to the Caloosahatchee River. The Facility's cooling tower will use approximately 1.1 million gallons per day (mgd) of treated wastewater. DER and SFWMD strongly encourage reuse of wastewater in this fashion, and the use will reduce the levels of nutrients which would otherwise be discharged into the Caloosahatchee by the City of Fort Myers treatment plant.

17. The Facility will use approximately 15,000 gallons per day (gpd) of potable water for boiler makeup and household-type uses. This water will be drawn from two wells located on site, which can also supply backup water for use during emergencies. Use of potable water as backup for cooling is limited to ten days per year.

18. The Facility will not discharge any wastewater into groundwater or surface waters. Wastewater generated at the Facility will be recycled to the extent practicable and then routed by pipeline to the City of Fort Myers' wastewater treatment plant. The Facility is not expected to cause or contribute to groundwater contamination. A groundwater monitoring system will ensure that the Facility does not impact

Status of the Project

22. Lee County will own the Facility. Ogden-Martin (Ogden) will build and operate the Facility for 20 years pursuant to a contract Ogden executed with the County in 1990. Ogden was selected because it submitted the lowest and best bid for these services in a competitive bidding process.

23. Ogden is one of the largest and best vendors of resource recovery facilities in the United States. Ogden currently operates three resource recovery facilities in Florida and twelve in the United States. Ogden uses the Martin technology which has been used successfully at more than 140 facilities around the world.

24. Lee County already has secured \$197 million in escrow financing for the construction of the Facility, which will take approximately 27 months to complete. The County hopes to have the Facility in operation in the spring of 1994.

EPA's 1991 New Source Performance Standards

25. In February 1991, the United States Environmental Protection Agency (EPA) promulgated New Source Performance Standards which established stringent minimum requirements for the construction and operation of new resource recovery facilities, including Lee County's Facility. Among other things, EPA's 1991 New Source Performance Standards (NSPS): (a) establish specific emission limits for a wide array of pollutants, including dioxin; (b) require facility operators to be trained and certified; and (c) require resource recovery facilities to

the injection of slaked lime to neutralize acid gases in the exhaust gas stream. Because the lime injection process effectively cools the gas stream, the scrubber system also effectively removes heavy metals except mercury; these metals adsorb to particulate matter which is removed by the fabric filter baghouse. Nitrogen oxides (NO_x) are controlled by SNCR, which involves the injection of ammonia or urea into the post-combustion zone of the boiler to dissociate NO_x , which is formed at high combustion temperatures, into nitrogen and water vapor. Good combustion practices minimize emissions of substances produced by incomplete combustion of solid waste, including carbon monoxide (CO), unburned hydrocarbons, soot, and toxic organic compounds such as dioxins, furans, and polycyclic organic matter (POM). The adherence to good combustion practices will assure that emissions of total dioxins and furans will not exceed the NSPS standard.

29. Lee County considered the possibility of using a wet scrubber system, but the wet scrubber was rejected because it suffers from a variety of problems. Wet scrubbers have never been selected as BACT for any resource recovery facility in the United States. Wet scrubbers are not BACT in this case.

Control Technology for Mercury

30. The mercury emissions from the Facility will be minimized by at least four factors. First, many sources of mercury in municipal solid waste have been or soon will be eliminated. EPA has banned the use of mercury in paints and

33. Fourth, Lee County will utilize an additional pollution control device to control mercury emissions. Specifically, Lee County will use a reagent injection system which will inject activated carbon, sodium sulfide, or other reagent into the flue gases. The mercury will adhere to the reagent and then be removed from the flue gases by the fabric filter. The reagent injection system should be very effective at capturing mercury and it also should reduce some other emissions (e.g., dioxins).

34. The reagent injection system has been used in Europe, but it has never been used on a full-time basis on any resource recovery facility in the United States. This technology is not required under any state or federal regulatory program.

35. The Facility's reagent injection system for mercury will provide the highest degree of mercury control that is technologically possible at this time. As a result of the County's extraordinary efforts to control mercury, the mercury emissions from the facility will be among the lowest in the world.

Emission Limits For Mercury

36. In August 1991, EPA completed a series of experiments with a reagent injection system at a resource recovery facility in Stanislaus, California. EPA will use its new test data from Stanislaus and its existing mercury data base to establish numerical limits for mercury emissions from new resource recovery facilities. EPA's new emission limits for

however, it would be imprudent and inappropriate to establish a mercury emission limit for the Facility that is lower than the level proposed by DER in the conditions of certification. The proposed mercury emission limit for the Facility represents a reasonable upper limit, given the available test data, and it rests on sound engineering judgment.

41. Mercury emission rates of 130 ug/dscm or 80% removal recently were proposed in two pending cases in New York, but there are no reliable data available at this time to confirm that such levels can be consistently achieved.

42. SFCARE contends that the BACT analysis should have set the Facility's mercury emission limit at 50 ug/dscm or 90% removal, however this limit is not supported by the evidence of record.

43. SFCARE's proposed emission limits have never been established as BACT for any resource recovery facility in the United States. SFCARE's witness (Craig Volland) admitted that vendors for air pollution control equipment tend to exaggerate about the capabilities of their products, but no vendor in the world would guarantee that its equipment would meet his proposed emission limit of 50 ug/dscm. No vendor in the United States would guarantee the 90% removal limit. Another SFCARE witness (Richard Cook) conceded that he was unaware of any resource recovery facility that could achieve SFCARE's proposed emission limits for mercury.

44. Nonetheless, SFCARE believes the County's mercury control system can reduce mercury emissions by 90% and limit them

47. Lee County also utilized a conservative approach (i.e, one designed to over-predict actual impacts) when determining the ambient air quality at the Site. The County used ambient air quality data from areas of heavy urban or industrial growth, which reflect levels of air pollution that are much greater than the levels expected at the County's Site.

48. The County used EPA and DER approved computer models to evaluate the Facility's air quality impacts. These computer models have been tested extensively in the field to confirm that the models will over-predict a facility's maximum impacts.

49. In accordance with DER's recommendation, the computer models used five years of consecutive hourly meteorological data from Fort Myers to calculate the Facility's impacts on air quality. As a result, the models will over-predict the Facility's maximum potential impacts at any time under any meteorological conditions.

Ambient Air Quality Standards

50. Primary ambient air quality standards are established by EPA to protect public health "with an adequate margin of safety." Primary standards are designed to protect the health of the most susceptible groups of the population, including children, the elderly, asthmatics and those with respiratory problems. Secondary ambient air quality standards are designed to protect the public welfare against "any known or anticipated adverse effects" from air pollution. Florida has

Facility's maximum impacts for non-criteria pollutants are 10 to 100 times less than DER's no-threat thresholds.

55. The Facility's maximum impacts were compared to health-based standards and guidelines adopted by New York, North Carolina, Kentucky, and the American Conference of Governmental and Industrial Hygienists. The Facility's maximum impacts for non-criteria pollutants were far below all of the applicable criteria.

56. The dioxin emissions from the Facility will be well below all of the health-based standards and guidelines that have been established by DER, EPA, the World Health Organization, and the European Community. The Facility's maximum impacts will be about 1,000 times less than the ambient air quality standard for dioxin that was established by Connecticut, the first state to adopt an ambient air quality standard for dioxin.

Prevention of Significant Deterioration

57. EPA and DER enforce the Prevention of Significant Deterioration (PSD) program, which is designed to protect existing air quality. The PSD program limits airborne emissions by establishing maximum allowable increments that can be consumed in Class I, II, and III areas by potential sources of air pollution.

58. Lee County and all adjacent areas are designated as PSD Class II areas, except for the Everglades National Park, which is a Class I area. The Facility will consume no more than 2.8% of any of the applicable PSD Class II increments. It will

County's 3000 tpd resource recovery facility. They concluded that the impacts from the Pinellas County facility were "minimal."

62. In light of this extensive data base, EPA and DER do not require applicants to conduct health risk assessments for proposed resource recovery facilities. Nonetheless, Lee County analyzed the potential health impacts of the Facility's emissions. The County's analyses demonstrated that the maximum predicted impacts from the Facility will be far below any level that might cause any human health problems.

63. Lee County evaluated the Facility's effects on human health and the environment by using standard health risk assessment techniques that were developed by EPA and other agencies. The evaluation was performed by Dr. Paul Chrostowski, a nationally recognized expert who teaches courses concerning health risk assessments for EPA and state regulatory agencies.

64. Lee County's evaluation was based on a series of very conservative assumptions about the project that were intentionally designed to greatly over-predict the potential risks associated with the Facility's emissions. For example, the County's evaluation was based on the assumption that the Facility will operate at 1800 tpd, 100% of the time, for 70 years, even though Lee County only intends to build a 1200 tpd facility, which will operate approximately 85-95% of the time, over a useful life of approximately 30 years. The Facility's maximum impacts will occur relatively close to the Site in an undeveloped agricultural area, but the County assumed that hypothetical

dioxin. Accordingly, the risk from all exposure pathways for dioxin would be 3 in 10,000,000. This risk is well below any level of concern for regulatory purposes.

68. To put these risks in perspective, it should be recognized that a 1 in 1,000,000 risk would be experienced if a person smoked two cigarettes at any time during his or her life. A risk of 1 in 1,000,000 also would be encountered if a person drank one liter of wine during his or her entire lifetime. Hence, the risk from drinking one liter of wine or smoking two cigarettes during a person's lifetime is approximately 10 times greater than the risk that would be experienced if a person located at the point of maximum impact received 70 years of uninterrupted exposure to the maximum predicted dioxin emissions from an 1800 tpd facility. When the risks are considered in this context, it is clear that the Facility's dioxin emissions will pose no meaningful risk to human health.

69. Similarly, the Facility's mercury emissions pose no threat to human health. The Center for Disease Control (CDC) has developed "minimal risk levels" for short term and long term exposure to mercury. If a person's exposure is below the minimal risk level, the CDC does not anticipate any adverse health effects. In this case, the maximum short-term impact from the Facility's mercury emissions at 1800 tpd will be about 1,000 times less than the CDC's minimal risk level for short term exposure. The Facility's maximum annual impact will be many thousands of times lower than the CDC's minimal risk level for long-term exposure.

washed into the water bodies under investigation; (d) the snail kite and wood stork will only feed in the two areas that are under investigation; (e) the birds' food (i.e., snails for the snail kite; fish for the wood stork) will stay in one location where it will receive maximum exposure; and (f) the fish and snails will live 70 years and accumulate mercury over that period. The County also used the lowest sensitivity levels that could be found for any bird species and then applied a toxicological safety factor of 20.

73. The County's analyses demonstrated that after 70 years of Facility operations at 1800 tpd, the mercury concentration in snails would be three times less than any levels that might cause an impact on the snail kite. Wood storks would be exposed to even less risk than snail kites because the bioaccumulation of mercury in fish would be less than the bioaccumulation of mercury in snails. Since eagles also eat fish, this same conclusion is true for eagles.

74. Bald eagles and panthers would be at even less risk than snail kites or wood storks because they feed over a larger range than snail kites or wood storks. Panthers and eagles would not get all of their food from the area of maximum impact near the Site. Panthers and eagles are very mobile and they would not remain for a long period of time in the areas where the Facility's maximum impacts would occur.

75. Panthers can range over hundreds of square miles of land. Indeed, one young panther once moved through the general area near the Site, but since then it has spent most of its time

do not experience any effects from lead until soil concentrations reach at least 200 ppm. EPA sets a safe level of 500 ppm.

80. Similarly, after 70 years of worst case impacts, the Facility's contribution to arsenic concentrations in the soil would be 3×10^{-6} ppm. Naturally occurring levels of arsenic in Florida's soil range up to 15 ppm.

81. The Facility's maximum contribution to beryllium concentrations in the soil would be about 1,000,000 times less than the levels that naturally occur in Florida soils.

82. The Facility's maximum contribution to mercury levels in the soil would be 2×10^{-4} ppm. By comparison, sugar cane contains approximately 1.2 ppm of mercury.

83. In all of these worst case analyses, the 1800 tpd Facility's maximum contribution to soil concentrations would be at least 100 times below any level that the EPA or CDC has associated with health impacts. Indeed, the Facility's contributions to these soil concentrations could not be measured with any known analytical technique.

Air Quality Monitoring

84. Lee County will utilize sophisticated operational safeguards to ensure that the Facility is operated properly. The Facility will have continuous emission monitors (CEM) to continuously measure the levels of carbon monoxide, nitrogen oxide, sulfur dioxide, and oxygen in the Facility's emissions. Opacity and other parameters also will be monitored with CEMs. These monitors will be connected to visible and audible alarms in

small that they could not be measured with an EPA approved ambient air monitoring system located at the point of maximum impact or anywhere else in Lee County. For this reason, state and federal regulations will not require ambient air quality monitoring at or near the Site. Facility operations can be better evaluated by using CEMs and stack tests to measure the Facility's emissions, rather than ambient air monitors.

Lee County's Recycling Programs

88. Lee County has a very aggressive and innovative recycling program. Lee County expects to achieve the state recycling goal of 30% by 1994. Moreover, the County Commission established a county recycling goal of 40% and the County is doing everything practicable to achieve its 40% goal.

89. Lee County's residential curbside recycling program will serve 100% of the County by the end of 1991. The County expects to have 50% of the County's commercial businesses in its recycling program by 1992 and 100% of the businesses by 1994. The County already collects used oil, automobile batteries, and telephone books. The County is implementing a mulching program for horticultural wastes.

90. The County's recycling rates are among the best in the State of Florida. The County's overall recycling program is among the best in the nation.

91. The County received an award from EPA for its innovative approach to recycling. Among other things, the County has a contract with Goodwill Industries that allows Goodwill to

96. The County Commission reduced the size of the Facility because the County wanted to maximize its recycling programs and minimize its reliance on the Facility. As a result of the County's decision, it will be very expensive to expand the Facility. The County has created a strong financial disincentive against expansion of the Facility.

97. Resource recovery facilities normally are designed with excess capacity to provide for future growth. In this case, however, the Facility will be full when it begins commercial operations, unless the County achieves a 30% recycling rate. Even if the County achieves a 30% recycling rate, the Facility will be full within two years after it commences operation.

Source Separation As BACT

98. SFCARE contends that the BACT determination in this case should require additional recycling or source separation (i.e., the removal of certain materials from the waste stream prior to their disposal at the resource recovery facility). SFCARE's proposal is rejected.

99. Recycling and source separation programs do not significantly affect the emissions from resource recovery facilities, with two exceptions. Removing household batteries from the waste can reduce mercury emissions. Removing lead-acid batteries, as required by Florida law, can reduce lead emissions. In this case, Lee County already has taken steps to remove these two types of batteries from the waste stream.

environmental benefits (if any) would result. Thus, SFCARE's proposal is fatally defective.

SFCARE

103. SFCARE has approximately 600 people on its mailing list, but the actual number of SFCARE members is unknown. The members of SFCARE fish, jog, and otherwise enjoy the natural resources of Lee County; however, SFCARE's President readily admitted that SFCARE's members are just like all of the other citizens in Lee County in this regard.

104. The Facility will be approximately five miles from the nearest home of any SFCARE member. The evidence demonstrated that the Facility's impacts on the public will be negligible. The Facility's impacts on the members of SFCARE will be no different than its impacts on other members of the community. Several members of SFCARE complained of personal illnesses or physical infirmities, but here, too, the members of SFCARE are like any other typical cross-section of the community. The evidence did not demonstrate that any member of SFCARE would be affected in any manner that would be different than the public at large.

Notice of Certification Hearing

105. On July 27, 1990, Lee County published a large notice in the Fort Myers News-Press to announce that Lee County had filed its application for site certification. On July 23, 1991, Lee County published a full page notice in the Fort Myers

than sufficient to protect Florida's citizens and its environment.

109. The Facility will create electrical power while providing a regional solution to the solid waste needs of Lee County and Hendry County. The beneficial impacts of the Facility are substantial, while the environmental impacts resulting from the Facility's construction and operation are negligible. Indeed, the Facility will not have any meaningful impacts on Florida's air, water, soil, or wildlife.

110. The conditions of certification attached hereto as Appendix A are reasonable and appropriate to ensure that the construction and operation of the Facility will have minimal impacts on the environment and natural resources of the state and on the welfare of the citizens of Florida. Additionally, the County has agreed to comply with these conditions of certification.

CONCLUSIONS OF LAW

The Division of Administrative Hearings has jurisdiction over the parties to and subject matter of this proceeding. Section 408.508(3), Florida Statutes (Supp. 1990).

SFCARE was allowed to fully participate as a party at the certification hearing, but SFCARE failed to establish its standing in this case. SFCARE was permitted to intervene pursuant to Section 403.508(4)(e), Florida Statutes (Supp. 1990), which allows intervention if the intervenor's substantial interests are affected and being determined by the proceeding.

The County's plan to use a resource recovery facility is consistent with state and federal law. Section 377.709(1), Florida Statutes, contains the Florida Legislature's declaration that:

[T]he combustion of refuse by solid waste facilities to supplement the electricity supply not only represents an effective conservation effort but also represents an environmentally preferred alternative to conventional solid waste disposal in this State. Therefore, the Legislature directs the Florida Public Service Commission to establish a funding program to encourage the development by local governments of solid waste facilities that use solid waste as a primary source of fuel for the production of electricity.

Hence, it is clear that the State of Florida has strongly supported the use of resource recovery facilities like the one proposed by Lee County.

Florida's State Comprehensive Plan expressly encourages the use of resource recovery facilities. Policy 13.9 in the State Comprehensive Plan provides that Florida should:

Encourage the research, development, and implementation of recycling, resource recovery, energy recovery, and other methods of using garbage, trash, sewage, slime, sludge, hazardous wastes, and other wastes.

The use of resource recovery facilities is consistent with the policies of the United States Environmental Protection Agency and the Florida Department of Environmental Regulation. EPA generally considers landfilling and incineration to be equal disposal options. Similarly, it has been DER's policy to use recycling, resource recovery and landfilling for the disposal of equal (1/3) shares of the waste stream.

capacity at issue." AES Cedar Bay, Inc. v. Department of Environmental Regulation, DOAH Case No. 88-5740, Final Order rendered Feb. 18, 1991, slip op. at 6. Thus, the balancing test encompasses close scrutiny of whether an applicant for certification has taken pains to ameliorate potential adverse consequences which might be expected to result from its facility, even when facial compliance with agency standards might be achieved without reference to certain expected impacts.

In this case, the record is clear that the County has designed the Facility in a way which easily meets the balancing test as explicated by the Siting Board in the AES Cedar Bay case. There is no suggestion by any agency that the design of the Facility fails to meet the non-procedural standards applicable to it; no regulatory agency objects to certification of the Facility as requested by the County. Significantly, however, the evidence here shows that the County has not merely aimed its design of the Facility at satisfying minimum agency standards. Rather, in several important areas, the design of the Facility seeks to achieve the smallest environmental impacts possible, especially given the state of pollution control technology at the present time. The most noteworthy example of this effort is shown by the pollution controls which are proposed for the incinerator: SNCR for NO_x control and reagent injection for control of mercury and other volatile substances. Both of these technologies are the most stringent available to control the air emissions in question, without regard to cost.

Turning to the question of whether the expected consequences of air emissions from the Facility would mandate a denial of certification for the Facility, as SFCARE contends, the record evidence does not support a conclusion that the environmental impacts of the air emissions are so great as to outweigh the need for the Facility. The pollution control technologies which the county will be required to install under the terms of the PSD permit and conditions of certification represent the best available control technologies, regardless of cost. There is no doubt that the DER's BACT determination is correct, in the literal sense of the term as well as in the regulatory context of Rule 17-2.500, Florida Administrative Code. SFCARE's suggestion that the BACT determination is erroneous lacks merit because there is no evidence in the record that actual emissions from the Facility would be reduced by source separation as advocated by SFCARE. Moreover, there is no evidence that the level of controls required under the current BACT determination could lawfully be reduced, given the NSPS standards applicable to the facility. It must be kept in mind that the County already practices source separation via its recycling program.

As to mercury emissions, the record shows that the modeled impact of the mercury emissions of the Facility are not likely to harm the citizens or the ecosystem of South Florida; this modeling did not take into consideration the expected reductions in mercury emissions resulting from the implementation of the reagent injection control technology. Testimony adduced

RECOMMENDATION

Based on the foregoing Findings of Fact and Conclusions of Law, it is

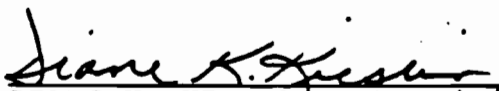
RECOMMENDED that the Siting Board enter a Final Order and therein:

1. Grant site certification for the Lee County Solid Waste Resource Recovery Facility, subject to the conditions of certification attached hereto as Appendix A;

2. Order that the Department of Environmental Regulation issue PSD construction permit authorizing construction of the Lee County Solid Waste Resource Recovery Facility in accordance with the DER BACT determination and subject to the conditions of certification attached hereto as Appendix A; and

3. Deny and dismiss the Motion to Intervene filed by SFCARE.

DONE and ENTERED this 9th day of December, 1991, at Tallahassee, Florida.



DIANE K. KIESLING, Hearing Officer
Division of Administrative Hearings
The DeSoto Building
1230 Apalachee Parkway
Tallahassee, Florida 32399-1550
(904) 488-9675

Filed with the Clerk of the Division of Administrative Hearings this 9th day of December, 1991.

NOTICE OF RIGHT TO SUBMIT EXCEPTIONS: All parties have the right to submit written exceptions to this Recommended Order. All agencies allow each party at least 10 days in which to submit written exceptions. Some agencies allow a larger period within which to submit written exceptions. You should consult with the agency that will issue the final order in this case concerning

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(continued on page 48)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
LEE COUNTY SOLID WASTE ENERGY RECOVERY FACILITY
CASE NO. PA 90-30

CONDITIONS OF CERTIFICATION

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Lee County Solid Waste
Energy Recovery Facility
Case No. PA 90-30

CONDITIONS OF CERTIFICATION

I. CHANGE IN DISCHARGE

All discharges or emissions authorized herein shall be consistent with the terms and conditions of this certification. The discharge of any regulated pollutant not identified in the application, or more frequent than, or at a level in excess of that authorized herein, shall constitute a violation of the certification. Any anticipated facility expansions beyond the certified initial nameplate capacity of 1,200 TPD, production increases, or process modifications which may result in new, different, or increased discharges of pollutants, change in type of fuel as described in XIV.8., or expansion in steam generation capacity shall be reported by submission of a supplemental application pursuant to Chapter 403, Florida Statutes.

II. NON-COMPLIANCE NOTIFICATION

If, for any reason, the Permittee (defined as the Applicant or its successors and or assigns) does not comply with or will be unable to comply with any limitation specified in this certification, the Permittee shall notify the South District Office of the Department of Environmental Regulation by telephone within a working day that said noncompliance occurs and shall confirm this in writing within seventy-two (72) hours of becoming aware of such conditions, and shall supply the following information:

A. A description of the discharge and cause of noncompliance; and

B. The period of noncompliance, including exact dates and times; or if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying event.

III. FACILITIES OPERATION

The Permittee shall at all times maintain in good working

B. To have access during normal business hours (Mon.-Fri., 9:00 a.m. to 5:00 p.m.) to any records required to be kept under the conditions of this certification for examination and copying, and:

C. To inspect and test any monitoring equipment or monitoring method required in this certification and to sample any discharge or pollutants, and:

D. To assess any damage to the environment or violation of ambient standards.

VI. REVOCATION OR SUSPENSION

This certification may be suspended or revoked for violations of any of its conditions pursuant to Section 403.512, Florida Statutes.

VII. CIVIL AND CRIMINAL LIABILITY

This certification does not relieve the Permittee from civil or criminal penalties for noncompliance with any conditions of this certification, applicable rules or regulations of the Department or Chapter 403, Florida Statutes, or regulations thereunder.

Subject to Section 403.511, Florida Statutes, this certification shall not preclude the institution of any legal action or relieve the Permittee from any responsibilities or penalties established pursuant to any other applicable State Statutes, or regulations.

VIII. PROPERTY RIGHTS

The issuance of this certification does not convey any property rights in either real or personal property, nor any exclusive privileges, nor does it authorize any injury to public or private property or any invasion of personal rights nor any infringement of Federal, State or local laws or regulations.

IX. SEVERABILITY

The provisions of this certification are severable, and if any provision of this certification or the application of any provision of this certification to any circumstances, is held invalid, the application of such provisions to other

the South District Office at least 90 days prior to construction of those portions of the facility for which the plans are then being submitted. Specific South District Office acceptance of plans will be required based upon a determination of consistency with approved design concepts, regulations and these Conditions prior to initiating construction of the: off-site water and wastewater pipelines; transmission line; stormwater run-off system; and hazardous, toxic or pathological handling facilities or areas. Review and action by the South District Office on said plans shall be accomplished in a timely fashion in accordance with Chapter 120, F.S. from the date of a complete submittal of such plans and any action may be subject to review pursuant to Chapter 120, Florida Statutes.

A. Control Measures

1. Stormwater Run-off

To control run-off during construction which may reach and thereby pollute Waters of the State, necessary measures shall be utilized to settle, filter, treat or absorb silt-containing or pollutant-laden storm water to ensure against spillage or discharge of excavated material that may cause turbidity in excess of 29 Nephelometric Turbidity Units above background in Waters of the State. Control measures may consist of sediment traps, barriers, berms, and vegetation plantings. Exposed or disturbed soil shall be protected and stabilized as soon as possible to minimize silt and sediment laden run-off. The pH of the run-off shall be kept within the range of 6.0 to 8.5. The Permittee shall comply with Florida Administrative Code Chapters 17-25, 40E-2, and 40E-4. The Permittee shall complete the forms required by 17-25.09(1) and 40E-4 and submit those forms and the required information to the SFWMD for any modifications that might occur.

2. Open Burning

Open burning in connection with initial land clearing shall be in accordance with Chapter 17-256, F.A.C., Chapter 5I-2, F.A.C., Uniform Fire Code Section 33.101 Addendum, and any other applicable County regulation.

Any burning of construction generated material, after initial land clearing that is allowed to be burned in accordance with Chapter 17-256, F.A.C., shall be approved by the South District Office in conjunction with the Division of Forestry and any other County regulations that may apply. Burning shall not occur unless approved by the appropriate agency or if the Department or the Division of Forestry has issued a ban on burning due to fire safety conditions or due to air pollution conditions.

Department and SFWMD.

B. Environmental Control Program

An environmental control program shall be established under the supervision of a Florida registered professional engineer to assure that all construction activities conform to applicable environmental regulations and the applicable Conditions of Certification. If a violation of standards, harmful effects or irreversible environmental damage not anticipated by the application or the evidence presented at the certification hearing are detected during construction, the Permittee shall notify the South District Office as required by Condition II.

C. Reporting

1. Notice of commencement of construction shall be submitted to the South District Office within 15 days of initiation. Starting three (3) months after construction commences, a quarterly construction status report shall be submitted to the South District Office. The report shall be a short narrative describing the progress of construction.

2. Upon or immediately prior to completion of construction of the Energy Recovery Facility or a phase thereof and upon or immediately prior to completion of all necessary preparation for the operation of the off-site landfill, the South District Office will be notified of a date on which a site or facility inspection can be performed in accordance with Condition V.

XIV. OPERATION

A. Air

The operation of the Solid Waste Energy Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-256, and 17-702, Florida Administrative Code.

The construction of the Lee County Solid Waste Energy Recovery Facility in Fort Myers, Florida shall consist of three mass-burn Municipal Waste Combustors (MWC) with two units to be constructed initially and the third unit to be installed in the future. These mass-burn units shall be of Stoker Waterwall Combustor design (or equivalent) with a maximum heat input of 275 MMBtu per hour per unit or a total heat input for the facility of 825 MMBtu per hour based on a municipal solid waste average heating value of 5000 Btu per pound.

Each combustor unit is designed to produce a maximum of

block average (midnight to midnight), 0.29 lb/MMBtu, 80 lbs/hr per unit, and 320 tons/yr per unit.

- (6) *Carbon Monoxide: 100 ppm_{dv} at 7% O₂, 4-hour block average beginning at midnight, 0.099 lb/MMBtu, 27.23 lbs/hr/unit, and 108 tons/year per unit.
- (7) *VOC (Hydrocarbons): 37 ppm_{dv} at 7% O₂, 0.0211 lb/MMBtu, 5.80 lbs/hr/unit and 23 tons/yr. per unit.
- (8) HCl: 25 ppm_{dv} at 7% O₂, or at least 95% removal, which ever is least restrictive (not to exceed 0.0644 lb/MMBtu or 17.7 lbs/hr/unit), and 70.7 tons/yr per unit.
- (9) H₂SO₄ (sulfuric acid mist): 0.0358 lb/MMBtu, or 9.85 lbs/hr/unit and 39.3 tons/year per unit.
- (10) *F (fluoride): 5.0 ppm_{dv} at 7% O₂, 0.0035 lb/MMBtu, or 0.96 lbs/hr/unit, and 3.8 tons/year per unit.
- (11) *Pb (lead): Lead emission shall not exceed 0.0006 lbs/MMBtu, .165 lbs/hr/unit and .66 tons/yr per unit.
- (12) *Be: Beryllium emissions shall not exceed 1.35 x 10⁻⁷ lbs/MMBtu, 3.7 x 10⁻⁵ lbs/hr/unit, and 1.47 x 10⁻⁴ tons/yr per unit.
- (13) *Hg: Mercury emissions shall not exceed .0006 lbs/MMBtu, 0.165 lbs/hr/unit, and .66 tons/yr per unit.
- (14) As: Arsenic emissions shall not exceed 9.1 x 10⁻⁶ lbs/MMBtu, 2.5 x 10⁻³ lbs/hr/unit, and 0.01 tons/yr per unit.
- (15) *Dioxins/Furans: Emissions of total (tetra thru octa-chlorinated dibenzo-p dioxins and dibenzofurans) shall not exceed 30.0 ng/dscm @ 7% O₂, 2.54 x 10⁻⁸ lbs/MMBtu, 7.0 x 10⁻⁶ lbs/hr/unit, and 2.8 x 10⁻⁵ tons/yr per unit.
- (16) NH₃: Ammonia slip from exhaust gases shall not exceed 50 ppm_v.
- (17) There shall be no visible emissions during the lime silo loading operations (i.e., less than 5% opacity).

sources.

- 7, 7C, or 19 Nitrogen oxide emissions from stationary sources.
- 9 Visible emission determination of opacity.
- At least three one hour runs to be conducted simultaneously with particulate testing for the emissions from dry scrubber/baghouse, and ash handling building baghouse.
 - At least one lime truck unloading into the lime silo (from start to finish).
- 10 Carbon monoxide emissions from stationary sources.
- 12 or 101A Lead concentration from stationary sources.
- 13A or 13B Fluoride emissions from stationary sources.
- 23 Dioxin/furan concentration.
- 18, or 25, Volatile organic compounds concentration.
- 26 HCl emissions or other methods approved by EPA or DER.
- 101A or 108 Mercury, Antimony, Arsenic, and Cadmium emissions.
- 104 Beryllium emission rate and associated moisture content.

Note: The weight of MSW being fed to each combustor during the stack test shall be continuously monitored and recorded by a weighing device which is properly calibrated. Stack test shall be conducted upstream and downstream of the applicable control device for the following pollutants, SO₂, Hg and HCl. Soot blowers shall be operated in a mode consistent with normal cleaning requirements of the system during the compliance testing.

b. Continuous Emissions Monitoring

Continuous emission monitors with recorders shall be installed, calibrated, maintained and operated subject to approval by the Department for the following:

Carbon Monoxide, Oxygen, Nitrogen Oxide,

approval at least 60 days prior to construction of the sampling ports and stack.

e. Record Keeping

Lee County Solid Waste Energy Recovery Facility shall maintain a central file containing all measurements, records, and other data that are required to be collected pursuant to the various specific conditions of this permit. This file shall include but not be limited to: i) the data collected from in-stack monitoring instruments, ii) the records on MSW input rate, iii) the amount of propane gas burned per unit, iv) the results of all source tests or performance tests, v) the amount of ammonia, activated carbon, sodium sulfide or other chemicals used for NOx and mercury control, vi) calibration logs for all instruments, vii) maintenance/ repair logs for any work performed which is subject to this permit. All measurements, records, and other data required to be maintained by SWERF shall be retained for at least two years following the date on which such measurements, records, or data are recorded and made available to the Department upon request. The South District office of the Department shall be notified in writing at least 15 days prior to any testing of any instrument to allow witnessing.

3. Miscellaneous Requirements

a. Start-up and Shut-down Procedures

During start-up procedures, propane gas shall be used to preheat the combustion zone to achieve a furnace roof temperature of 1270°F and a minimum temperature of 1800°F above the grate (at a height to be specified by the vendor) prior to the ignition of MSW.

During all shut-down procedures, propane gas shall be used to ensure that the temperature above the grate, as specified above, does not drop below 1800°F and the furnace roof temperature is maintained above 1270° while any MSW is still burning.

b. Operating Procedures

Operating procedures shall include good combustion practices and proper training and certification of all operators. The good combustion practices shall meet the guidelines established in 40 CFR 60, Subpart Ea and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained and certified in accordance with the manufacturers guidelines. A list of all such certified personnel shall be submitted to the South District Office.

prior to start of construction, to further minimize mercury emissions. Chromium compounds shall not be used as an additive in the cooling tower water.

g. Fugitive (Unconfined) Emissions

Fugitive emissions at this facility shall be adequately controlled at all times. All roads shall be adequately paved and vacuum swept if appropriate, to keep free of visible dust. Speed limit signs shall be posted. Residue from the grates, grate siftings, and ash from the combustor/boiler and fabric filter hoppers during normal operations shall be discharged into the ash quenching system so as to minimize visible dust. The ash/residue in the ash handling building shall remain sufficiently moist to prevent dust during storage and handling operations.

h. The height of the boiler exhaust stack shall not be less than 275 feet above grade or the height determined to be Good Engineering Practice.

i. The SWERF's boilers shall not be loaded in excess of their permitted capacity of or 275×10^6 Btu per hour, each unit, based on heating value of 5000 Btu/lb of MSW.

j. The combustor boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, and rated capacity.

k. Combustion efficiency shall be calculated by: $\%CE = (1 / (1 + (CO/CO_2))) \times 100$, and shall be at least 99.5% for an 8 hour average.

4. Emission Control Equipment

a. The combustor's particulate control baghouse shall be designed, constructed and operated to achieve a maximum emission rate of 0.010 grains per dscf corrected to 7% O₂.

b. The facility shall be equipped with dry scrubbers which are designed, constructed and operated to remove SO₂ at an efficiency of 80% by weight or to achieve an emission rate of 30 ppm_{dv} at 7% O₂ which ever is less stringent and to cool the flue gases to an average temperature not to exceed 300°F (3-hour rolling average).

c. The Permittee shall submit to the Bureau of Air Regulation within thirty (30) days after it becomes available, copies of technical data pertaining to the selected emissions control systems. These data should include, but not be limited to, guaranteed efficiency and emission rates, and major design parameters.

Weather Bureau Technical Paper No. 40, or the DOT drainage manual, or similar documents) shall meet applicable State Water Quality Standards, Chapter 17-302, F.A.C., the Standards of Chapter 17-25, F.A.C., and Chapter 40-E, F.A.C.

2. Groundwaters

All discharges to groundwaters shall be collected and treated as necessary, or otherwise be of high enough quality, to be able to meet the applicable Water Quality Standards of Sections 17-301.402 and 17-301.404, F.A.C., at the boundary of a zone of discharge approved for each potential pollution source. If monitoring should indicate a violation of the standards, the Permittee shall immediately notify the South District office and SFWMD and institute remedial action.

3. Groundwater Monitoring Program

a. Sampling of the shallow aquifer groundwater quality shall be conducted in at least six well clusters in the site vicinity. At least one of these wells shall be up the hydrologic slope from the landfill area to provide current background data. Other wells shall be located down the hydrologic slope from the ground water discharge areas. Specific location of any new wells or modifications to the monitoring program may be proposed by the applicant, but shall be approved by the South District Office prior to the construction of the new monitoring wells.

b. A ground water monitoring plan shall be submitted within 120 days of certification in accordance with Rule 17-28.700 F.A.C., for approval by the South District Office.

c. Upon completion of construction of the groundwater monitoring system, the following information shall be submitted to the South District Office for all ground water monitoring wells and any new well(s) constructed:

Well identification	Drillers log
Latitude/Longitude	Total depth of well
Aquifer monitored	Casing diameter
Screen type & slot size	Casing type and length
Screen length	SFWMD well construction
Elevation at top of pipe	permit numbers
Elevation at land surface	

c. Upon completion of construction of the groundwater monitoring system, but no less than 12 months before the commencement of operation the Permittee shall sample all ground water monitoring wells for the Primary and Secondary

of Agriculture and Consumer Services.

4. Storage of putrescible waste for processing shall not exceed storage capacity of the refuse bunker or tipping floor as designed on the approved plan.

5. Ash prior to transport to the landfill shall be stored in an enclosed building on an impervious surface. Final disposal of the ash shall be into the lined landfill or other method approved by the South District Office. Any leachate generated within the building shall be collected and disposed of by a method approved by the South District Office. The South District Office shall notify the SFWMD of the plans and specifications regarding the above referenced method.

6. A monthly report shall be prepared detailing the amount and type (putrescible, special wastes, boiler residue, etc.) of materials processed at the site. (see condition XIV.E.2. above). These reports shall be furnished to the South District Office quarterly, commencing 120 days after the SWERF becomes operational and is producing residues.

7. Unless approved by the Department with subsequent modification of conditions, this facility shall not accept materials defined by applicable Federal, State or local statutes, rules, regulations or ordinances as "Hazardous Wastes".

8. There shall be no discharge to waters of the State of polychlorinated biphenyl compounds.

9. The design, operation, and monitoring of disposal or control of any "special wastes" shall be in accordance with F.A.C. Section 17-702.060, and any other applicable department rules, to protect the public safety, health and welfare. "Special wastes" means those wastes that require extraordinary management. They include but are not limited to abandoned automobiles, white goods, used tires, waste oil, sludges, dead animals, agricultural and industrial wastes, septic tank pumpings, and infections and hazardous wastes. Sludges which may be hazardous due to their chemical composition shall be disposed of in accordance with F.A.C. Section 17-7.040(4). Disposal of Grade III Domestic Wastewater Treatment Sludge, disposal of domestic septage, and disposal of food service sludge, shall be in accordance with F.A.C. Section 17-7.540(6).

F. Operational Safeguards

The overall design and layout of the facilities shall be such as to mitigate potential adverse effects to humans and the environment. Security control measures shall be utilized to prevent exposure of the public to hazardous conditions. The

1. General

a. Responsible Entity

The Permittee, defined as Lee County or any full-service vendor/contractor under contract to the County, shall be responsible for the implementation of the Certification Conditions. If contractual rights, duties, or obligations are transferred under this Certification, notice of such transfer or assignment shall immediately be submitted to the Florida Department of Environmental Regulation and the SFWMD by the previous certification holder (Permittee) and the Assignee. Included in the notice shall be the identification of the entity responsible for compliance with the Certification. Any assignment or transfer shall carry with it the full responsibility for the limitations and conditions of this Certification. Reference: Sections 373.223 and 373.413, F.S.; Rules 40E-2.091(1)(a), 40E-2.301, 40E-2.381(1), 40E-4.091(1)(a), and 40E-4.301, F.A.C.

b. Minimum Standards

This Certification is based on the Permittee's submitted information to the SFWMD which reasonably demonstrates that adverse off-site water resource related impacts will not be caused by the authorized activities. The plans, drawings and design specifications submitted by the Permittee shall be considered the minimum standards for compliance. Reference: Sections 373.219, 373.223, 373.229, 373.308, 373.316, 373.413(1) and 373.416(1), F.S.; Rules 40E-2.091(1)(a), 40E-2.301(1), 40E-2.381, 40E-3.500-531, 40E-4.091(1)(a), 40E-4.301(1), and 40E-4.381, F.A.C.

c. Compliance Requirements

This project must be constructed, operated and maintained in compliance with and meet all non-procedural requirements set forth in Chapter 373, F.S., and Chapters 40E-2 (Consumptive Use), 40E-3 (Water Wells), and 40E-4 (Surface Water Management), F.A.C.

d. Off-site Impacts

It is the responsibility of the Permittee to ensure that adverse off-site water resource related impacts do not occur during the construction, operation, and maintenance of the project. Reference: Sections 373.223 and 373.413(1); Rules 40E-2.091(1)(a), 40E-2.381(d), 40E-2.381(e), 40E-4.091(1)(a), 40E-4.301, and 40E-4.381(2)(k), F.A.C.

e. Liability

activities authorized by the Certification Order. Reference: Sections 373.239 and 373.429, F.S.; Rules 40E-2.331 and 40E-4.331, F.A.C.

j. Post Certification Construction Notifications

At least 30 days prior to the commencement of construction, the Permittee or Project Engineer shall notify the SFWMD Field Engineering Division of the construction start date. Annual construction status reports shall be submitted by the Permittee to the SFWMD Engineering Division beginning with the initial construction start date. Reference: Sections 373.413(1) and 373.416(1), F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381(2)(h), F.A.C.

k. Operation Authorization

Authorization for the proposed energy recovery facility to begin operating shall not be granted by the Florida Department of Environmental Regulation until it has received and approved an executed contract between Lee County and an entity capable of receiving and disposing of the ash residue and other waste products to be generated by the proposed facility. Reference: Sections 373.043 and 403.504, F.S.

l. Enforcement

The SFWMD may take any and all lawful actions to enforce any condition of this Certification that is based on the rules of the agency. Prior to initiating such actions, the SFWMD shall notify the Secretary of DER of the proposed actions. The SFWMD may seek modification of this Certification for any change in any activity resulting from the SFWMD's enforcement of this Certification which change will have a duration longer than 60 days. Reference: Sections 373.2223, 373.319, 373.423, and 373.603, F.S.; Rules 40E-2.091(1)(a), 40E-2.301, 40E-2.381(2)(f), 40E-3.461, 40E-4.091(1)(a), and 40E-4.301, F.A.C.

2. Processing of Informational Requests

a. At least ninety (90) days prior to the commencement of construction of any portion of the proposed project, the Permittee shall submit to SFWMD staff, for a completeness and sufficiency review, any pertinent additional information required under the SFWMD's site specific standards and the Conditions of Certification for that portion proposed for construction. If SFWMD staff does not issue a written request for additional information within thirty (30) days, the information will be presumed to be complete and sufficient. Reference: Section 373.413(2), F.S.

The Permittee shall be responsible for mitigating to the satisfaction of the SFWMD any adverse impacts on existing legal uses caused by the groundwater withdrawals authorized by this Certification. If adverse impacts occur, or are imminent, SFWMD reserves the right to curtail withdrawal rates pursuant to the enforcement provisions of Condition XV.A.1.1 of these conditions. The adverse impacts can include:

(1) A reduction in well water levels that impairs the ability of an adjacent well to produce water (an adjacent well may be a domestic well, lawn irrigation well, public water supply well, etc.);

(2) A significant reduction in water levels in an adjacent water body such as a lake, pond, wetland, or canal system;

(3) Saline water intrusion or induction of pollutants into the water supply of an adjacent water user, resulting in a significant reduction in water quality; and/or

(4) A change in water quality that causes impairment or loss of use of well or water body.

Reference: Section 373.223, F.S.; Rules 40E-2.091(1)(a), 40E-2.301(1), and 40E-2.381(2)(d), F.A.C.

c. Impacts on Existing Off-Site Land Uses

The Permittee shall be responsible for mitigating to the satisfaction of the SFWMD any adverse impacts on existing off-site land uses as a consequence of the groundwater water withdrawals authorized by this Certification. If the withdrawals cause an adverse impact on existing land uses, the SFWMD reserves the right to curtail future withdrawal rates pursuant to the enforcement provisions of condition IV.a.1.1 of these conditions. Adverse impacts can include:

(1) A significant reduction in water levels in an adjacent water body such as a lake, pond, wetland, or canal system;

(2) Land collapse or subsidence caused by a reduction in water levels;

(3) Damage to crops and other vegetation, causing financial harm to the landowner; and/or

(4) Damage to the habitat of rare, endangered or threatened species.

request an extension of this authorization prior to the expiration of the five (5) year period.

Reference: Sections 373.223 and 373.236, F.S.; Rules 40E-2.091(1)(a), 40E-2.301, 40E-2.321(1)(e), and 40E-2.381, F.A.C.

3. Additional Information Requirements

a. Dewatering Operations

Prior to the commencement of construction of those portions of the project which involve dewatering activities, a detailed plan for the proposed dewatering activities must be reviewed by the SFWMD for a determination of compliance with the non-procedural provisions of Chapter 40E-2, 40E-3, and 40E-4, F.A.C. The following information must be submitted:

(1) A detailed site plan which shows the location(s) for the proposed dewatering area(s);

(2) The method(s) of dewatering operations;

(3) The maximum depth for each dewatering operation;

(4) The location and specifications for all proposed wells and/or pumps associated with each dewatering operation;

(5) The discharge method, route, and location of receiving waters generated by each dewatering operation, including the measures (Best Management Practices) to be taken to prevent water quality problems in the receiving waters;

(6) The duration of each dewatering operation;

(7) An analysis of the impacts of the proposed dewatering operations which indicates that no significant impacts will occur to any existing on-site and/or off-site legal users, wetlands, or any existing plume of groundwater contamination;

(8) The location of any infiltration trench(es); and

(9) All plans must be signed and sealed by a State of Florida registered Professional Engineer and a State of Florida registered Professional Geologist.

Reference: Sections 373.229, 373.308, and 373.413, F.S., Rules 40E-2.091(1), 40E-2.301, 40E-3.500-531, and 40E-4.381(2)(1), F.A.C.

b. Monthly Reporting Requirements

inspection and approval. Such notification shall include as-built drawings of the site which shall include elevations, locations, and dimensions of components of the surface water management system. Reference: Sections 373.117 and 373.419, F.S.; Rules 40E-4.091(1)(a), 40E-4.301(2), and 40E-4.381(2)(d), F.A.C.

b. Impacts on Fish, Wildlife, Natural Environment Values and Water Quality

The Permittee shall prosecute the work authorized under this Certification in a manner so as to minimize any adverse impacts of the authorized works on fish, wildlife, natural environment values, and water quality. The Permittee shall institute necessary measures during the construction period, including necessary compaction of any fill materials placed around newly installed structures and/or the use of silt screens, hay bales, seeding and mulching, and/or other similar techniques, to reduce erosion, turbidity, nutrient loading and sedimentation in the receiving waters. Reference: Sections 373.413(1) and 373.416(1) F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381(2)(a), F.A.C.

c. Access Roads

The Permittee shall, whenever available, utilize adjacent existing roads for access to the transmission line and potable water, reclaimed water and wastewater transmission line rights-of-way for construction, operation and/or maintenance purposes. Finger roads connecting the existing roads to the structure pads and access roads which must be constructed in areas where an existing road is not available shall be constructed in a manner which does not impede natural drainage flows and minimizes impacts to on-site and adjacent wetlands. Reference: Sections 373.413(1), 373.414, 373.416(1); Rules 40E-4.301, and 40E-4.381, F.A.C.

d. Off-site Discharges

Off-site discharges during construction and development shall be made only through the discharge facilities authorized by this Certification. No roadway or building construction shall commence on-site until completion of the permitted discharge structure and detention areas. Water discharged from the project shall be through structures having a mechanism suitable for regulating upstream water stages. Stages may be subject to operating schedules satisfactory to the SFWMD. Reference: Sections 373.413(1) and 373.416(1), F.S.; Rules 40E-091(1)(a), 40E-4.301, and 40E-4.381(2)(g), F.A.C.

e. Discharge Structures

d. Authorized Control Elevation

20.5 Feet NGVD.

e. Should Lee County determine that this project should discharge to the Orange River, it may be necessary to revise these facilities in order to bring them into compliance with the appropriate drainage criteria. Reference: Section 373.413 and 373.414, F.S.; Rules 40E-4.091, 40E-301, and 40E-4.381, F.A.C.

3. Additional Information Requirements

a. Surface Water Management System
Construction Plans

Prior to the commencement of construction of any portion of the project which affects the movement of waters, all construction activities for that portion of the proposed project which may obstruct, divert, control, impound or cross waters of the state must be reviewed by the SFWMD for a determination of compliance with the non-procedural requirements of Chapters 40E-2 and 40E-4, F.A.C. All plans, detail sheets and calculations shall be signed and sealed by a Florida Registered professional Engineer. For all construction activities, the following information shall be submitted:

- (1) Detailed paving, grading and drainage plans, including on-site water management areas and on-site and perimeter site grades, which clearly indicate how run-off will be routed within and discharged from the site, demonstrate that the design storm will be held on-site, and verify the stage/storage assumptions;
- (2) If control elevations are revised for any portion of the proposed surface water management system, revised calculations which demonstrate compliance with the SFWMD's retention/detention criteria for both quantity and quality purposes;
- (3) If control elevations are revised for any portion of the proposed surface water management system, revise soil storage calculations;
- (4) Detailed plans of all proposed roads, parking lots and building pads which demonstrate compliance with Lee County and SFWMD flood protection criteria;
- (5) Cross-section of all proposed control structures which demonstrate compliance with SFWMD water quality and quantity criteria;

calculations, showing the type and size of water control structures (pipe, culvert, equalizer, etc.) to be used, with proposed flowline elevations marked, drainage areas identified and design capacity verified;

- (6) A cross-section of all proposed excavation areas showing the proposed depth of excavation;
- (7) Calculations and the supporting documentation which demonstrate compliance with all applicable criteria, particularly as they relate to allowable discharge;
- (8) Identification of wet season water table elevations for each basin in which facilities will be located;
- (9) Calculations and supporting documentation which demonstrate that the proposed construction activities associated with the transmission line or potable water, reclaimed water, and/or wastewater transmission line will not have an adverse water quantity and/or water quality impact on existing and/or permitted surface water management systems; and
- (10) If construction of the proposed transmission line or potable water, reclaimed water, and/or wastewater transmission lines contributes to the necessity for future modifications to adjacent/existing roads, water quality treatment of the requested modifications must be addressed in the surface water management system design for the transmission line or potable water, reclaimed water, and/or wastewater transmission lines.

Reference: Sections 373.413(1), 373.413(2), and 373.41691), F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

c. Surface Water Quality Monitoring Program

Within three months of issuance of this Certification, the Permittee shall submit for review by the SFWMD a surface water quality monitoring program which monitors all discharges from the surface water management system into the Buckingham Road drainage system.

- (1) While the program may incorporate additional monitoring requirements and parameters as required by other agencies, it shall include the following parameters and time frames at a minimum:

sufficient reasonable assurances to support a reduction, the SFWMD reserves the right to require that the original water quality monitoring program be continued.

Reference: Section 373.413(1), 373.413(2), and 373.416(1), F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

d. Hazardous Materials Management

Prior to the commencement of construction of this project, the Permittee shall submit a copy of the Comprehensive Oil, Hazardous Materials, and Waste Management Plan for the Lee County Energy Recovery Facility to the SFWMD for a determination of compliance with the requirements of Chapter 40E-4, F.A.C. The plan shall provide an adequate level of detail for early warning and detection of hazardous materials within the shallow groundwater. At a minimum, the plan shall include a groundwater monitoring network, including proposed up-gradient and down-gradient locations of monitoring wells, prepared by a hydrogeology consultant. Reference: Section 373.413(1), 373.413(2), and 373.416(1), F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

D. Environmental Conditions

1. General

a. Wetland Avoidance

The Permittee shall avoid impacting wetlands within the plant site and transmission line and potable water, reclaimed water and wastewater transmission line corridors wherever practicable. Where necessary and feasible the location and span between power poles and the location of the potable water, reclaimed water and wastewater transmission lines within the right-of-way shall be varied to eliminate or reduce wetland impacts. Reference: Sections 373.413(1), 373.414, and 373.416(1) F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

b. Fill Materials

No fill materials shall be obtained from excavated wetlands within the project site, unless in accordance with a mitigation plan submitted in compliance with the conditions of this Certification. Reference: Sections 373.413(1), 373.414, and 373.416(1) F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

c. Additional Wetlands Mitigation

to be undertaken, including the location of all mitigation areas and a description of the manner in which these areas will be created, restored or enhanced;

- (6) A timetable for accomplishing the proposed mitigation activities prior to, or concurrent with, the construction of the proposed power plant facilities and any associated wetland impacts; unless documentation for doing otherwise is submitted and approved in writing prior to the commencement of construction;
- (7) Documentation that the mitigation areas and preserved wetlands, with buffer zones, have been legally reserved such that they will be managed in a manner consistent with their proposed use as conservation areas;
- (8) A detailed monitoring and maintenance program designed to ensure the survival and success of any created, restored, or enhanced wetlands, which is predicated on a guaranteed survival or coverage of 80% of the appropriate vegetation. At a minimum, the monitoring program shall be conducted for a period of five years, with reports submitted to SFWMD staff annually, and all monitoring stations identified on a plan view.

Reference: Sections 373.413(1), 373.413(2), 373.414, 373.416(1), and 373.59, F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

c. Transmission Line and Potable Water,
Reclaimed Water, and Wastewater
Transmission Lines Mitigation Plans

Prior to the commencement of construction of any portion of the proposed transmission line or potable water, reclaimed water and/or wastewater transmission lines, a mitigation plan to offset any wetland impacts associated with that portion of the transmission line or potable water, reclaimed water and/or wastewater transmission lines must be submitted to the SFWMD for a determination of compliance with Chapters 40E-2 and 40E-4, F.A.C., including Appendix 7 (Isolated Wetlands Rule) of the Basis of Review for Surface Water Management Permit application within the SFWMD. The plan shall include the following:

- (1) Specific acreage figures and locations of all wetlands, both within the transmission line and potable water, reclaimed water and wastewater

annually, and all monitoring stations identified on a plan view.

Reference: Sections 373.413(1), 373.413(2), 373.414, and 373.416(1), F.S.; Rules 40E-4.091(1)(a), 40E-4.301, and 40E-4.381, F.A.C.

XVI. OPERATIONAL CONTINGENCY PLANS

A. Operating Procedures

The permittee shall develop and furnish the South District Office a copy of written operating instructions for all aspects of the operations which are critical to keeping the facility working properly. The instructions shall also include procedures for the handling of suspected hazardous, toxic and infectious wastes.

B. Contingency Plans

The Permittee shall develop and furnish the South District Office written contingency plans for the continued operation of the system in event of breakdown. Stoppages which compromise the integrity of the operations must have appropriate contingency plans. Such contingency plans shall identify critical spare parts to be readily available.

C. Current Engineering Plans

The Permittee shall maintain a complete current set of modified engineering plans, equipment data books, catalogs and documents in order to facilitate the smooth acquisition or fabrication of spare parts or mechanical modifications.

D. Application Modifications

The Permittee shall furnish appropriate modifications to drawings and plot plans submitted as part of the application, including operational procedures for isolation and containment of hazardous wastes.

XVII. TRANSFER AND OR ASSIGNMENT

If contractual rights, duties or obligations are proposed under this certification, notice of such transfer or assignment shall immediately be submitted to the Department and SFWMD by the certification holder (Permittee) and the Assignee. Included within the notice shall be the identification of the entity responsible for compliance with the certification. The Department may approve such transfer or assignment by

The Permittee shall perform a survey of the project site for endangered and threatened plants and animals according to Florida Game and Fresh Water Fish Commission specifications prior to initiation of construction. If it is determined that any of these species will be adversely affected by the construction, the Permittee shall consult with the Commission to determine the appropriate steps to be taken to minimize or mitigate any adverse impacts.

C. Exotic Plant Removal

All Brazilian pepper, Australian pine, and melaleuca shall be removed from the site during construction or the trees shall be cut and the stumps treated with an approved herbicide. Removal shall be in a manner that minimizes seed dispersal. Removal of these species shall be a part of the regular maintenance of these areas.

D. Air Pollution Control

1. The County shall add a mercury control device to the project that is guaranteed by its manufacturer to remove 70 percent of the mercury in the exhaust gases.

2. The County shall operate a household battery collection program to remove batteries from the waste stream.

3. The Permittee shall undertake and implement any additional processes and procedures to control emissions of regulated pollutants which are determined necessary by the Department of Environmental Regulation or the U.S. Environmental Protection Agency (EPA). This shall specifically include the new EPA emission limitations to be promulgated later this year, as required under the Clean Air Act Amendments of 1990.

4. The Permittee shall increase the planting of trees on county properties and encourage the planting of trees throughout the county. The objective is to offset the energy recovery facility's release of carbon dioxide from the combustion of fossil-fuel-derived materials.

5. The Permittee shall monitor mercury emissions from the energy recovery facility to ascertain the efficiency of its mercury-control equipment. The results shall be reported to the DER.

E. Ash Marketing

The Permittee shall endeavor to market the energy recovery facility's ash residue. The Permittee shall file an annual report with the Department of Environmental Regulation

construction and operation of the facility.

2. The Permittee shall provide innovative arrangements such as flexible hours of employment, as appropriate, to increase the access of working parents to employment at the facility.

XXI. SOUTHWEST FLORIDA REGIONAL PLANNING COUNCIL

A. Waste Management

1. Lee County shall amend the application to include the additional control device for mercury removal (as described in the March 8, 1991 letter to FDER) or comply with any future requirement for mercury emission controls of the United States Environmental Protection Agency, whichever is more restrictive.

2. Lee County shall implement a battery recycling program.

3. Lee County shall implement a commercial recycling program. The aim of the program should be to separate recyclable materials from the commercial waste stream.

4. The project will be required to ensure that no objectionable smell will be produced in areas downwind of the facility, or in the adjacent park site.

B. Water Resources

1. All impacted wetlands, whether on-site or off-site, shall be buffered from impacts of construction or operation of the proposed facility. Such buffers may be natural or structural, but should extend between 15 feet and 25 feet from the edge of each impacted wetland to comply with the requirements of the SFWMD and Lee County.

2. The applicant will be required to ensure that the recycled wastewater and circulation systems do not impact surface or groundwater quality, and that the water from the cooling tower blowdown (via the dry scrubber and residue quench tanks), does not discharge to surface or ground waters. The applicant shall provide safeguards to prevent any leakage from these systems from impacting surface water or groundwater.

3. The applicant shall ensure that the moist residue from the residue quench system does not contaminate surface water or groundwater.

4. The construction, operation and maintenance of

accurately measure) and ensure that the removal levels are being attained.

E. Hazardous and Nonhazardous Materials and Waste

1. The hazardous waste and recycling programs identified by Lee County within the letter to the SWFRPC, dated Nov. 5, 1990, and the mercury control strategy identified in the March 8, 1991, letter to FDER shall be implemented.

2. The applicant will take steps and precautions to ensure that commercial and industrial wastes accepted at the facility as a fuel source do not contain hazardous materials or wastes, and that such materials and wastes do not enter the processing stream.

F. Transportation

1. The construction phases for the facility have the potential to produce more traffic than the facility when operational. Prior to approval of building permits, an analysis of the traffic produced during construction should be performed.

2. A reanalysis of the traffic impacts of the facility should be performed prior to approval of building permits. The analysis should address the following:

a. Turn lane improvements to accommodate the trucks accessing the facility both on site and at the intersection of Buckingham Road with State Road 82/Immokalee Road and other impacted intersections.

b. Access to the proposed joint Hendry/Lee County landfill in Hendry County.

c. Potential widening of Buckingham Road and State Road 82/Immokalee Road and other impacted roadways to accommodate truck traffic.

d. The trucks accessing the site will be heavily loaded; projections are between 30 and 35 tons apiece. The additional roadway and bridge maintenance or reconstruction costs associated with the weights of the trucks should be reviewed.

3. The traffic analysis assumes that the ash residue will be taken by truck from the resource recovery facility to a disposal site in Hendry County via SR 82. If the route to the disposal site changes in the future, Lee County shall be required to submit a revised analysis of traffic impacts and

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

In Re:

APPLICATION FOR POWER PLANT)
SITE CERTIFICATION OF LEE)
COUNTY SOLID WASTE RESOURCE)
RECOVERY FACILITY)

CASE NO. 90-3942EPP .

APPENDIX B

APPENDIX TO RECOMMENDED ORDER
IN CASE NO. 90-3942EPP

The following constitutes my specific rulings pursuant to Section 120.59(2), Florida Statutes, on the proposed findings of fact submitted by the parties in this case.

Specific Rulings on Proposed Findings of Fact
Submitted by Lee County

1. Each of the following proposed findings of fact is adopted in substance as modified in the Recommended Order. The number in parentheses is the Finding of Fact which so adopts the proposed finding of fact: 1-10(1-10) and 11-98(22-109).

Specific Rulings on Proposed Findings of Fact
Submitted by the Department of Environmental Regulation

1. Each of the following proposed findings of fact is adopted in substance as modified in the Recommended Order. The number in parentheses is the Finding of Fact which so adopts the proposed finding of fact: 2-6(11-15); 7(3); 8(4); 10-15(16-21); 16(25); 17(26&27); and 18-20(28).
2. Proposed findings of fact 1, 2, 9, and 21-26 are subordinate to the facts actually found in this Recommended Order.

Specific Rulings on Proposed Findings of Fact
Submitted by SFCARE, Inc.

1. Each of the following proposed findings of fact is adopted in substance as modified in the Recommended Order. The number in parentheses is the Finding of Fact which so adopts the proposed finding of fact: 7(16-18).
2. Proposed findings of fact 1-6, 8, 10, 11, and 15 are subordinate to the facts actually found in this Recommended Order.
3. Proposed findings of fact 9, 12, 13, 14, and 16, in whole or in part, are unsupported by the credible, competent, and substantial evidence.

OGDEN MARTIN SYSTEMS
of LEE, Inc.

SPEC NO. SM-101
ISSUE 011
DATE 10-31-91

TECHNICAL SPECIFICATION

FOR

(MSW) MUNICIPAL SOLID WASTE STEAM GENERATORS

Facility Name: LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

Location: LEE COUNTY, FLORIDA

This document and all information contained herein are the property of Ogden Martin Systems of LEE, Inc. and are not to be used except as expressly authorized in writing by said company.

Specification Prepared By:

Name: OGDEN MARTIN SYSTEMS, INC

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FAIRFIELD, NJ 07007

Telephone: 201 - 882 - 9000

Approved for Release:

1.	<u>R. TERRAMOCCIA</u> Printed Name	<u>R. Terramoccia</u> Signature	<u>6/25/92</u> Date
2.	<u>R. TERRAMOCCIA</u>	<u>R. Terramoccia</u>	<u>10/26/92</u>
3.	<u>A. TERRAMOCCIA</u>	<u>R. Terramoccia</u>	<u>2/5/93</u>
4.	_____	_____	_____
5.	_____	_____	_____

Revision

001	Initial Issue	01/01/87
002	Revision	07/01/87
003	Revision	10/21/87
004	Revision	10/29/87
005	Revision	11/04/87
006	Revision	05/26/88
007	Revision	08/05/88
008	Revision	09/14/89
009	Revision	10/09/90
010	Revision	01/31/91
011	Revision	10/31/91

OGDEN PROJECTS, INC.
 TECHNICAL SPECIFICATION
 FOR
 MSW STEAM GENERATORS

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1.0 GENERAL

1.1 Scope

This Specification covers requirements for the design, manufacture, delivery, erection, field adjustment, calibration and testing of bulk municipal refuse fired steam generators complete with accessories. Refuse will be fired on Martin stokers furnished by the Purchaser and erected by the Contractor.

The Contractor shall establish the boiler configuration, the heating surface requirements and tube geometry using the enclosed Martin data sheets and drawing. If the Contractor's proposed heating surface requirements are different from those presented in the Martin data, the Contractor shall provide the Purchaser with complete technical details of the differences as well as complete proposals for both schemes.

The Contractor shall include in his scope the building support steel, purlins, girts, roof deck support steel, roof trusses, parapet, miscellaneous steel at wall openings/penetrations, roof access hatch framing and silencer support framing, etc., for the boilerhouse envelopes which shall be integrated with the boiler support steel. The steel shall be erected on foundations supplied by the Purchaser.

The Attachments including all Specifications are part of this Boiler Specification and shall govern the purchase of material, equipment or services specified herein.

Where conflicts exist between the requirements of this Specification and the attachments, they shall be brought to the attention of the Purchaser for final resolution.

1.2 Work to be Provided

1.2.1 Furnished and Installed by the Contractor

The Contractor shall furnish and install equipment and materials consisting of but not limited to the following:

- Prime Paint Coat on all Structural Steel, Uninsulated Pipe,
Ductwork and Supports
- Steam Generator Pressure Parts
- Steam Purifier
- Superheater
- Attemperator(s)
- Economizer
- Air Heater(s) (Steam Coil)

Inner Casing
Insulation and Lagging
Refractory
Boiler Structures
Building Steel - including girts and subgirts designed to meet
spacing requirements of Owner's siding and roof
deck support steel
Accessory Structures
Platforms and Ladders
Framing for Doors, Louvers, A/C Ducts, Silencers and Roof
Hatches
Ash Hoppers
Framing and Support for Elevator and Lobby, if Required
Framing and Supports for Ducts, Piping, Conveyors, Electrical
Cable, etc.
Penetrations in roof and walls
Ash Chute(s) from Boiler Convection Pass Hopper to Stoker Ash
Chute Area
Ash Dischargers Bypass or Diverter Gate Support
Air Ducts, Dampers and Flow Elements
Desuperheater Control Valves
Trim, Piping and Valving
Miscellaneous Boiler Instrumentation
Safety Valves and Power-Activated Relief Valves (including
vent stacks, silencers, Vents, Drains)
F.D. Fan(s) (including flow control equipment as specified)
F.D. Fan Drive(s)
O.F.A. Fan(s) (including flow control equipment as specified)
O.F.A. Fan Drive(s)
O.F.A. Fan Supports (as required)
Seal Air Fan(s)
Seal Air Fan Drive(s)
Seal Air Fan Silencer
Fan Silencer Support(s)
Fan Pedestal Concrete Fill (if required)
Fan Isolation/Vibration Dampers (if required)
Soot Blowers (complete system, including insert panel,
controls, piping and starters)
Auxiliary Fuel Burner(s) (complete system including piping and
fuel safety valves, vent piping to roof and ignition
system)
Auxiliary Fuel Burner Purge System (including fans, motors,
if required)
Burner Fuel and Air Flow Positioning System
Burner Management System
Lagging, Insulation and Setting
Stoker Casing Enclosure and Seals, including Stoker Support
Beams
Erection Supervision (including boil-out and refractory
curing)
Field Erection Labor

Service Representative
Test Engineer
Freight
Unloading, Storage and Handling of Contractor Installed
Equipment
Plywood Covering of Stokers
Special Tools
Hydrostatic Testing
Spare Parts (optional price)

1.2.2 Services

Erection Service

The Contractor shall receive, unload, store and remove from storage, erect, install and prepare for operation all equipment and materials furnished by the Contractor and stoker system equipment supplied by the Purchaser for erection by the Contractor. The Contractor shall follow all instructions by the stoker supplier (Martin GmbH) including covering the finished stokers with plywood protection before refractory installation and regarding storage and handling of stoker system equipment.

The Contractor shall furnish all supervision, labor, tools, rigging, and incidental material necessary for the complete installation of the specified materials and equipment.

Start-Up and Testing Services

The Contractor shall furnish all labor, supervision, materials and equipment required to perform hydrostatic testing of equipment furnished under this Specification.

The Contractor shall furnish service and testing advisors to assist the Purchaser for the following functions and durations. Costs for addition and deletion of service advisor time shall be included in the proposal:

1. Chemical Cleaning - 5 man-days per steam generator
2. Startup and Field Operations Tests - 30 man-days per steam generator.

1.3 Work by Others

1.3.1 Furnished and Installed by the Purchaser

The Purchaser will furnish and install the following materials and equipment:

Ash handling chutes, valves and conveyors (except convection pass chute(s))
Flue gas ducts (from economizer outlet flange)
Starters (except for sootblowers)
Wiring (except for superheater thermocouple wiring from headers to junction box)
Building siding

Building roof deck and framing for roof penetrations (except for silencers and access hatches)
Miscellaneous roof framing for smoke hatches, ducts and exhaust fans.

Elevator
Foundations and anchor bolts
Boiler cleaning (boil-out, including special chemicals and disposal thereof)
I.D. Fan(s) (including flow control equipment as specified)
I.D. Fan Drive(s)
Grouting
Finish painting of all structural steel

1.3.2 Furnished by the Purchaser and Installed by the Contractor

The Purchaser will furnish the following materials and equipment for installation by the Contractor.

Martin Stoker components basically consisting of:

Refuse feed hopper and chute assembly
Chute shutoff gates
Stoker grate assemblies
Feed rams/tables
Ram ash discharger and connecting piece
Hydraulic cylinders for stoker, ash discharger, overfire and underfire air dampers (including hydraulic piping)
Hydraulic pumping station
Electronic and hydraulic control cabinets
Undergrate air control system including dampers, orifices, pressure gauges and piping
Undergrate air hoppers and air plenums
Overfire air nozzles
Automatic central lubrication system

1.4 Terminal Points

It is the intent of this Specification that the Contractor shall furnish and install all piping, valves, instruments, and other appurtenances within the jurisdictional limits of the ASME, Section I, Boiler and Pressure Vessel Code, latest edition, as well as other scope items detailed herein.

In addition to the above requirements, the following shall also apply.

The Contractor's supply shall terminate at the points listed below:

A. Water Connections

1. Inlet to chemical feed valve(s).
2. Outlet of water wall and economizer blow-off valves.
3. Outlet of continuous blowdown valve(s).
4. Outlet of gauge glass and water column drain valves.
These valves are located at the operating level.
5. Outlet of pressure test valve at the economizer.
6. Feedwater regulating station at feedwater block and by-pass valve (valves included in Contractor's scope)
7. Outlet of intermittent bottom drum blowdown valve(s).
8. Inlet to desuperheater spray regulator.
9. Safety valve drip pan and stack drains to operating/grade level.

B. Steam Connections

1. Outlet of superheater up to and including the second stop/check valve and the free-blow drain valve.
2. Silencer outlet of drum and superheater safety valves.
3. Silencer outlet of power activated relief valve.
4. Silencer outlet of drum and superheater vents.
5. Outlet of all vents (double valved by Contractor).
6. Outlet of all drains (double valved by Contractor).
7. Outlet of steam sampling valves.
8. Outlet of pressure test shut-off valves at drum and superheater.
9. Pressure and temperature connections as specified herein.
10. Inlet and outlet connections of steam coil airheater(s).
11. Outlet of traps and strainers or drain valves in sootblower piping.
12. Outlet of boiler drum trim shut-off and drain valves, as specified.
13. Sootblower piping connection to main steam pipe or to interstage (including flow element and taps).

C. Air Inlet Connections

1. Forced Draft (FD) and Overfire Air fan (OFA) inlet ducts and screens at top of refuse receiving pit.
2. Forced draft fan duct connections to Purchaser supplied stokers.
3. Seal air fan inlet(s) and silencer(s).
4. Auxiliary burner FD fan(s) inlet(s) including dampers.

D. Flue Gas Connections

1. Economizer outlet duct, complete with flange.

E. Ash Connections

1. Outlet discharge flanges at ash hoppers for superheater and economizer.
2. Stoker discharge chute.

F. Stoker Equipment

1. Brickwork, tile, refractory, insulation, lagging, casing enclosure for stoker(s), including insulation for the siftings hoppers, all to be supplied and installed by Contractor.
2. Seal air pipe system terminal connections at stoker transverse frame.
3. Connection for driving beam support roller seal air pipe system below stoker.
4. Openings for 3' x 4' access door, observation ports at stoker discharge rear wall and furnace side walls (waterwalls).

G. Electrical

1. Sootblower panel insert, motor starters and pushbutton stations with local disconnect switches.
2. 125 volt D.C. power relief valve controller connection.
3. Forced draft fan motor.
4. Overfire air fan motor.
5. Seal air fan motor.
6. Auxiliary fuel burner forced draft fan motor.
7. Auxiliary fuel burner purge air fan motor.
8. Auxiliary fuel burner panel and/or inserts.
9. Instrument and control terminal strips

H. Auxiliary Burner Fuel

1. Flanged valves, at inlet connection to burner front package (gas or fuel oil)
2. Atomizing air inlet connection (if applicable)

Note: If steam is used for fuel atomization the Contractor shall design and install the complete steam system.

1.5 Applicable Codes, Standards and Specifications

The latest edition and addenda of the following publications, effective on the date of Contract Award, are part of this Specification and, whether referred to by title or by designation only, are applicable to the extent indicated by the specific reference.

ASME - American Society of Mechanical Engineers

- ASME I Boiler and Pressure Vessel Code, Section I, Power Boilers, and all addenda thereto
- ASME II Boiler and Pressure Vessel Code, Section II, Material Specifications, and all addenda thereto
- ASME IX Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications, and all addenda thereto
- ASME PTC 4.1 Power Test Code - Steam Generating Units

ASTM - American Society for Testing and Materials

- ASTM Material Specifications
- ASTM Special Technical Publication 442, Manual on Water
- D-1066 Standard Method of Sampling Steam
- D-2186 Standard Methods of test for Deposit Forming Impurities in Steam
- D-3370 Standard Methods of Sampling Water
- A-123 Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips
- B-209 Aluminum Alloy Steel and Plate

ANSI - American National Standards Institute

- B 16.5 Steel Pipe Flanges and Flanged Fittings

B 31.1 Code for Pressure Piping, Power Piping

Other standards not listed herein but referenced in this specification shall be the edition specified in Appendix F of ANSI B31.1.

AWS - American Welding Society

AWS D1.1 Structural Welding Code

ABMA - American Boiler Manufacturers Association

Industry Standards

NFPA - National Fire Protection Association

NFPA 85A Prevention of Furnace Explosions in Fuel Oil - Natural Gas - Fired Single Burner Boiler Furnaces

NFPA 85B Prevention of Furnace Explosions in Natural Gas - Fired Multiple Burner Boiler-Furnaces

NFPA 85D Boiler-Furnaces

NFPA 85G Prevention of Furnace Implosions in Multiple Burner Boiler - Furnaces

AISC - American Institute of Steel Construction

Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings

Code of Standard Practice for Steel Buildings and Bridges

Building Code

All applicable requirements of the local, state and national building codes shall apply for the state in which construction will be performed

OSHA - Occupational Safety and Health Act

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

- SSPC - Steel Structures Painting Council
 - SSPC-SP6 Commercial Blast Cleaning
- ASHRAE - Handbook and Standards
- NEMA - National Electrical Manufacturers Association
- NEC - National Electrical Code
- IEEE - Institute of Electrical and Electronic Engineers
- IPCEA - Insulated Power Cable Engineers Association
- NESC - National Electric Safety Code
- UL - Underwriter's Laboratory, Inc.

Should there be a conflict between various codes and/or specifications the Contractor shall refer it to Purchaser for resolution, but in principle it will be resolved in this order:

- ASME Pressure Vessel Code
- Other legal requirements, including state and local building codes
- This specification
- The more stringent requirements, should two or more specifications or areas within a specification differ in degree of severity

2.0 TECHNICAL REQUIREMENTS

2.1 Design Requirements

The steam generator and auxiliary equipment shall be designed to meet all general conditions and requirements of this specification, and the project specific requirements listed in the Design Conditions.

The steam generator shall be designed and fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section I., latest edition. All boiler external piping being provided and not falling

within the scope of ASME Boiler and Pressure Vessel Code Section I shall be designed and fabricated in accordance with ANSI B31.1. The steam generators shall be of welded-wall, balanced draft design, suitable for continuous operation while fired by municipal solid waste (MSW) with the fuel and flue gas compositions as stated in the Martin Furnace Design Data.

The steam generators and auxiliary equipment shall be designed for indoor or outdoor installation as stated in the Design Conditions.

The design of the unit shall ensure maximum economizer flue gas outlet temperature rise of 75°F after 4,000 hours of continuous operation without shutdown for manual cleaning of fireside surfaces.

2.1.1 Furnace Pressure (Structural)

The furnace and boiler enclosure shall be designed as per NFPA 85G or 20 inches w.g., whichever is more stringent.

2.1.2 Martin Design Data

A set of Martin design data (Attachment 4) has been included with this Specification. It contains the following sections:

- a) Furnace Design Data
- b) Boiler Design Data
- c) Stoker Capacity Diagram
- d) Boiler Sketch
- e) Load Plan

2.2 Pressure Part Materials - Tubes, Headers and Drums

The following minimum requirements are specified for the boiler pressure part materials:

	Dia. (in. O.D.)	Minimum Thk (in.)	Material (min. reqmts.)
Furnace waterwall	*	0.180	SA-178 A
Furnace Arch (above refractory)	*	0.220	SA-178 A
Furnace Exit Screen SA-106 B	As Req'd	0.380	SA-178 A or
Convection Evaporator	*	0.180	SA-178 A
Secondary Superheater T-11**	*	0.180	SA-210 A1/SA-213
Primary Superheater A1**	*	0.180	SA-178 A/SA-210

Superheater enclosure	As Req'd	0.180	& SA-213 T-11
Economizer	*	0.150	SA-178 A
			SA-178 A
All waterwall headers***	10 (min.)	Per ASME	SA-106 B
Superheater headers	10 (min.)	Per ASME	As Req'd**
Economizer header	6 (min.)	Per ASME	SA-106 B
Steam drum	54 (min. I.D.)	Per ASME	SA-299 or
Water drum	36 (min. I.D.)	Per ASME	SA-515 GR 70
			or SA-516 GR 70

* Per attached Martin Boiler Design Data

** Use of carbon steel materials is permissible up to a 750°F metal temperature. Above that temperature, a Cr-Mo material must be used.

*** Chillwall tube headers may be 8 inches O.D.

All waterwall, evaporator, economizer and superheater headers shall be provided with inspection nipples with welded caps or welded hand hole plates as appropriate.

Vents and drains shall be provided on all high and low points of boiler pressure parts.

Tube shields shall be provided at the following locations:

Inlet to curtain wall panel, (dividing wall) first into second pass (1 row, full length of the exposed part of the first tube)

Inlet to convection banks including screen tubes (2 rows, full length)

Convection bank evaporator tubes facing sootblower, whole length and around outside bend if less than 6 feet from sootblower.

Inlet to superheater (2 rows, full length)

Economizer-inlet only (1 row, full length)

First tubes on either side of every sootblower cavity immediately facing the sootblowers (each tube bank and screen, full-length, except in the economizer where only the first row at the inlet shall be provided with tube shields).

Tube Shield Requirements:

Manufacturer: Helmick or Purchaser approved equal
Material: According to temperature (stainless steel)
3rd pass evaporator shall be minimum Type 310 stainless steel. Superheater and economizer shall be minimum Type 304 stainless steel.

Style: -F and 180 degrees for straight tubes
-CCI or CCO for curved tubes

Thickness: Ten (10) Gauge

Length: Maximum 48 inches per shield

Installation: To ensure a tight fit, a clamping device must be used while the clips are welded to the shields. Each shield shall be tack-welded to the tube at one clip location only. Shields must cover the pipe also at the location of any tube welds.

Max. 24" between clips.

Sootblower supports or guides shall not be welded to tube shields

2.3 Steam Generating Section

2.3.1 Boiler Drums

The boiler drums shall be of fusion welded construction, complete with dished ends, 16 x 12 inches elliptical manholes and hinged covers in each end.

The steam drums shall be equipped with drum internals consisting of vortex type steam separators and steam dryers designed to ensure the steam purity (total dissolved solids in the steam) in accordance with the ABMA recommendations and this specification.

The required steam purity is to be achieved at all boiler loads and full steam drum water level operating range, when the boiler water quality is maintained within ABMA recommended limits. All drum internals shall be secured by bolts with acorn style nuts.

The steam drum shall be fitted with, at least, the following nozzles and connections:

- a) Feed water nozzle
- b) Chemical injection
- c) Continuous blowdown
- d) Intermittant blowdown
- e) Safety valves
- f) Water column with gage glass and remote reading level device
- g) Probe water column
- h) Water level transmitter
- i) Pressure gauge and switch
- j) Pressure transmitter
- k) Saturated steam connection (to the superheater)
- l) Spare nozzles (2 x 2 inches NPS, location on shell vertical centerline-saturated steam)

The feedwater and the chemical injection nozzles are to be fitted with thermal sleeves to minimize the local thermal stresses. The feedwater, blowdown and chemical injection shall be provided with suitably drilled, internal distribution pipes.

In general, most pipe connections to the steam drum nozzles shall be provided with butt-weld ends. Flanged connections are only required for safety valves, and probe water column, items e), and g).

2.3.2 Furnace and Waterwalls

The multiple pass unit shall be enclosed by gas-tight, fully welded waterwalls. These walls shall be shop fabricated, welded, panel type, tube-and-web design. The tubes shall be attached to the respective headers by welding. All bottom headers will be equipped with drains. The minimum drain size is 1-1/2 inches NPS. If required due to the relief tube layout, the top headers shall be provided with vents.

Should other design be offered as an alternative, for example, at the boiler bank side walls or superheater roof, the Contractor shall clearly identify this in his proposal together with detailed explanation of this alternative offer.

To minimize the slag and ash accumulation, the screens between first and second radiant passes shall be arranged with inlet headers and formed from a small number of relatively large bore pipes (minimum 4 inches in diameter) arranged with wide spacing (1-2 feet).

The furnace waterwalls shall be covered with SiC refractory up to a height of not less than 30 feet above the grate. To support this refractory, closely spaced stainless steel studs shall be shop welded onto the wall panels, as follows:

Stud material	430 SS
Stud dimensions	3/8 inch/diameter x 3/4 inch/long
Stud density	660/sq meter

In addition, 2 7/8 inches long 430 stainless steel Y-anchors (130/sq meter) and 4 1/4 inches long, 430 SS Y-anchors (also 130/sq meter) will be welded to the front wall ignition roof to support the castable alumina refractory.

The lower front wall header shall be provided with Y-anchors in sufficient number and size to support a 2 inch thick refractory liner.

Two inch long 430 SS Y-anchors (260/sq. meter) shall be welded to the chilled tube wall to side wall intersection. This intersection shall be designed to keep the uncooled area to an absolute minimum.

Proper studding shall be provided for all wall openings and penetrations. The studded areas shall be provided with a protective coating which must be carefully and completely removed by appropriate means (e.g., sandblasting) before the refractory may be applied.

The waterwall surface that forms the rear sidewalls and rear stoker roof, from 3 feet below the lower panel bend that houses the overfire air nozzles to the chill tube and bridgwall headers, shall be bare.

For all headers exposed to direct heat from combustion, the necessary protection shall be provided, including studs, bracing, anchors, sleeves, etc.

A suitable number of access door and observation port openings as well as sufficient number of scaffold cable openings in the roof of the first and second boiler passes shall be provided. Openings shall also be provided for the furnace temperature and pressure probes and the auxiliary fuel burner(s). The burner openings shall be water cooled and fitted with suitably reinforced rings and mounting flanges with minimum thickness of 1/4 inch and 3/8 inch respectively.

As a minimum, the following doors and observation ports are necessary in the first boiler pass:

	<u>Up to 3 Stoker Runs</u>	<u>More than 3 Stoker Runs</u>
Martin supplied observation ports	One side only: one near rear overfire air nozzles; two near burner at "end of refractory" level (angled to look down) Ignition door, near feed table edge	LH and RH side, same locations
Contractor supplied observation ports	As many as require to observe burner flame in from wall and opposite of burner(s)	
Contractor supplied access door near screen and header between 1st and 2nd pass (could be in 2nd pass also)	One side only	LH and RH side, same locations
Martin supplied access doors to stoker	One in rear wall	Two in rear wall
Martin supplied observation ports in rear wall	One stoker run Two stoker runs Three stoker runs Four stoker runs Five stoker runs Six stoker runs	0 1 2 2 3 4

High pressure overfire air nozzles shall be installed in the lower front and rear walls. These stainless steel nozzles will be supplied by the Purchaser and the Contractor shall provide the necessary waterwall openings and to install these nozzles.

Boiler buckstays and hangers shall be designed for independent support of each unit and also for applicable seismic loading. The buckstays and hangers shall allow free and unrestricted expansions under all operating conditions. Boiler bumpers and guides off boiler support steel shall also be provided.

Contractor shall provide chill wall restraints, tied to the stoker casing frame.

2.3.3 Convection Evaporator

In order to control the thermal performance of the unit, a convection evaporator is required. This evaporator shall be situated in the third boiler pass and arranged for upward flue gas flow.

The evaporator shall be arranged with adequate spacing to minimize fouling, for ease of cleaning and access. The necessary supports and spacers shall be designed to minimize metal temperatures, allow for sufficient expansion/thermal movements under all operating conditions and to minimize the dust accumulation. The design shall also ensure that the longitudinal and transverse alignments are kept during operation. Tubes shall be adequately braced to prevent excessive lateral movement during sootblowing.

The evaporator shall be of natural circulation design and shall be fully drainable. The minimum drain size is 1-1/2 inches NPS. Evaporator tubes must slope a minimum of 2 degrees.

Inlet and outlet of evaporator banks for two drum boilers shall be furnished with off-set screen tubes, arranged in-line.

The Contractor shall supply sufficient number of access door and sootblower openings and instrument connections, as required for operation, cleaning and monitoring of the unit.

As a minimum, each sootblower cavity shall be equipped with an access door that allows entry to the cavity for sootblower inspection. All access doors shall be positioned to facilitate entry into the boiler and be located near supporting surfaces (e.g. headers, tube banks, ledges, hoppers, etc) and the lower ledge of the door be not less than 1 foot or more than 3 feet above an access platform, unless a dedicated ladder with a step is provided to allow for easy access. Each access door shall have a handhold at the outside and the inside of the boiler. Access doors shall have integrated refractory where needed. Blocking of the opening with refractory bricks is not allowed.

2.3.4 Boiler Circulation System

The correct design of the circulation system is the sole responsibility of the Contractor. All sections, including downcomers, feeders, risers, relief tubes, all headers, distributors and collectors and drum separators shall be properly sized with low restrictions for high flow (circulation) rates to ensure low metal temperatures, especially of the radiant tube sections.

Boiler water shall enter downcomers arranged at the low point of the drum. To ensure steam free circulating water, steam and water separators shall be used and the incoming feed water shall be distributed to allow all downcomers to obtain proportioned flow. Downcomers larger than 10 inches NPS shall be fitted with anti-vortex devices. The downcomer system shall be fully drainable with minimum drain size of 1-1/2 inch NPS.

Due consideration shall be given to achieve proper circulation in the radiation and convection evaporating sections operating in parallel with different flow characteristics. If necessary, separate downcomers and relief pipes, header membranes (separating discs), orifices, distributors, etc. shall be provided.

2.4 Superheater

A multistage superheater shall be provided. It shall be arranged downstream of the convection evaporator for maximum protection from corrosion by hot fluegasses and ash particles. The superheater shall be designed to maintain the outlet steam temperature over the specified control range (steam generation).

2.4.1 Superheater Tube Banks

The tube banks shall be designed for high steam velocities to ensure proper steam distribution and to minimize superheater tube metal temperatures. The minimum steam mass flow rate shall be 220,000 lb/sq ft.-hr at MCR condition. The multistage design is required to ensure proper thermal performance under all operating conditions. Individual superheater tube banks shall not exceed 5 feet overall depth, measured between first and last tube centerlines in the direction of the gas flow.

The superheater shall be arranged with adequate spacing to minimize fouling, for ease of cleaning and access. The necessary supports and spacers shall be designed to minimize metal temperatures, allow for sufficient expansion/thermal movements under all operating conditions and to minimize the dust accumulation (e.g. design crossbracing and tube spacers at different elevations). The design

shall also ensure that the longitudinal and transverse alignments are kept during operation. Tubes shall be adequately braced to prevent excessive lateral movement during sootblowing.

The Contractor shall supply sufficient number of access door and sootblower openings and instrument connections, as required for operation, cleaning and monitoring of the unit.

As a minimum, each sootblower cavity shall be equipped with an access door that allows entry to the cavity for sootblower inspection. All access doors shall be positioned to facilitate entry into the boiler and be located near supporting surfaces (e.g. headers, tube banks, ledges, hoppers, etc.).

2.4.2 Spray Attemperator(s)

The Contractor shall furnish the required number of interstage, spray type, attemperator(s) as specified. In general, units with the final steam outlet temperature up to 750°F will use single stage attemperator and units with steam temperature above 750°F will use two stage attemperators.

These interstage attemperators shall be complete units with spray water assemblies, including spray nozzle(s) and orifice plate(s) as required and alloy steel, shop assembled spray header liner(s).

The Contractor shall furnish desuperheater control valve(s) including 4-20 mA I/P converters and airsets.

2.5 Economizer

Each boiler shall be provided with a bare tube economizer of counter flow design, preferably arranged with fluegas downflow and water upflow. The economizer shall be fully drainable and all tubes shall be attached to the headers by welding. Minimum drain size shall be 1-1/2 inch NPS. It shall have a gas-tight steel casing, minimum of 3/16 inch thick.

The economizer tube banks shall be designed for high water velocities to ensure proper water distributions and prevent steaming. The minimum water mass flow rate shall be 400,000 lb/sq. ft.-hr at MCR conditions. It should be noted that the individual economizer tube banks shall not exceed 5 feet overall depth, measured between first and last tube centerlines in the direction of the gas flow.

The economizer shall be arranged with adequate spacing for cleaning and access. The necessary supports and spacers shall be designed to minimize metal temperatures, allow for sufficient

expansion/thermal movements under all operating conditions and to minimize the dust accumulation. The design shall also ensure that the longitudinal and transverse alignments are kept during operation. Tubes shall be adequately braced to prevent excessive lateral movement during sootblowing.

The Contractor shall supply sufficient number of access door and sootblower openings and instrument connections, as required for operation, cleaning and monitoring of the unit. If hangers, supports or other obstacles limit access to certain areas, additional doors will be needed to allow unobstructed access to all parts of the economizer.

As a minimum, each sootblower cavity shall be equipped with an access door that allows entry to the cavity for sootblower inspection. All access doors shall be positioned to facilitate entry into the boiler and be located near supporting surfaces (e.g. headers, tube banks, ledges, hoppers, etc.).

2.6 Boiler Appurtenances, Instrumentation, Valves and Piping

The Contractor shall supply all specified boiler mountings and fittings, instrumentation, valves and piping within all terminal points of supply. All items shall be selected for the specified pressure and temperature conditions and in accordance with the ASME, Section I or ANSI B31.1 as applicable. The trim shall be selected for a minimum of 125% of the normal operating pressure (psig).

All instruments that are inserts to be mounted in the Purchasers control panels shall be shipped directly to the Purchaser's panel manufacturers shop. Examples include the miniature multi-light level indicator and sootblower insert panel.

2.6.1 Boiler Appurtenances and Instrumentation

All instrument locations must be provided with access and platforms for ease of maintenance or observation.

Steam Drum Instrumentation

- Pressure:

One pressure tap and valve shall be provided for use by others to monitor drum pressure. An additional tap, valve and pressure gage shall be furnished and installed for local readout of drum pressure. Separate instrumentation and taps are to be provided as required for the auxiliary burner safety system.

- Level

Drum level trim and accessories shall be furnished as specified below and as illustrated on Attachment 3. Gage glass isolation valves are to be of the angle, outside screw type.

Quantities below are typical for one (1) steam generator.

Near End:

<u>Quantity</u>	<u>Item</u>
1	a) Direct vision illuminated water gauge with gauge valves and blowdown valves.
1	b) Electro Eye-Hye system (or equal) consisting of the following:
1	b1) Multi probe electrolev flanged water column with isolation, blowdown valves and NEMA 4 junction box.
2	b2) Multi-light indicators with a range of not less than the trip point and not more than +3, -1.5 inches wider than the high and low trip ranges, one (miniature) to be located in control room and one (standard) to be mounted on the operating floor.
1	b3) NEMA 4 control unit with optional test switch and relays. Unit shall have relays and contacts for the following outputs: Hi-Hi, Hi,Lo and Lo-Lo Alarms and cut-offs
4	b4) Primary isolating valves.
1	Holding switch (located next to the blowdown valve of item b1) to prevent trip when blowing down.

Far End:

<u>Quantity</u>	<u>Item</u>
1	a) Probe safety column consisting of the following:
1	a1) Water column with isolation and blowdown valves
1	a2) One set of probes positioned in water column cap

- 1 a3) NEMA 4 control unit with relays and supply transformer; following outputs (as dry contacts) are required:

LWL Output (4 contacts)
HWL Turbine Trip (1 contact)

- 1 b) One holding switch (located next to the blowdown valve of item a1) to prevent trip when blowing down the water column
- 1 c) Direct vision illuminated watergauge with gage valves and blowdown valves
- 2 d) Isolating valves (for water column connection)
- 2 e) Isolating valves (for feedwater level transmitter connection)

Furnace and Fluegas Instrumentation

Temperature taps - All temperature taps shall be 2 inch NPT and shall penetrate horizontally from outside of the lagging or vertically from above the roof, into the flue gas path.

Taps shall be provided at the following locations:

- a) One on each side just above the refractory (max. 3 ft). Exact location(s) per the stoker manufacturer (Martin GmbH).
- b) One on each side just above the bull nose. Exact location per the stoker manufacturer (Martin GmbH).
- c) A specific number of taps across the roof of the first pass above the nose, equally spaced; the quantity based upon the following: boiler width-less than 20 ft, three taps; up to 40 ft, four taps; and up to 60 ft, five taps. The taps must be accessible from the top of the penthouse roof to be able to exchange thermocouples while the boiler is in operation. The taps shall be tapered at the bottom to guide the probes to the opening in the membrane wall roof.
- d) On one side near the bottom of the second pass before the convection section. Exact location(s) to be provided by stoker manufacturer.
- e) On one side before and after each superheater tube bank.
- f) On one side before and after each economizer tube bank.

For items (d), (e), and (f), the temperature taps shall be on one side of the steam generator unless the steam generators are equipped with stokers of more than 3 runs in which case temperature taps shall be provided on both sides.

Pressure taps - All pressure taps shall be 2 inch NPT and shall penetrate from the outside of the lagging into the gas path at a 45° angle downward. The instrument connection on the outside will terminate in a 2" x 2" x 1" tee with a plug in order to allow for rodding out. It is essential that the tee and the instrument are not more than 5 feet above the access platform.

Taps shall be provided at the following locations:

- a) One on each side just above the refractory (max. 3 ft). Exact location per the stoker manufacturer (Martin GmbH).
- b) One on each side above the nose at a point where the furnace pressure is expected to be approximately zero.
- c) One at each location designated under item d), e) and f) for temperature taps

Oxygen - 4 inch flanged connection with access and maintenance platform shall be provided upstream of the economizer in the center and on top of the inlet duct in conformance with Martin's instructions.

Metal Temperatures - Metal temperature thermocouples are to be installed in accordance with the boiler manufacturers recommendation. As a minimum, thermocouples shall be located at the superheater sections before each attemperator and at the final section. Thermocouples shall be wired out to a NEMA 4 junction box for monitoring by others.

Refractory Temperature - Thermocouples shall be buried near the top of the refractory. The number shall be as required by the refractory supplier to monitor the curing process. They shall be brought out to an accessible location on the main firing aisle (elv. 28.5) and terminated in a NEMA 4 junction box. They shall be clearly identified and protected as necessary.

CO Test Taps

To perform CO testing, furnace sampling penetrations are required on each boiler sidewall above the refractory, at two elevations. Each elevation shall contain three individual sampling points; at the center line of the furnace and the two quarter points. The location of these six (6) penetrations per sidewall shall be accessible from platforms or walkways. Each sampling point will

consist of 1/4 inch, schedule 40 carbon steel pipe welded to the tube fin. The tube fin penetration must be large enough to allow 1/4 inch stainless tubing to pass through (Refer to Attachment 11).

Air and Gas Duct Instrumentation

All taps shall be 1" NPT for flow, pressure and temperature.

Pressure - The following pressure taps shall be provided:

- a) FD fan discharge pressure
- b) Air heater inlet and outlet pressure
- c) Underfire air pressure just prior to the stoker duct work interface point
- d) Overfire air fan discharge pressure
- e) OFA ducts, downstream of each damper and in each OFA header.

Temperature - Temperature taps shall be provided at the steam coil air heater inlet and outlet.

Flow - Flow elements shall be provided at the following locations:

- a) FD fan inlet ductwork
- b) OFA fan inlet ductwork

Flow elements shall be of low loss, venturi type with adequate (ASME) straight run and measurement taps furnished. The Contractor shall inform the Purchaser should insufficient straight run be available, so the Purchaser can arrange site calibration.

Feedwater and Steam Line Instrumentation

Temperature - The following temperature test points are to be provided complete with thermowells, cap and chain.

- a) Economizer inlet
- b) Superheater outlet

The following local temperature indicators complete with wells are to be provided:

- a) Economizer inlet
- b) Economizer outlet
- c) Attemperator(s) inlet
- d) Attemperator(s) outlet
- e) Superheater outlet

The following temperature points are to be monitored by others. Thermowells for 1/4 inch diameter elements are to be provided by Contractor for the following:

- a) Economizer inlet
- b) Economizer outlet
- c) Superheater inlet
- d) Attemperator(s) inlet
- e) Attemperator(s) outlet
- f) Superheater outlet

Pressure - All pressure connections shall be 3/4 inch NPT complete with isolation valves.

The following local pressure indicators are to be provided.

- a) Drum pressure
- b) Superheater outlet

The following taps are to be provided for use by others.

- a) Drum pressure (transmitter)
- b) Superheater outlet (test tap and transmitter tap)
- c) Economizer inlet (test tap)

Separate taps shall be provided for burner controls and power operated relief valves as required.

Steam and Water Sampling

Sampling probes shall be installed to sample the following:

- a) Boiler blowdown (Stainless steel)
- b) Saturated steam (stainless steel)
- c) Superheated steam (stainless steel)

All steam probes shall be per ASTM D 1066

Damper Drives

The following dampers shall have drives furnished and installed, in accordance with the requirements of the fan specification SM-104, Attachments 3-2 & 3-3. They shall include inter-connecting linkages, current to pneumatic converters, positioners, limit switches for damper position indication, tubing, filter, regulators, solenoids and any accessories as required to have the dampers fail to the defined position. Drives shall be manufactured by Bailey Controls.

- a) FD fan inlet vane, fail close.
- b) OFA fan inlet vane, fail close.

The overfire air distribution dampers will be fitted with drives furnished by Purchaser. Contractor shall furnish the interconnecting linkages and the supports and mounting brackets in

accordance with Martin's drawings and instructions for these drives. All dampers and drives have to be provided with access for maintenance.

Fan Instrumentation

Fan instrumentation shall be furnished and installed in accordance with the requirements of the fan specification, SM-104.

2.6.2 Valves and Piping

A full complement of trim piping and valving shall provided. All boiler blowdown, vents and drains, including drains from drum instruments and all sampling lines, shall be double-valved, with the downstream valve located at the stoker operating level, grouped together for ease of operator access.

Feedwater piping shall be furnished from the economizer to a point in the piping at the inlet to the feedwater block and bypass valves (boiler external piping). Feedwater line sizing shall be in the range of 12 fps to 15 fps (max.).

Steam line sizing shall be in the range of 100 fps to 120 fps (max.).

Safety valves shall be furnished in accordance with ASME Section I with capacities certified by National Board of Boiler and Pressure vessel inspectors. All safety valves shall be flanged and furnished with vent stacks, silencers and drip pans. These valves shall be of rugged construction with tight shut-off. Thermally compensated design shall be used to ensure stability of set pressure and to minimize temperature distortion. The safety valves shall be Consolidated "Maxiflow", Crosby "HC/HCA" or Purchaser approved equal. A 125V D.C. electrically controlled relief valve and manual block valve shall be furnished at the superheater outlet piping, in addition to the code required relief valves. The relieving capacity of the electrically controlled valve shall not be less than 20 percent of the steam generator maximum continuous rating. The valve shall be provided with controls and subpanel for remote mounting by the Purchaser and shall be Crosby type "Pressurmatic" or Purchaser approved equal and shall be furnished with vent stack and silencer.

Silencers must be properly sized to avoid excessive back pressure on the safety valve causing improper valve action or reducing relieving capacity. Vent stacks, silencers and related piping shall be properly supported to avoid excessive loading on the valve discharge flanges.

All valves are to be selected for the intended service. Gate valves shall be used unless otherwise specified or agreed by Purchaser. Drain and vent valves shall be Hancock, Rockwell-Edward, Yarway, or Purchaser approved equal. Continuous blowdown valves shall be Yarway "Hy-drop" throttling valve designed for continuous blowdown rates of 0.2% to 2.0% of MCR steam flow (typical). Intermittent bottom blow-off valves for steam drum, bottom drum (for two drum boilers), and waterwall headers, shall be Yarway "Unit Tandem", Edward "Univalve" tandem blow-off valves, or approved equal. All valves shall be of the back-seat type and supplied with bolted bonnet, rising stem and stainless steel trim, repairable or replaceable without removing valve from the line. Valves two (2) inches and smaller, except control valves, shall be as a minimum 600 lb. std. forged steel with socket weld ends. Valves two and a half (2-1/2) inches and larger, shall be as a minimum 600 lb. std. cast steel with raised face flange or butt-weld ends. Four (4) inches and larger steam valves shall be provided with an integral valved by-pass for warm up. Safety valves shall be supplied with test gags. Feedwater and main steam non-return valve shall be furnished and be Rockwell-Edwards or Purchaser approved equal. Angle type check valves shall be furnished as required by the arrangement of the piping.

As far as possible, all valves supplied shall be of a single manufacturer. All valves of a single classification shall be identical and interchangeable.

The selection of pneumatic valve operators shall be subject to approval by the Purchaser. A handwheel and a position indicator shall be provided for manual operation of control valves. Interlocking shall be provided to prevent engagement of the handwheel when the operator is energized. Control valves shall be supplied with open and close limit switches for remote control and indication. Control valves shall be Fisher Controls or Purchaser approved equal.

Pipe material shall be seamless, carbon steel ASTM A-106 B or ASTM A-53 B, or chrome-moly ASTM A335 P11, subjected to pressure and temperature limitations. Piping two (2) inch and smaller shall be as a minimum schedule 80. Pipes two (2) inches and smaller shall have socket weld joints and all pipes two and a half (2-1/2) inches and larger shall have butt-weld joints.

Fittings two (2) inches and smaller shall be 3,000 lb. forged carbon steel ASTM A-105 II, or forged alloy steel, ASTM A182 F11, socket type. Fittings two and a half (2-1/2) inches and larger shall be forged carbon steel ASTM A-234 WPA or WPB, or forged alloy steel, ASTM A182 F11, butt-weld joints.

All butt weld connections shall be provided with butt-weld ends in accordance with ANSI B 16.25.

The Contractor shall verify all flap gate valve sizes and dimensions with the Engineer for interfacing with the boiler steel, platform and stoker equipment.

2.6.3 Vents and Drains

Vents must be terminated through the roof. Drains (including safety valve drip pan drain and sootblower drains) shall be brought to a common "zero expansion" header at operating/grade level unless specifically requested otherwise.

Superheater and drum vents shall be routed into the nearest safety valve vent silencer or a separate silencer shall be mounted on each superheater and drum vent line.

2.7 Casing, Hoppers and Ducting

The Contractor shall supply all casing, hoppers and ducting with expansion joints within the scope of supply limits. These shall be of welded steel plate construction, designed and fabricated, including all supports, in accordance with applicable rules of the AISC. All material required to support these casings, hoppers and ducting, including all brackets, hangers, frames, etc., shall also be supplied by the Contractor.

2.7.1 Casing/Ducting

The Contractor shall include the economizer casing, boiler penthouse, and stoker front, sides and rear casing. Stoker casing shall be in accordance with Martin GmbH drawings and instructions.

The casing/ducting which is in direct contact with fluegas, i.e., economizer casing, shall be designed for the maximum expected flue gas temperature and for full internal design pressure. The maximum flue gas temperature must be assumed in the maximum fouled condition (e.g., + 75°). Carbon steel material is permissible up to a maximum expected flue gas temperature of 750°. For higher temperatures, appropriate alloy steels must be applied. It shall be adequately stiffened by externally welded steel reinforcements. The deflection of the casing stiffeners shall not exceed 1/360 of the span and the deflection of the plates shall not exceed 1/120 of the span between stiffeners. It shall be seal welded as required to obtain gas-tight design.

All plates used shall be of suitable carbon (A-36) or alloy steel, manufactured in accordance with ASTM specifications and shall not be less than 3/16 inch in thickness.

2.7.2 Hoppers

The Contractor shall furnish ash hoppers for the convection, superheater and economizer passes. Hoppers shall be of pyramidal configuration with minimum valley angle of 55 degrees. Hoppers shall be furnished with access doors, poke holes and strike plates. Hopper outlets shall be provided with 16 inch square openings for the convection pass hoppers and 12 inch square openings for all other hoppers. Minimum 3/8 inch thick square flanges shall be provided for connection to and to support the Purchaser's ash removal equipment. The hoppers shall be designed as a minimum for full ash loading based on density of 90 lb/cu. ft.

Convection pass hoppers shall connect through the rear membrane wall roof with a flanged insulated duct or be ducted into the rear furnace wall, in accordance with Martin's drawings and instructions. In each case the hopper exit opening and the connecting ductwork shall be no less than 16 x 16 inch inner dimension.

All plates used shall be A-36 carbon steel, manufactured in accordance with ASTM specifications and shall not be less than 1/4 inch in thickness. Alloy steel (A387 Grade 11, Class 1 or better) suitable for the maximum design temperature shall be used for the superheater hoppers.

The clearance between the economizer hopper(s) and ground floor elevation shall be minimum 16 feet for single hoppers and minimum 18 feet for multiple hoppers.

Where multiple hoppers are required across the width of the unit, the number of these shall be minimized as far as the minimum valley angle of 55 degrees allows.

2.7.3 Air Ducts and Dampers

Combustion air ducts with air intake screens shall be provided, which extend from the refuse pit intake to the forced draft (FD) and overfire air (OFA) fan inlets. The inlet duct shall be provided with a sealed penetration through the refuse storage/boiler area separation wall and an inlet screen of wire mesh (wire 1/8 inch diameter, mesh opening 3/8 inch square). The penetration detail shall be coordinated with the Purchaser to insure proper interface with building steel and siding. Ducting shall be 3/16 inch thickness (minimum) and designed with either single inlet which then splits into individual ducts to the FD and OFA fans, or completely independent inlet ducts to the fans. In either case, ducts shall be sized for a maximum local intake velocity through the screen of 800 fpm and maximum transport velocity of 3,000 fpm. The intake plenum shall allow for gradual increase in velocity to keep pressure drop to a minimum.

All ducts shall be adequately stiffened by externally welded steel reinforcements. Internal stiffeners are not acceptable. The deflection of the duct stiffeners shall not exceed 1/360 of the span and the deflection of the plates shall not exceed 1/120 of the span between stiffeners. Ducts shall be seal welded as required to obtain air-tight design. Turning vanes shall be furnished if required by the Contractor's design to reduce pressure loss.

The Contractor shall furnish flow balancing dampers in individual ducts to the overfire air nozzles. Each damper shall be provided with a control lever and linkage for connection to Purchaser furnished hydraulic activators. Dampers shall be equipped with end stops at their open end position. The Contractor shall provide all mounting hardware and installation including the mounting brackets to support the drive cylinders in accordance with Martin drawings and instructions. Dampers shall be of the multiple opposed blade type, with flanged connections to the ductwork.

Overfire air ducts shall be designed for low pressure drop. Velocities in the overfire air ducts shall not exceed 2000 fpm when 60% of the overfire air fan capacity is supplied to either the front or the rear row of nozzles. All stokers with more than 2 grate runs must feed the overfire air headers from each side of the boiler or have branch headers designed with a continuously reduced cross-section to assure even pressure across the boiler width. Special arrangements must be made to ensure equal flow to all nozzles, e.g., gradually decreasing header size or multiple feed to header. Headers shall not be fed in line with nozzle centerline to avoid "blow through." Headers shall be fed perpendicular to the nozzle centerlines.

The sealing air from the seal air fan shall be supplied to one connection on each side of the stoker transverse frame, to the stoker observation ports (peepholes) and to the wallboxes of all retractable, and rotary sootblowers in the superheater and boiler convection passes. The sealing air to the filter for the driving beam support rollers may be supplied from the FD fan discharge. For stokers with 4 runs or more, seal air is required to be supplied to both sides of the stoker in separate air supply ducts or pipes.

Manual dampers shall also be furnished in the seal air distribution ductwork for balancing and isolation of flow paths.

All dampers shall be marked on the outside to clearly indicate the position of each damper blade and endstops shall be provided to avoid overturning of the blades.

2.8 Steam Coil Air Heater

The Contractor shall provide for each unit, for installation in the underfire air duct, a minimum of five (5) drainable steam coil air heater assemblies, mounted in airtight heavy duty frame casings, with removable core feature. The assemblies shall be arranged in series to provide at least five (5) separate stages of heating. A ductwork section with a minimum 18" x 48" quick opening type access door for cleaning shall be provided between the second and third stages. In addition, minimum 18" x 48" quick opening type access doors shall be provided in ductwork upstream of the first stage, and downstream of the last stage. Also, air heaters must be cleanable without removing the coils from the ductwork. Four inch diameter, capped drains in the ductwork shall be provided at the low point of the heater, spaced every 3 ft. across the width of the duct.

Finned steel tubes shall be schedule 40, with .036" minimum thickness steel fins, 4 fins per inch maximum. Tubes shall be arranged with in-line pitch. Offset tube arrangements are not acceptable.

Steam coil design shall be horizontal coils. Vertical coils, if required due to space and arrangement restrictions, shall be subject to Purchaser's approval.

Horizontal coils shall be inclined with internal steam distribution tubes. Flanged single inlet and outlet connections for each heater coil stage shall be provided on the same side of the coil. Coils shall be horizontally removable from the end opposite the piping connections. Piping, valves, traps, etc. for the steam supply and condensate return lines will be furnished by the Purchaser.

The steam coil air heater shall be designed to operate with the turbine extraction steam conditions specified in the Design Conditions. The following criteria shall also be used for coil design:

Air side fouling factor	-	0.01 hr-ft ² -°F/Btu
Steam side fouling factor	-	0.001 hr-ft ² -°F/Btu
Maximum allowable face velocity	-	900 ft/min.

For boilers with heated overfire air the Contractor shall furnish and install a similar type air heater and duct arrangement in the overfire air duct with a minimum of 4 separate stages.

The steam coil air heater(s) shall be designed to preheat the underfire combustion air (UFA) and overfire air (OFA) flow specified in Attachment 1, Design Conditions as follows:

<u>HHV of Refuse</u>	<u>Temperature of UFA</u>	
	<u>Inlet</u>	<u>Outlet</u>
up to 5250 Btu/lb	60°F	300°F
5250-5500 Btu/lb	60°F	250°F
over 5500 Btu/lb	60°F	200°F

Steam coils shall be manufactured by Armstrong-Hunt, Yuba Heat Transfer, Aerofin or Purchaser approved equal.

2.9 Lagging, Insulation and Setting

The Contractor shall furnish and install the complete brickwork, refractory, insulation and lagging for each steam generator and stoker unit.

2.9.1 Insulation and Lagging

All hot surfaces, including the boiler settings, and hot air ducts, plenums, piping, all hoppers including stoker siftings hopper, those parts of the Martin stoker supply as indicated on Martin's drawings, etc. shall be insulated and aluminum lagged. Outside skin temperature shall be no more than 130°F based on 80°F ambient temperature. Hot piping and equipment which are not in operation which are potentially subject to contact by personnel shall be insulated and lagged for personnel protection. Setting, ductwork and equipment lagging shall be 0.040 inch ribbed aluminum. For outdoor boiler units, lagging shall be provided with a shop applied enamel finish in a color and panel configuration to be determined by the Purchaser.

Piping insulation shall be mineral wool or fiberglass suitable for the operating temperature of the piping. Insulation shall be finished with aluminum jacketing.

Insulation used for covering valves, flanges, water columns, cross tees and watergauge valves shall be a removable jacket made of fiberglass blankets, suitable for the operating temperature.

2.9.2 Setting

Furnace waterwalls shall be covered with minimum 87% gunnited silicon carbide refractory to a thickness of 7/8 inch from the tangent of the tubes, up to a height of 30 feet above the Martin grate at the center of the furnace. The waterwall surface that

forms the rear sidewalls and stoker roof from 3 feet below the lower panel bend that houses the overfire air nozzles to the chill tube and bridgewall headers, shall be bare.

Thermocouples shall be buried in the silicon carbide lining, as required by the refractory supplier, to monitor the curing process. The Contractor shall furnish and install these thermocouples.

The suppliers of this system shall be Dyko, Didier Taylor, Norton or Purchaser approved equal. All SiC refractory shall be applied over SiC sleeves, which shall have a minimum density of 150 lb/cu. ft. and be installed on 3/8" dia. x 3/4" lg. stainless steel studs welded at 660 per sq. meter.

Shop installed refractory around the overfire air nozzles shall have provisions for anchoring field-installed refractory.

For the other refractory in the stoker area, the following shall be furnished and installed:

- . The feed table side walls up to the end of the feed table, shall have minimum 85% SiC bricks. Brickwork in the entire feed table area shall be of the interlocking type. Adequate expansion joints and dense anchoring must be provided to withstand the extreme service expected in this area.
- . The ignition roof shall be provided with 3 inch of 70% castable alumina (Al_2O_3) up to the overfire air nozzles and SiC (1 inch thick) at the nozzles and from the nozzles to the corner and up the front wall. The nozzle row shall have sufficient anchoring between the nozzles to install the refractory across the whole row in the form of a single wave.
- . The area immediately below the feed table at the front of the grate shall have 85% high alumina special shaped firebricks with adequate expansion joints, e.g., every third joint to be filled with compressible material instead of mortar.
- . The area immediately below the chill tubes shall be provided with special shaped firebricks. The fire bricks in the area of the first three stoker sections shall be minimum 85% SiC. The remainder shall be 85% high alumina. Adequate insulation between these bricks and the support frame is essential. Expansion joints must be provided as required.
- . The areas from the lower sidewall chill headers to the rear wall and down to the ash chute, and the rear wall itself, shall be provided with castable refractory or low duty firebrick.

- . The areas behind the chill tubes and special sidewall shapes shall have high duty firebrick, insulating firebrick, and high temperature block insulation.

All firebricks and refractory shall be properly designed and installed. Special attention shall be given to anchorage and expansion. Attention must be given specifically to the fact that the flow of refuse along the refractory will exert additional forces that require to be compensated by adequate anchoring of the refractory. All design drawings shall be submitted for information and review.

Low duty firebrick is defined as a fireclay brick having a PC value not lower than 15 nor higher than 28. High duty firebrick is defined as a fired clay brick having a PC value not lower than 29 nor higher than 31-1/2.

Hoppers for the convection passes shall be lined internally with refractory suitable for the maximum temperatures expected and for the mechanical strength required to withstand impact from falling slag. The refractory lining for the hopper for the second furnace pass shall be suitable for water washing without deterioration. The surface of the lining of the hoppers must be very smoothly trowelled to allow fly ash to glide through the hopper easily. As an alternate, hoppers may be fabricated from material suitable for the maximum expected gas temperatures, without refractory lining, but adequately insulated.

2.10 Sootblowing System

The Contractor shall provide a completely automated, sequential sootblowing system for each boiler, including sootblowers, wall boxes, motor starters and pushbuttons with local disconnect switches, solid state control system and panel, all necessary steam supply and condensate piping, valves, fittings, hangers, thermal drain valves, etc.

The sootblower system shall be designed to operate with superheated steam, taken from the superheater outlet piping down-stream of the Purchaser's flow element.

The sootblowing system shall be supplied by Diamond Power, or Copes Vulcan.

2.10.1 Sootblowers and Piping

Retractable blowers shall be provided for the convection evaporative surface (third pass) and superheater sections which are exposed to flue gas temperatures in excess of 1000-1200°F. The remaining superheater banks and the economizer may have rotary blowers, typically two blowers per section, including two blowers

at the superheater outlet. Sootblower materials shall be suitable for the temperatures and gas compositions normally encountered when bulk firing municipal solid waste.

Retractable sootblowers shall have steel box beam construction with an open bottom to enclose the drive mechanism, motor, lance and other moving parts for complete protection.

Rotary, lance sootblowers shall not be mounted further than 6 inches from the tube bank that they have to clean. Sootblower mounts and guides shall not be attached to the tube shields.

All sootblowers in the superheater and boiler convection passes shall be provided with a positive pressure, cooling/sealing air system. This air shall be obtained from the seal air fan system.

The piping system which is provided for the steam supply and drainage, shall be designed to allow for the thermal expansion of the piping system and the boiler. It shall be routed in a serpentine, downward arrangement, with shortest possible flanged connections to the individual sootblowers. Sootblower drains shall terminate at the stoker level with an isolation valve. A provision shall be made for removal of the condensate during the blowing cycle without interruption of the blowing.

Piping materials shall conform to the pressure and temperature limitations of ANSI B31.1 and ASME.

2.10.2 Sootblower Control System

Sootblowers shall have sootblower manufacturer's standard 460 volt electric motor drives. A NEMA 4 motor starter shall be furnished and installed local to each sootblower. Individual, blower mounted manual pushbuttons shall be provided. Sootblower pushbuttons, limit switches, etc. and motor shall be completely factory wired to the motor starter. Motor starter shall be furnished and wired complete with all necessary relays and auxiliary contacts required for interlocks and control. Terminal blocks shall be provided and wired to accept all remote power and control cables. Local disconnect switches with an external handle to disconnect power and control voltages shall be furnished, installed and wired to starters.

The Contractor shall furnish complete factory-fabricated sootblower sequencing control insert panels, suitable for mounting in a panel board. Insert panel color shall be as determined by the Purchaser. Factory to install in the subpanel enclosure all timing devices, relays and other devices as required for system control and operation with all wiring connected to terminals for field wiring

connections. Control system shall be the manufacturer's microprocessor or programmable controller system as approved by the Purchaser.

Three-way switches (Auto/Bypass/Manual) or electronic equivalent shall be provided for each sootblower.

The sootblower system and control panels shall be furnished with the following capabilities:

1. Reprogramability of blowing sequence to allow Operator to vary selected sootblower sequence from the panel.
2. Manual initiation of the automatic cycle.
3. Manual blow of any selected sootblower.
4. Deletion of any sootblower or combination of sootblowers from the cycle.
5. Manual stop of the automatic cycle at any point with provision for the completion of any sootblowers in operation.
6. Blowing failure alarm.
7. Forward and reverse travel indication for long retractable sootblowers.
8. Automatic retract of long retractable sootblowers upon motor overload.
9. Provision of separate SPDT "Sootblowing in Progress" dry contact for interface with flue gas cleaning control equipment.
10. Automatic warmup and condensate draining system based on thermal drain valve temperature indication. Use of warmup timing device may be incorporated, but shall not replace or override temperature sensing for control of warmup.
11. Blower operation elapsed time function, to alarm and stop blower sequence if a sootblower takes excessive time to complete its blowing cycle.
12. Variable space timer (0-60 minutes), to permit varying the time between sootblower operation in the sequence.
13. Reverse of all long retractable sootblowers and sequence stop, upon boiler trip.

2.11 Auxiliary Fuel System

The Contractor shall provide auxiliary burner(s) for each of the steam generators. The burner(s) shall be utilized for warmup, shutdown and temperature maintenance dictated by environmental permit conditions, and will be located in the side walls of the furnace within the SiC refractory area and rated for a continuous heat input as defined in the Design Conditions. The burner(s) shall be located 26.5 feet above the grate. The Contractor shall verify that the burner(s) is capable of raising combustion gases temperature to 1800°F for a combustion gas residence time of at least two seconds at all loads as well as during startup and shutdown. If this is not possible with the burner elevation stated above, the Contractor shall propose an alternate location to Ogden Martin Systems, Inc.

2.11.1 Auxiliary Fuel Burner(s)

The burner(s) and burner equipment shall be of a rugged and heavy duty design, entirely suitable for continuous power plant service. They shall also be suitable for service in place but not in operation. The design and all materials shall be chosen to minimize maintenance. Parts subject to severe wear or deterioration shall be replaceable with a minimum of dismantling. All valves or controls shall be mounted outside the burner front and air housing.

The Contractor shall provide a completely prewired burner front package with the necessary combustion control drive unit(s), safety controls and alarm systems, fuel shut-off safety valves, windbox and burner throat, combustion air fan with motor drive and control louvers, etc. The Contractor shall provide a pressure regulator upstream of the fuel control valve train for each gas fired burner. Fuel piping and electrical connection external to the burner front will be provided by the Purchaser. A minimum of two viewports for flame viewing shall be furnished.

The auxiliary burner system shall be provided with a low capacity continuous burner purge/cooling air system utilizing air from the burner purge air fan or from the seal air fan.

The burner design shall provide positive and uniform mixing of the air and fuel at all loads, and shall produce sufficient turbulence to preclude stratification. Burner(s) shall be designed to burn fuel(s) as specified in the Design Conditions.

If fuel atomization is required, an air atomizing design shall be provided utilizing compressed air at 80 psig.

The burner lighting equipment shall be suitable for an entirely automatic purging and light-off procedure, after a manual initiation. For natural gas fired burners, spark ignited gas

pilots shall be used for burner lightoff. For oil fired burners, the ignitors shall be high-energy spark ignitors capable of lighting off the atomized oil without the use of a pilot.

The ignition transformers shall be of the air-cooled type. The high tension wiring from the transformers to the electrodes at the burners shall be furnished and shall have special insulation suitable for the temperatures encountered in this application. The entire ignition system shall be impervious to radio interference. Filters or other equipment required to prevent such interference shall be included.

The ignitor system shall be furnished complete, including all transformers and high tension wiring.

2.11.2 Auxiliary Fuel Burner Control System

The auxiliary burner system, including the control system shall be designed and installed in accordance with the National Fire Protection Association standards, as follows:

- NFPA 85-A For single burner boilers
- NFPA 85-B For multiple burners boilers (gas fired)
- NFPA 85-D For multiple burners boilers (oil fired)
- NFPA 70 For electrical equipment and wiring

The Contractor shall provide a complete Burner Management System (BMS) as part of the burner front package. The Burner Management System shall be a PLC or microprocessor based system that can be reprogrammed at the site if need be and shall be housed in a NEMA 4 locally installed enclosure. The local enclosure shall have mounted on it the required hardware (switches, lights, alarms, etc.) for locally operating the burner(s).

The BMS shall include the following:

- a) Safety control and alarm systems (SCA), designed to act automatically and independently of any other control systems or human operator action. The SCA system shall execute the automatic burner purge, all required function in preparation to light-off, light-off procedure, and safety fuel shut-off.

The SCA system includes flame scanners and all required monitoring instrumentation.

- b) Combustion Control System (CCS), designed to modulate fuel and air at the optimal ratio between 10% and 100% of full burner load, to maintain a set temperature in the furnace. Separate actuators shall be provided for the combustion air damper and fuel control valve.

The furnace temperature controller will be furnished by the Purchaser, will have its own process variable input (furnace temperature) and setpoint, and will send out two 4-20 mA signals to the CCS. These signals shall be passed on to the air and fuel actuators without any alteration.

However, Contractor shall override the Purchaser's signal during purge and light-off procedure in order to develop the correct fuel and air quantities.

The BMS shall accept a remote on/off signal from the control room and a remote permissive signal "boiler purge completed"; the permissive signal shall be used to allow the burner light-off sequence to be initiated only after the boiler purge is completed.

The BMS shall provide the following information to the control room, by means of dry contacts:

- burner starting sequence in progress
- burner on/off
- burner tripped
- burner fail to light
- one common trouble alarm from the local panel.

The Contractor shall identify the hazardous area classification for the electrical equipment and wiring in accordance with Article 500 of NFPA 70 (National Electrical Code). In addition, the hazardous area boundary shall be provided so that interface connections by Purchasers can meet the hazardous area requirements. If the Contractor's design is such that the burner enclosure(s) and/or immediate areas are not considered hazardous, Contractor shall provide a statement to this effect.

A complete description of the features of the burner management system shall be provided, including wiring diagrams, control loops, debugging procedures, check-out procedures, interlocks, etc. Contractor shall also provide a description of operation during the period of transition of firing one fuel to another fuel, (i.e., fuel gas to refuse) or cofiring of different fuels.

2.12 Structural Steel

The structural steel shall be designed in accordance the code prevailing in the jurisdiction of the project and with the following parameters:

Structural Design Parameters Applicable requirements of the local, state and national building code shall apply

For enclosed boilers:

Roof	Decking, insulation, etc.	10 psf
	Piping support	20 psf
Siding	Panels, insulation, etc.	6 psf

Other loads for: Boiler and appurtences, piping and trim, ductwork, electrical raceways, cable tray, lighting fixtures and electrical enclosures and boxes, deaerator, elevators, ash diverter gates, roof fans, ash screw conveyor, lime feed system, etc., as specified.

Wind loads: Applicable state and local codes with all amendments

Seismic Applicable state and local codes with all amendments

2.12.1 Support Steel

The Contractor shall furnish and erect boiler and boilerhouse support steel (including girts, purlins, parapet and roof trusses for enclosed boilers) as an integrated design, based on the tentative boiler layout per the attached Martin Boiler Design Drawings and Preliminary Boilerhouse Sketch. Girts shall be furnished from grade elevation to the parapet or roof line for the three outside boiler enclosure walls. Girts shall also be furnished to support the wall separating the boiler enclosure, beginning at the charging hopper floor elevation up to the roof line. A 3 foot wide by 7 foot high clear walkway shall be provided behind the Martin feed hoppers at the charging floor elevation. (Refer to Attachment 12). If space restrictions exist above the unit roof, then the building roof steel shall be arranged such that beams frame into (in-lieu of bearing upon) girders to afford the maximums headroom for maintenance operations. The boilerhouse building may or may not be structurally independent from adjacent buildings. The refuse bulding structural frame will be designed to stand and act as an independently supported structure for both vertical and horizontal forces attributed to dead, live, erection, operating, wind and seismic loading conditions. To facilitate this concept, a double column row shall be employed at the refuse/boiler building interface without a load transfer interconnection. The APC and turbine buildings may however, at OMS's option, frame into the boiler building if considered possible. When this option is exercised, the Contractor will be given load points in the Project Specific Requirements for the design of his structure. The

Contractor shall acknowledge that the interconnection points are included in his bid.

If the Contractor requires a larger building envelope due to his own design requirements for the boilers, then the building steel should be correspondingly increased and OMS advised. The support steel shall be sized to take into account steam, feedwater and condensate piping loads; duct loads for ductwork from the economizer outlet to the air pollution control equipment inlet; screw conveyors, smoke hatches, vent silencers, roof appurtenances and load for the Purchaser furnished equipment listed in the Design Conditions. The Contractor shall provide all primary steel for support of such Purchaser furnished equipment. The bracing system shall also be arranged to allow access at grade for at least a 5 cubic yard front end loader in each column bay (12' x 12' opening). Further, the Contractor will coordinate and arrange his steelwork to account for water storage tanks, ash handling equipment and other equipment that may be located with the Boiler Enclosure.

All structural steel design drawings shall be sealed by a professional engineer currently registered in the state where the work will be constructed. Shop detail drawings shall also be prepared under the direct supervision of a currently registered professional engineer. A final set of shop drawings shall be submitted to OMS for record purposes.

The boiler building support steel shall include framing for openings for roof access hatch(es), relief valve vent stacks and silencers, screw conveyors, vibrating conveyor(s), piping and electrical trays, economizer outlet ducts and doors; including those for access to APC scrubber penthouse (one) and scrubber inlet duct test platforms (one per boiler). Spacing of roof purlins for Purchaser's roof decking shall not be more than 5'-0".

The Contractor shall provide framing and support for the elevator shaft, machine room, doors, blockwalls around the elevator, when the elevator is located in the boiler building. In addition, the lobby floor at elevation 30 feet and 62.5 feet shall be concrete on metal deck or floor plate.

The Contractor shall furnish adequate support steel to ensure that vibration due to overfire air fan operation is eliminated. If additional materials such as concrete platforms and mass concrete vibration dampers are required, the Contractor shall furnish and install all such materials.

2.12.2 Platforms and Walkways

The Contractor shall provide a complete set of platforms with galvanized grating, stairs and walkways to enable access to the boiler, stoker, sootblowers, ash dump valves at all hoppers,

elevator landings, and other appurtenances. Platforms shall be designed based on a minimum width of 2'-6" for walkways and on each side of sootblowers and around other pieces of equipment. In addition, all platforms shall meet or exceed all OSHA requirements. Wherever possible, platform elevations shall be established such that it shall not be necessary to walk over or duck under the sootblowers.

Stairs and platforms shall be provided, as required, to allow easy access to fans, auxiliary burners, airheaters, sootblowers, all boiler hopper access doors, poke holes, dampers and impact plates, all boiler access doors, all Purchaser and Contractor supplied observation and inspection ports, all temperature and draft connections, drum instrumentation, relief valves, boilerhouse roof, spray attemperation station(s), oxygen analyzers, deaerator flash and storage tank(s) and other locations which have to be reached either regularly or occasionally. In addition, the Contractor shall provide all platforming required for access to Martin supplied equipment including the feed chute access platform. The feedchute access platform shall be located adjacent to the feedchute between the boiler and the feedchute and shall run the entire length of the feedchute at an approximate elevation of 45'. Platforms at the boiler hoppers shall be located not less than four (4) feet and not more than five (5) feet below the hopper outlet flange for installation and maintenance of the flap gate valve. Hopper doors shall be accessible with small step-up platforms at each hopper.

Boiler platforms on both sides of each steam generator shall be extended to meet adjacent building floor elevations at the charging and operating floors. Contractor shall also provide structural support at the rear of the boiler for connection of a 30 foot long walkway to access the flue gas cleaning system. In addition, Contractor shall supply support steel, access to and platform for each scrubbers' inlet duct test ports. This platform will be approximately 10 feet by 10 feet and cantilevered off boiler steel. Stairs shall be provided as required to match building elevations and to avoid obstacles, if present. Platforms shall be extended to the rear of the boiler to match-up with flue gas cleaning system scrubber penthouse and duct access platform.

Each boiler shall be provided with full stair tower access from grade to roof on at least one side. Crossover platforms shall be provided on the rear of the boiler at a minimum of three elevations including the stoker viewing level (approximate elevation 20'-0"), the steam outlet level (for access to Purchaser furnished steam flow element), and at one intermediate level as defined by the Purchaser during the design development.

Handrails and posts shall be angle 2-1/2 x 2-1/2 x 1/4 inch (OSHA approved) or square or round rails and posts. Posts shall be spaced no greater than 8 feet-0 inches on centers. Top rail and intermediate rails shall be spaced in accordance with local codes. All grating shall be banded at edges of openings. Banding strips shall be at least the same thickness and depth as the bearing bars to which they are welded. When openings between grating and protruding elements exceed 1", the a 1/4" minimum toe plate thickness shall be provided and have a vertical height of 4" from its top edge to the level of the floor.

2.13 Welding

All boiler pressure parts welding shall be performed in accordance with ASME, Boiler and Pressure Vessel Code, Section I and/or ANSI B31.1. All structural steel welding shall conform with AWS D1.1.

Welding procedures, welders and welding operators shall be qualified in accordance with ASME, Section IX and/or ANSI B31.1, as applicable. All welding procedures shall be written in accordance with the codes specified and shall include materials used, wall thicknesses, joint design details, welding voltage and current to be used, etc.

The shop welding procedures shall be available for Purchaser's review at the manufacturing location. The field welding procedures will be submitted to the Purchaser.

2.14 Access Doors and Other Wall Openings

Access doors

A sufficient number of access doors shall be provided to facilitate inspection and maintenance work. These shall be provided as a minimum at the following locations:

- a) Stoker discharge rearwall (large door, 3 x 4 feet, supplied by Martin).
- b) To each section of convection evaporator, superheater and economizer and all sootblower locations.
- c) To the sides and top of the penthouse.
- d) To the sides of all ash hoppers.
- e) Furnace pass at screen tube inlet.

The standard design 18 x 18 inch or 18 inch I.D. round doors (or nearest larger size) shall be ASTM A-48 C1 30 cast iron. All ash hopper doors shall be 24 x 24 inch, fabricated from A-36 plate. All the doors shall be hinged, quick opening type and with grooved faces to accommodate suitable fire box quality door gasket to ensure gas-tight sealing. The door frames shall be fabricated of

suitably reinforced steel plate. All doors in high temperature zones shall be refractory lined. Separate plugs or refractory bricks are not acceptable.

Access doors shall be located and oriented to allow unobstructed access and supply of necessary inspection and maintenance materials, including sky climbers, scaffolds, tubing, etc. For boiler width greater than 25 feet, access doors shall be provided on both sides. Hand holds shall be provided outside and inside and footholds shall be provided as required to ensure safe entrance and exit.

Access doors/openings for on-line water-wash cleaning

To allow access to the convection heating surfaces for water washing of the tubes during boiler operation, doors and openings shall be provided in the sidewalls. These doors shall be the same access doors as provided for access to the tube banks (e.g. 18 x 18 inch square or 18 inch I.D. round) or in those locations where such doors are not required for personnel access they shall be 12 x 4 inch rectangular inspection doors. All doors shall be located immediately adjacent to the sootblowers. Each sootblower shall have a door at its side or below or above it, whichever way is most convenient to access the tube banks with the water lances. These doors shall be adjacent to the bull nose in the second pass, adjacent to each sootblower in the third pass evaporation section, the superheater and economizer tube banks. Final location shall be approved by the Purchaser.

Observation Ports

An adequate number of observation ports shall be provided to ensure unobstructed furnace monitoring. There would be typically about 12 ports in the furnace (first pass) and rear wall, however, the final number will be determined during the Contract finalization (see also Section 2.3.2).

Observation ports with glass and hinged protection shield shall be provided in the first boiler pass to observe the auxiliary burner(s) and the refuse fire. The observation ports and ignition doors supplied by Martin for the furnace and rear wall shall be installed according to Martin's drawings and instructions. The observation ports at the end of refractory level shall be angled for a downward view of the fire while maintaining view of the refractory top line.

The standard design 8 x 6 inches, hinged doors shall be ASTM A-48 C1 30 cast iron. The door frames shall be steel plate type. To ensure tight closure, the faces of the door are grooved to accommodate suitable quality door gasket. All doors shall be refractory lined and provided with suitably protected glass ports.

Cable Connections

To allow installation of suspended scaffolds (sky climbers) in the furnace (first pass) and second pass, a sufficient number of permanent cable openings shall be incorporated to allow inspection of all 4 walls in each pass. Safety rope openings shall be provided in addition. These openings shall consist of minimum 2 inch OD pipes, extended through the penthouse and provided with capped ends.

Wall Openings

All necessary wall openings for sootblowers, access doors and observation ports, auxiliary burner(s), and instrument and test connections shall be provided.

The burner openings shall be provided with a minimum of suitably reinforced 1/4 inch steel plate and with 3/8 inch thick mounting flanges. The tubes in and around the burner opening shall be formed to provide for a cooled burner throat.

2.15 Boiler Fans

If required in the Design Conditions, Contractor shall provide system fans and associated inlet vanes and drives. Design requirements shall be as contained in the enclosed fan specification (Attachment 5) and the Design Conditions. Acceptable suppliers of these fans include Howden, TLT Babcock, American Davidson, Buffalo Forge, Garden City.

2.16 Motors

All motors provided by Contractor shall conform to the requirements of Purchaser's motor specifications (Attachment 6).

2.17 Electrical

The Contractor's physical layouts shall show and dimension the required clear access and working space about all electrical equipment in accordance with Article 110-16 of the NEC. In no case shall the minimum clear distance be less than 3 feet for 0-150 volt enclosed equipment and 3 feet for 151-600 volt enclosed equipment. The minimum width of the working space shall not be less than 30 inches.

All electrical equipment enclosures, junction boxes and wiring devices shall be NEMA 4. All conduit and wiring devices shall be arranged for side or bottom entry. Top entry into electrical enclosures is not acceptable.

2.18 Nameplates and Tags

Boiler nameplates (two) shall be attached to a bracket welded onto the boiler drum and furnace waterwalls. It shall include the Contractor's (manufacturer's) name, place and year of manufacture, boiler serial number, maximum allowable working pressure and heating surface. Minimum acceptable size is 6 x 8 inches.

The Contractor shall furnish identification tags for valves and instruments. The tags shall be 16 gauge yellow brass plate, 3/4 x 2 inches with 1/8 inch hole for attachment. Tags shall be engraved with 3/16 inch numbers. All tags shall be securely attached, using stainless steel wire.

The tag numbers shall be alpha-numeric combination conforming to the project standard symbols and identifications. Tag numbers will be assigned by the Purchaser.

2.19 Painting and Finishing

The types of surface preparation, priming, finish painting and galvanizing required for the Contractor's scope of supply shall be in accordance with the Purchaser's Painting Specification SA-550 (Attachment 10).

2.20 Erection Requirements

2.20.1 General Erection Requirements

All erection of equipment and materials as defined in this specification shall be performed by the Contractor. This shall include uncrating, receiving, unloading, storage, protection, necessary moving from storage, rigging, drilling, doweling, setting, welding, assembly, aligning, cleaning, testing and any other work necessary to prepare the steam generator and all its auxiliary equipment and accessories, hereinafter called equipment, for normal continuous service. Materials, piping and electrical systems and equipment shall be installed in the locations shown on approved drawings.

Installation procedures shall conform with the procedures prescribed by the Contractor and shall be under technical direction of his field erection representatives. For subcontracted or Purchaser furnished equipment, procedures outlined in

manufacturer's instruction manuals for the equipment shall be followed. For equipment not supplied with instruction manuals, Contractor shall follow standard practices acceptable to Purchaser or the manufacturer's representatives.

The Contractor shall be responsible for locating and setting all equipment furnished under this contract, and for verification of all dimensions and measurements. No allowance will be made to the Contractor for any expense caused by his failure to make a thorough field check. Expansion markers shall be permanently installed at the appropriate location and the design cold and hot positions shall be clearly indicated.

Prior to placing equipment, the Contractor shall inspect and clean, or prepare, the surfaces of all foundations, anchor bolts, sole plates, equipment, etc., to assure satisfactory setting of the equipment. Once foundations are turned over to the Contractor, responsibility of the foundation is assumed by the Contractor (i.e., freeze damage, etc.).

All equipment shall be put in a condition suitable for initial operation, as attested to in writing, by signoff of the Contractor's start-up advisor and the Purchaser's start-up engineer.

Concrete foundations shall be cleaned of all laitance and dirt by chipping and saturating with water for four hours prior to grouting (grouting by others).

All construction shall be performed in accordance with the OSHA requirements of 29 CFR 1926.

2.20.2 Storage and Protection During Erection

Immediately upon arrival of equipment at the jobsite, the Contractor shall thoroughly inspect and determine that all equipment or material is free of damage and complete.

The Contractor shall assume all responsibility for the care, inventory control, safeguarding, weather protection, fire protection, and temporary lay up of all equipment and materials at all times until the installation is accepted by the Purchaser for operation. The Contractor shall protect the equipment and material so that there is no deterioration that could adversely affect the useful life or the suitability of the equipment or material for the purpose for which it was furnished.

All equipment stored outdoors shall be kept clean at all times during storage, handling, installation and after installation until initial operation. In the storage area, it shall be stored on sleepers or otherwise so that it does not contact the earth. When handled, it shall not be dragged along the ground. Electrical and electronic equipment shall be specially handled with heated indoor storage. Interim storage on site of Martin-furnished equipment shall be in accordance to Manufacturer's instruction given in Attachment 8.

The Contractor shall unload, store, protect, and turn over to the Purchaser all tools furnished with the equipment. Any tools furnished with the equipment and used for erection purposes shall be either replaced or cleaned and reconditioned to the satisfaction of the Purchaser before being turned over to the Purchaser.

Specifically, the stokers shall be covered with plywood for protection as soon as the stoker grate bars are installed. This cover shall be installed according to Martin's instructions and, as a minimum, consist of layered plywood sheets with rungs nailed on to allow walking. Heavy plastic foil shall be installed between the stoker grate surface and the wood cover.

2.20.3 Structural Erection Requirements

Erection shall be in accordance with the AISC Specification and OMS Specification No. SS-410 (Attachment 9).

The Contractor shall furnish and install all shims which may be required.

Structural steel members shall be cleaned and deburred at punched holes, sheared edges, etc., to provide a smooth level bearing surface. When specified, friction reducing bearing plates shall be provided and installed in accordance with the equipment and plate manufacturer's recommendations.

Shims for concrete supports shall be random size steel plates and bars. Shims shall be located adjacent to all anchor bolts and at sufficient intermediate points to assure complete alignment of equipment.

Shims for structural steel supports shall be steel plates cut to suit the full bearing surface being supported. The composite thickness of shims between equipment and base plates or sole plates shall be not less than 1/8 in. All base plates and sole plates shall be set to accommodate the 1/8 in. of shims.

After final alignment and torquing of anchor bolts, locking jam nuts shall be installed for all bolts and shall be drawn up firmly. The Contractor shall cut off and deburr all anchor bolts which have a projection beyond the locking nut of more than half the bolt diameter.

2.20.4 Alignment of Equipment

The Contractor shall set and align all rotating equipment and drivers in accordance with the manufacturer's instructions or recommendations. The couplings shall be left loose during alignment. If the equipment and the driver were shipped as a complete unit, the coupling shall be loosened before the alignment.

After all piping and ductwork have been connected to the equipment, and initial operation is imminent, the Contractor shall check the alignment, realign if necessary, and make-up the coupling.

After the equipment has run at normal operating temperature, the Contractor shall recheck the alignment. Then, the Contractor shall final torque all equipment and drivers to the base plates.

2.20.5 Piping Erection Requirements

All piping furnished with the boiler shall be erected, pressure tested and cleaned by the Contractor. Non-boiler external pipe shall be hydrostatically tested in accordance to ANSI B31.1. Fuel piping shall be pneumatically air tested prior to operation. The Contractor shall furnish, install and adjust all hangers and pipe supports for this piping.

2.20.6 Electrical Erection Requirements

The receiving inspection of motors shall include checking to assure that oil was drained from the bearings before shipment, and that protective coatings on bare machined metal surfaces such as shafts and couplings remain intact.

While in storage, oil shall be added for bearing lubrication. The rotors of horizontal shaft motors shall be turned at weekly intervals, to prevent bowing of the shaft. The rotors of vertical shaft motors shall be rotated several turns at weekly intervals, to maintain the oil coating on bearing surfaces and to prevent fretting of bearings. In addition, motor winding pigtails and other motor terminals shall be protected against moisture. A log of all rotations shall be maintained by the Contractor with copy provided to the Purchaser. Motor space heaters shall be energized.

3.0 TESTING, GUARANTEE, QUALITY CONTROL

3.1 Examinations and Tests

The Contractor shall perform examination and testing in accordance with written procedures. Procedures shall be available to the Purchaser for review and approval, at the Purchaser's discretion. For work requiring written procedures, no work shall be performed

until the procedures have been approved by the Purchaser, or approval has been waived. Waiver of approval does not relieve the Contractor of any responsibility for full performance of his obligations. Inspections and test required by local building officials or code shall be to Contractor's account.

Examinations and tests shall be performed by the Contractor and his subsuppliers in the shop, to the greatest extent possible. The

Contractor shall furnish advisors for any of the tests listed below even if they are not performed by the Contractor.

The Purchaser or his representatives shall have free access to the Contractor's plant at all times when the work and tests on the contract materials are in progress, and the Contractor shall notify the Purchaser in advance of all such tests to have a representative present at any such tests at his discretion.

The examinations and tests required by this specification are as follows:

3.1.1 Nondestructive Tests

All nondestructive tests (NDT) shall be performed in accordance with written procedures, which shall be available to the Purchaser. All NDT shall be performed by personnel certified to the applicable quality levels as defined in the procedures.

All NDT results shall be appropriately documented.

3.1.2 Hydrostatic Tests

All hydrostatic testing shall be performed by the Contractor in accordance with written procedures incorporating the requirements of ASME I. All shop fabricated pressure part assemblies shall be hydrostatically shop tested to the extent feasible or in accordance with Contractor's shop practice. Such testing shall take place prior to painting. A final hydrostatic test shall be performed in the field, held for at least one hour and witnessed by the Purchaser. No leakage indications are permissible. The Contractor shall furnish his hydrostatic test procedure to the Purchaser for approval. The Contractor shall be responsible for all supplies and procedures necessary to conduct this test, including but not limited to providing and disposing of the appropriate quality water, filling and draining of pressure parts, notifying appropriate parties, interfacing with the general contractor, the Purchaser and any other affected parties on site, etc.

Unless otherwise specified or permitted by the applicable code, tests shall be made after all heat treatment and weld repairs have been completed.

Corrosion-resistant castings and/or welds shall not be painted prior to testing.

3.1.3 Field Tests

The Contractor shall be responsible for furnishing advisors or Manufacturer's service representatives for all required operating tests of his equipment. The Purchaser will furnish personnel for

observing and recording test data, and will operate the boiler in accordance with the Contractor's recommended procedures.

Field tests shall:

1. Demonstrate that the equipment operates in a stable, commercially satisfactory manner and in accordance in all respects with the requirements of this specification.
2. Demonstrate that all equipment meets the applicable guarantees enumerated in the Performance Guarantees Section 3.2 and Attachment 1, Design Conditions, of this specification.

Boiler efficiency will be calculated by the heat loss method based on combustion analysis, using the ASME-PTC4.1 abbreviated test form. Radiation losses will be established based on Contractor's data.

For the tests, the boiler will be commercially clean and properly operated, and the excess air during each test will be as close as reasonably attainable to that used for the guarantee basis. "Commercially Clean" is defined as the condition of the boiler after it has operated continuously in normal service for at least 21 days but not more than 60 days since the last cleaning in accordance with the manufacturer's instructions. At the end of this period, without shutting down, and without special cleaning or conditioning of any kind, the boiler shall be considered as "Commercially Clean".

3.1.4 Inspections

The following are the notification points for which a minimum of five (5) working days prior notification is required:

1. Boiler - Hydrostatic Test
2. Shipping Release for major boiler components and fans
3. Start of refractory placement
4. Rotation and bumping of all fan motors

3.2 Performance Guarantees

The Contractor shall provide performance guarantees as specified in the Design Conditions. Contractor shall also complete the guarantee section of Equipment Data Sheets.

Contractor shall provide and install on-line cleaning devices, including the addition of retractable sootblowers in the open downpass following the furnace pass and/or the addition or modification of other sootblowers, and/or shall supply and install or delete, as appropriate, economizer heat transfer tube surface, at no additional cost to Purchaser, if necessary to meet the performance guarantees.

3.3 Quality Control

Quality Assurance/Quality Control manuals and Quality Control Reports shall be subject to Purchaser's approval.

A QA/QC inspection program shall be established and regular inspections shall be performed and/or reports submitted to the Purchaser, concerning overall system quality matters, including but not limited to such items as centering of boiler and stoker, spacing, arrangement of equipment studding, refractory, conformance of equipment with drawings and specifications, welding procedures and qualifications, structural steel connections testing, safety relief valve testing, etc.

3.4 Material Safety Data Sheets

Contractor, as part of its operating manuals shall provide Material Safety Data Sheets as required by Federal law.

4.0 SUPPLEMENTAL REQUIREMENTS

4.1 Data and Drawings Required

The Contractor shall provide the following information with his proposal:

- Detailed description of his offering
- The Contractor must state that he fully complies with this Specification other than specifically stated in a list of exceptions. Such a list of exceptions shall clearly state each exception, referenced to item and page number, reason for taking exception, cost and/or schedule impact if exception is not granted and any other clarification deemed necessary.
- Foundation loads and footprint*
- Layout drawing**
- Fan Curves (preliminary) for all proposed fans
- Construction Schedule

- Equipment Data Sheets
 - Motor Horsepower Consumption
 - Sootblower Location Drawing
 - Recommended Spare Parts List
- * Footprint shall show preliminary foundation loads for all cases including wind, seismic, operating, dead, live and hydrotesting of equipment to within $\pm 10\%$ of the loading and ± 12 inches of the ultimate column locations.
- ** Layout drawings shall include overall building dimensions (for enclosed boilers), column locations, boiler, fan and air heater arrangement, and duct and hopper arrangement. The number and location of hopper connections shall be clearly shown. Adequate space shall be allotted for removal of sootblowers, fan wheels, heater coils, etc.

After award the information and data below, as a minimum, shall be submitted to the Purchaser for "Review" or for "Information" as specified.

<u>Documents for Approval</u>	<u>Submittal Req'd By (Days after Award)</u>
Document Submittal Schedule	15
Delivery, Fabrication, & Construction Schedule	30
Boiler Pressure Parts, Outline and Arrangement Drawings, including all drawings needed for inter- facing with stoker equipment	Preliminary 30 Final 60
General Arrangement of each Platform Level	45
Trim List	45
General Arrangements of Boiler Fans and other Equipment	30
Loading Diagrams	30
Foundation Baseplate and Anchor Bolt Arrangement Drawings	30
Piping Flow Diagrams	60

Nozzle Loading Diagrams	60
Air & Gas Flow Diagrams	60
Water and Steam Flow Diagrams	60
Refractory Installation Drawings	90
Electrical Wiring Interface Diagrams	90
Burner Control Logic Diagrams	90
Hydrostratic Test Procedure	60 days prior to hydrostatic test
Examination and Test Procedures	90
Fan Curves (final)	90
Motor Curves	90
Certificate, signed and stamped by P.E., licensed in State of boiler location stating that the boiler has been constructed in accordance with the drawings and specifications	After hydrostatic test, but prior to boil-out
Test Reports	15 days after test
"As Built" Drawings	Prior to contract close-out, but not later than 30 days after first refuse fire
<u>Documents for Information</u>	
Installation Drawings	180
Storage & Handling Procedures	60 days before shipment
Installation, Operations and Maintenance Manuals (10 sets) *	120 days before boil out
Spare Parts List	120 days after award

Test Program Procedure	90 days prior to operation
Quality Control Manual	60
Quality Control Reports	Every 60 days until mechanical completion
Material Safety Data Sheets	With O&M manuals
Area Classification Drawing	60
Bill of Materials	45
Sootblower Control Logic Diagram	90

- * Installation, operation and maintenance manuals shall include availability of key system components, particularly of foreign manufacturers.

ATTACHMENT 1

DESIGN CONDITIONS AND PROJECT SPECIFIC REQUIREMENTS

Purchaser OGDEN MARTIN SYSTEMS OF LEE, INC.
Project LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY
Site Location LEE COUNTY, FLORIDA

1.0 DESIGN CONDITIONS

1.1 Scope

Quantity of Steam Generators Required 2

Boiler Support (X) Top () Bottom

Primary Fuel MSW

Wind 100 MPH, EXPOSURE C Code SBCCI, LATEST EDITION

Seismic Zone 0 Code SBCCI, LATEST EDITION

1.2 Design Data and Conditions (Per Unit)

Note: MCR = Maximum Continuous Rating

Fuel Firing Rate at MCR, TPD 600

Fuel Higher Heating Value (HHV)

Design HHV, Btu/lb 5000

Range HHV, Btu/lb 3640 - 6000

MCR Steam Conditions at superheater
non-return valve outlet

Minimum Capacity, lb/hr 169,270

13

Pressure, psig 865

Temperature, °F 830

Feedwater Inlet Temp. to Economizer, °F 300

Overfire Air Temperature, °F 300

Underfire Air Temperature, °F 300

Excess Air at economizer outlet @ MCR, % 100

Site Elevation (above MSL), ft. 2

Steam Generator Location Indoors, () Outdoors

Drums Single, () Two

Air Ducts and Dampers

Refuse Pit Air Intake - Estimated height above grade, ft. APPROX. 95

Steam Coil Air Heater (SCAH)

Inlet Steam

Steam Source T/G EXTRACTION

Pressure, psig 120

Temperature, °F APPROX. 460

	OFA	UFA
MCR Air Flow, lb/hr	102,860	240,010
MCR Air Flow, ACFM @ 80°F	23,480	54,780
Air Flow @ HHV < 5250 Btu/lb, lb/hr	<u>N/A</u>	
Air Flow @ HHV = 5250-5500 Btu/lb, lb/hr	<u>N/A</u>	

Air Flow @ HHV > 5500 Btu/lb, lb/hr	<u>N/A</u>
Air Inlet Temperature, °F	<u>80</u>
Coil Operating Pressure, psig	<u>120</u>
Coil Design Pressure, psig	<u>200</u>
Coil Operating Temperature, °F	<u>APPROX. 350</u>
Coil Design Temperature, °F	<u>650</u>
Auxiliary Burner(s)	
Rated continuous heat input % of MCR heat input	<u>2 BURNERS @ 20% EACH</u>
NOx Emission Requirement, ppm @ 7% O ₂	<u>150</u>
Co Emission Requirement, ppm @ 7% O ₂	<u>50</u>
Fuel Burned	<u>PROPANE</u>
Is the economizer outlet ducted to a fluegas scrubber, (Yes/No)	<u>YES</u>

1.3 Structural Steel and Boilerhouse Enclosure

Elevator-enclosed and supported by boilerhouse steel, (Yes/No)	<u>NO</u>
Capacity, lb.	<u>N/A</u>
Scrubber inlet duct test port platforms required, (yes/No)	<u>YES</u>

Other Purchaser furnished equipment
to be supported from boilerhouse
steel/platforms approximate
dead load, lb.

<u>Lighting Fixtures</u>	Yes	<u>LATER</u>
<u>Electrical Raceway (tray/conduit)</u>	Yes	<u>LATER</u>
<u>Steam and Water Piping</u>	Yes	<u>LATER</u>
<u>Ash Diverter Gate</u>	(Yes <input checked="" type="checkbox"/>)	<u>LATER</u>

Test Block Conditions:

Flow: 115% x Design Flow

Static Pressure: 16" w.g. plus 144% x system losses at design flow

Temperature: Operating temperature + 25°F = 105°F

BHP _____ HP

Motor Size Selected _____ HP

NOT APPLICABLE

2.3 Overfire Air Fan

MCR Conditions:

Flow: _____ ACFM

Static Pressure: 18"w.g. static plus losses in duct system

Operating Temperature: _____ to 80°F

BHP _____ HP

Test Block Conditions:

Flow: 115% x Design Flow

Static Pressure: 18"w.g. plus 144% x system losses at design flow

Temperature: Operating Temperature + 25°F = 105°F

BHP _____ HP

Motor Size Selected _____ HP

2.4 Seal Air Fan

MCR Conditions:

Flow:

NOT APPLICABLE

_____ ACFM (350 ACFM per grate run) plus any boiler required seal air for burner purge air, sootblowers, inspection ports, etc.

Static Pressure:

16" w.g. static plus losses in duct system

Operating Temperature:

_____ to 80°F

BHP

_____ HP

Test Block Conditions:

Flow:

115% x Design Flow

Static Pressure:

16" w.g. plus 144% x system losses at design flow

Temperature:

Operating temperature + 25°F = 105°F

BHP

_____ HP

Motor Size Selected

_____ HP

3.0 PROJECT SPECIFIC REQUIREMENTS

The attached Project Specific Requirements, if any, are additions, deletions and/or revisions to the preceding Specification requirements and shall be considered as part of this Specification. In the event of conflict, the Project Specific Requirements shall govern.

3.1 Loads from Adjacent Buildings

a) T-G Enclosure

b) APC Enclosure

Applicable
 Not Applicable

Applicable
 Not Applicable

The boiler building design shall provide for loads from adjoining T-G and APC enclosures interfacing with and attaching to the Boiler enclosure/structure. Loads and locations are given below and shown on [REDACTED] (Attachment 2):

LOAD TABLE

Load Point	Elevation	Column Lines	Vertical *		Horizontal *		Remarks
			DL	LL	E-W	N-S	
"A"	110	E.9/13	35	30		1.0/LF	(1)
"B"	110	D.9/13	35	30			
"C"	110	E.1/13	35	30			
"D"	110	D.1/13	35	30		1.0/LF	(2)
"E"	25	C.6/13	40	30	40	0.5/LF	(3)
	55	C.6/13	50	60	7.4		(4)
	60	C.6/13	25	15	23		(5)
	25	C.6/12	100	120			
	55	C.6/12	40	60	7.4	4	(4)
	60	C.6/12	20	30			
	25	C.6/11	100	150			
	55	C.6/11	25	30	7.4	2	(4)
	60	C.6/11	20	30			
	25	C.6/10	40	40			
	60	C.6/10	25	15			

NOTES:

* ALL LOADS IN KIPS

- (1) N-S HORIZONTAL LOADING APPLIES FROM EL. 0' TO 110'
- (2) N-S HORIZONTAL LOADING APPLIES FROM EL. 25' TO 110'
- (3) N-S HORIZONTAL LOADING APPLIES FROM EL. 0' TO 25'
- (4) E-W & N-S T/G CRANE LOADS
- (5) E-W WIND LOAD AT ROOF HORIZONTAL TRUSS

SM-101

A1-7

10/31/91

LOADING FOR CONCRETE SLAB BETWEEN COLUMNS C.6/D.1 AND 11/12 IS 250 LB/FT² (TOTAL)

LEE COUNTY - REFUSE FIRED BOILERS
SM-101 PROJECT SPECIFIC REQUIREMENTS

3.2 Page 2, Section 1.2.1:

A selective non-catalytic reduction system (Thermal DeNOx) will be furnished by the Purchaser and will be used to inject a mixture of air and ammonia into the boiler at one of two injection zones. The Vendor shall furnish and install the valving, flexible hoses, piping, supports, nozzles, boiler penetrations, platforming and access to platforming associated with this system. Refer to Attachment 14, which is typical for a boiler of the indicated width. The number of nozzles and width of the system will be modified as required for the width of the Lee boiler.

3.3 Page 6, Section 1.4.D.1:

Contractor shall provide a bolt hole pattern for the economizer outlet flange which is consistent with a pattern provided by the Purchaser.

3.4 Page 12, Section 2.2:

Tube shields shall cover all tube welds which are exposed to direct flue gas impingement. Tube welds shall be positioned to prohibit direct impingement by sootblowing steam.

3.5 Page 12, Section 2.3.1:

Boiler drum manholes shall be 16 inches round.

Spare drum connections shall be double valved and capped.

3.6 Page 14, Section 2.3.2:

The furnace waterwalls shall be sandblasted per SSPC-SP-6 prior to applying refractory.

3.7 Page 17, Section 2.4.1:

Primary superheater tube banks of 5 foot - 5 inches deep will be allowed in lieu of the 5 foot maximum depth specified.

3.8 Page 23, Section 2.6.1, Air Flow Measurement:

A venturi section shall be used to monitor the total air flow for underfire and overfire air flow. An independent flow measurement of overfire air shall also be provided utilizing an annubar type device.

2
P

3
P

2
P

3.9 Page 25, Section 2.6.2:

As opposed to the capacity requirement specified, the electromatic valve on the superheater outlet header shall be capable of passing a minimum of 10 percent of the boiler full load capacity, in complete accordance with ASME Code, Section 1.

3.10 Page 27, Section 2.6.2:

The design, materials of construction and installation of pipe hangers, supports, guides, restraints and anchors shall be in accordance with ANSI B31.1 and MSS Standard SP-58 in effect as of June 27, 1989, whichever is most stringent.

3.11 Page 27, Section 2.7.1:

The penthouse construction shall be all welded steel construction.

3.12 Page 28, Section 2.7.2:

The overall boiler arrangement will incorporate a total of 2 economizer hoppers, 4 superheater hoppers and 2 convection pass hoppers per boiler.

3.13 Page 28, Section 2.7.3:

The allowable velocity through the combustion air intake screen shall be 1000 fpm in lieu of the 800 fpm specified.

3.14 Page 29, Section 2.7.3 (third paragraph):

Air supply to OFA nozzles shall utilize a single header arrangement which is reduced in size to ensure equal flow to all nozzles.

3.15 Page 31, Section 2.8:

The overfire air steam coil air heaters shall be horizontal units, located at an elevation of approximately 20 feet and coordinated with overfire air fan placement. Air side drain connections from the air heaters shall be routed to grade. All air preheaters shall be designed and manufactured per ASME, Section VIII, Division 1.

3.16 Page 31, Section 2.9.2:

The waterwalls shall be covered with tile refractory for a height of 15 feet from the grate as measured from the center of the furnace. The waterwalls shall be covered with gunnited refractory as specified from a height of 15 feet to 30 feet as measured from the center of the furnace.

2

2

3

2

3.17 Page 32, Section 2.9.2:

The ignition roof shall be provided with 1-inch thick 85% SiC material up to the overfire air nozzles in lieu of 3- inches of 70% Al₂O₃.



3.18 Page 34, Section 2.10.1:

A pressure gauge shall be provided at each sootblower to monitor sootblowing steam pressure. Hardware for each steam pressure measurement shall be as follows:

- a) Pressure gauge Grade 1a (+/- 1.0% accuracy), range 0-600 psig, 4 1/2-inch dial size, stainless steel Bourdon tube and socket, 1/2 NPT bottom connection.
- b) Stainless steel pigtail siphon.
- c) Instrument valve, stainless steel, globe, grafoil packing, 1/2 FNPT connections.

Source shall be Ashcroft or Ametek - US Gauge Division.

3.19 Page 36, Section 2.11:

Propane piping train shall be of all welded construction.

3.20 Page 36, Section 2.11.1:

Burner purge air shall be provided by independent burner purge air fans.

Auxiliary burner forced draft and purge air fans shall be provided with TEFC motors in accordance with Attachment 6.

3.21 Page 37, Section 2.11.2:

The actuator for the burner forced draft fan vortex damper shall be as manufactured by Bailey Controls.

The propane piping systems at each burner front shall be classified as follows:

- a) Class 1, Group D, Division 1 - 5 feet in all directions.
- b) Class 1, Group D, Division 2 - 5 feet to 15 feet in all directions.

3.22 Page 39, Section 2.12.1:

The top of the boiler enclosure parapet shall not exceed 110'-0". The boiler enclosure roof shall be sloped at least 1/4-inch per foot front to rear. The minimum parapet height shall be 1'-0" above the roof, unless otherwise required by the local building official. The roof, including metal deck, insulation and single membrane roofing is approximately 6-inches thick. Therefore, the top of the boiler vendors lowest purlin must not exceed an elevation of 106'-6".

The primary boiler enclosure siding will be uninsulated vertical ribbed panel equivalent to H.H. Robertson HR5-36. The top 25 feet of the boiler enclosure will be sided with uninsulated flush metal panel equivalent to Steelite concealed fastener panels CFP III. Accordingly, alternate girt spacing will be required at the top 25 feet. In addition, a translucent panel will be provided between the upper 25 feet and the primary siding. The translucent panel will be approximately 3.5 to 7 feet in height and requires a girt at the top and the bottom.

Exterior wall girts will not be required as follows since the air pollution control equipment will be enclosed: (Refer to Attachment 2)

- a) At column line 13 between columns D.1 and E.9 from elevation 0 to 102 feet.
- b) At column line 13 between columns C.6 and D.1 from elevation 0 to 25 feet.

3.23 Page 40, Section 2.12.1:

Permanent platforming in the area of the ash dischargers shall be supported from above to maximize access capabilities below these platforms.

3.24 Page 42, Section 2.12.2:

In addition to the areas specifically referenced, the Vendor shall provide access to and access platforming for Purchaser supplied boiler blowdown equipment, closed cooling water surge tank, and deaerator equipment. This shall include interconnecting caged ladder between deaerator storage and air removal sections.

Platforming for deaerator is defined as follows: (Refer to Attachment 2)

- a) Drawing M201 between columns C.6/D.1 and 11/13 at el. 45 feet.
- b) Drawing M202 between columns C.6/D.1 and 11/13 (approx. 16 feet by 32 feet) at el. approx. 58 feet.

Further, clearance shall be provided for demineralized water and neutralization tanks shown on Drawing M200. Approximately 35 feet should be allowed for the demineralized water storage tank and 25 feet for the neutralization tank.

Control valve station platforming will be a concrete slab between columns C.6/D.1 and 11/12 at elevation 25 feet. This floor slab decking and concrete will be by Purchaser. Structural steel framing and supports, including access to this platform shall be by the boiler vendor. Boiler vendor shall provide steel beam framing in this area such that clear span does not exceed 6 feet.



3.25 Page 43, Section 2.14 (Access doors):

Access doors shall be provided in each run of ductwork of 24 inch square or round diameter, or greater. Doors shall be located on both sides of turning vanes and between each piece of equipment. Access doors shall be equipped with quick tightening clamp bolts.

3.26 Page 44, Section 2.15:

The Martin data sheets, Attachment 4, indicate fan sizing criteria which differs from Specification SM-104, Attachment 5. Attachment 5 shall be the governing document with regard to fan sizing criteria.

3.27 Page 44, Section 2.17:

The following electrical requirements shall be complied with:

- a) All electrical equipment/devices shall be UL listed.
- b) Conduit shall be intermediate metallic type.
- c) All 600 volt conductors for 480 volt power shall be copper, with thermosetting ethylene propylene rubber or cross linked polyethylene insulation and a neoprene, hypalon or CPE jacket. PVC or nylon materials shall not be used.
- d) Control, metering and alarm circuits shall be multiple conductor color coded in accordance with ICEA Table K-2. Instrumentation wiring shall be shielded, single-pair or multi-pair cable as required by the instrumentation equipment. PVC or nylon materials shall not be used.

3.28 Page 52, Section 4.1:

Drawing submittal for the following information shall be as follows:

- a) Boiler column loading - gravity weights (10-15% accuracy): 30 days prior to Notice to Proceed.
- b) Separate hydrotest load (flooded): 30 days prior to Notice to Proceed.
- c) Live loads on platforms: 30 days prior to Notice to Proceed.
- d) Structural steel drawings showing vertical bracing: 30 days prior to Notice to Proceed.
- e) Complete loading information including wind, seismic, snow, etc.: At Notice to Proceed.

3.28 Attachment 12:

The feed chute support bracket shall be modified to a cantilevered support integral to the charging floor to increase access space between the feed hopper and the dust wall.



END OF PROJECT SPECIFIC REQUIREMENTS

ATTACHMENT 2

PRELIMINARY BOILERHOUSE SKETCH

The attached sketch represents the preliminary layout of the boilerhouse. Contractor shall adhere to this layout to the greatest extent possible. Any required deviation from the preliminary layout must be clearly defined in the Proposal. Modifications to the layout after contract award will not be accepted.

DRAWINGS ATTACHED INCLUDE:

7102-E-210000 REV. C - PLOT PLAN
7102-E-210101 REV C - G/A EL. 0'-0" & 14'-3"
7102-E-210201 REV C - G/A EL. 28'-6" & 45'-0"
7102-E-210301 REV C - G/A EL. 62'-0"
7102-E-210401 REV C - G/A EL. 94'-5" & 89'-0"
7102-E-210901 REV C - G/A SECTION A-A

ATTACHMENT 4

MARTIN DESIGN DATA

The following Martin Design Data Sheets are included as part of this specification:

- a) Furnace Design Data Sheets No. 4P 9919/10 (6 sheets)
- b) Boiler Design Data Sheets No. 4P 9919/21 (6 sheets)
- ~~_____~~
- d) Boiler ~~Sketch~~ No. Layout. 1A000191/a
- e) Load Plan No. * 4P 9919/12

* REFER ALSO TO MARTIN
DWG. 1A000235

Date: February 20, 1990

Name: Ho/Ze

Sheet No. 1

Project: LEE COUNTY, FL (7 x 600 tpd)

Design case, MCR

FURNACE DESIGN DATA

Number of Units: in operation

standby

/ 2
-

Units of Measurement

US-units

Metric units

US-units

Metric units

Refuse throughput per unit

%

100

Refuse-throughput per unit

tpd

t/day

600

544.32

Calorific value, HHV (LHV)

Btu/lb

kcal/kg

5,000

2,470

Max. gross heat release per unit

10⁶ x
Btu/h
(HHV)Gcal/h
(LHV)

250.0

56.02

GRATE:

Martin Stoker Grate (German and foreign patents, patent pending)

Number of runs

4

Stoker width

ft, inch

mm

29'-5 9/16"

8,980

Number of steps

13

Total grate area

sqft

m²

693.2

64.4

ASH DISCHARGER:

Martin Ash Discharger (German and foreign patents)

Inlet section (inside)

ft, inch

mm

3'-3 3/8"
7'-10 1/2" x

1,000x2,400

Max. ash ejecting capacity

tons/h

t/h

9.9

9.0

Number per Stoker

2

Date: February 20, 1990

Name: Ho/Ze

Sheet No. 2

<u>FUEL DATA</u>	US-units	Metric units	US-units	Metric units
------------------	----------	--------------	----------	--------------

Refuse throughput per unit	%		100	
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Refuse throughput per unit	lb/h	kg/h	50,000	22,680
----------------------------	------	------	--------	--------

HHV (LHV)	Btu/lb	kcal/kg	5,000	2,470
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Ash	%		20.9	
-----	---	--	------	--

Water	%		20.7	
-------	---	--	------	--

Combustibles	%		58.4	
--------------	---	--	------	--

ULTIMATE ANALYSIS:

Carbon, C	%		28.5	
-----------	---	--	------	--

Hydrogen, H	%		3.8	
-------------	---	--	-----	--

Oxygen, O	%		25.1	
-----------	---	--	------	--

Nitrogen, N	%		0.5	
-------------	---	--	-----	--

Chlorine, Cl	%		0.4	
--------------	---	--	-----	--

Sulfur, S	%		0.1	
-----------	---	--	-----	--

Phosphorus, P	%		-	
---------------	---	--	---	--

Fluorine, F	%		-	
-------------	---	--	---	--

Iron, oxidizable, Fe	%		-	
----------------------	---	--	---	--

Ash	%		20.9	
-----	---	--	------	--

Water	%		20.7	
-------	---	--	------	--

Total	%		100.0	
-------	---	--	-------	--

HEAT INPUT AND GRATE LOADING

Gross heat input:

Refuse	x10 ⁶ Btu/h	Gcal/h	250.0	56.02
--------	------------------------	--------	-------	-------

Sewage sludge	"	"	-	-
---------------	---	---	---	---

Waste oil	"	"	-	-
-----------	---	---	---	---

Auxiliary firing	"	"	-	-
------------------	---	---	---	---

Preheated air	"	"	18.4	4.63
---------------	---	---	------	------

Total heat input	"	"	268.4	60.65
------------------	---	---	-------	-------

Grate heat release, refuse and sludge only	<u>Btu</u> sqft,h	kcal/m ² h	360.646	869.870
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Grate load performance	<u>lb</u> sqft,h	kg/m ² , h	72.13	352.17
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Date: February 20, 1990

Name: Ho/Ze

Sheet No. 3

	US-units	Metric units	US-units	Metric units
Refuse throughput per unit	%		100	
Refuse throughput per unit	lb/h	kg/h	50,000	22,680
HHV (LHV)	Btu/lb	kcal/kg	5,000	2,470
HEAT LOSSES AND EFFICIENCIES				
Loss by unburned material in residue	%	%	2.47	2.78
Heat loss by hot clinker	%	%	0.51	0.57
Heat loss due to radiation	%	%	0.48	0.54
Loss by sensible heat in flue gases	%	%	24.86	15.34
Unaccounted for losses	%	%	1.50	1.69
Total efficiency (calc.)	%	%	71.68	80.77
Total efficiency (guar.)	%	%	70.18	79.08
Stoker efficiency (calc.)	%	%	97.02	96.65
Stoker efficiency (guar.)	%	%	96.44	96.00
AIR AND FLUE GAS DATA (US-units referred to 68° F)				
CO ₂ (maximum)	% by volume		19.77	
CO ₂ in furnace (dry)	% by volume		9.82	
CO ₂ in system exit (dry)	% by volume		-	
Excess air rate: Furnace	% by vol.	-	100	2.0
" air rate: System exit	% by vol.	-	-	-
Specific air quantity in furnace, wet	scuft/lb	Nm ³ /kg	91.791	5.3400
Specific flue gas quantity				
Furnace, wet	scuft/lb	Nm ³ /kg	103.182	6.0027
System exit, wet	scuft/lb	Nm ³ /kg	-	-
Specific gravity of flue gases				
Furnace, wet	lb/scuft	kg/Nm ³	0.0742	1.2760
System exit, wet	lb/scuft	kg/Nm ³	-	-
Underfire air (- %)	SCFM	Nm ³ /h	See sheet	No. 5
Overfire air (- %)	SCFM	Nm ³ /h	See sheet	No. 5
Auxiliary firing	SCFM	Nm ³ /h	-	-
Combustion air quantity (total), wet	SCFM	Nm ³ /h	76,502	121,110
Flue gas quantity:				
Furnace, wet	SCFM	Nm ³ /h	85,996	136,140
System exit, wet	SCFM	Nm ³ /h	-	-
Flue gas composition (system exit) see page 6.				

Date: February 20, 1990

Name: Ho/Ze

Sheet No. 4

	US-units	Metric units	US-units	Metric units
Refuse throughput per unit	%		100	
Refuse throughput per unit	lb/h	kg/h	50,000	22,680
HHV (LHV)	Btu/lb	kcal/kg	5,000	2,470

AIR AND FLUE GAS TEMPERATURES

	°F	°C		
Ambient air			80	26.67
Underfire air			300	148.89
Overfire air			300	148.89
Air for auxiliary firing			-	-
Air for waste oil burning			-	-
Combustion temperature in furnace area (flame end)			-	-
Flue gas temperature:				
Boiler exit			425	218.33
Dust arrestor exit			-	-

AIR AND FLUE GAS PRESSURES

	in WG	mm WG		
Neg. pressure in furnace			-	-
Draught loss across boiler			-	-
Underfire air pressure at grate inlet			~ 16	~ 400
Overfire air pressure at nozzle inlet			~ 18	~ 460

FLY ASH DATA

	gr/scuft	g/Nm ³		
Dust burden of flue gases in furnace, as found by calculation (68 °F)			-	-
Ditto (design figure)			-	-
Dust burden of flue gases entering dust arrestor as found by calculation (68 °F)			1.7143	4.21
Dust burden of flue gases entering dust arrestor as found by calculation (design figure) (68 °F)			2.0360	5.00
Dust burden of flue gases leaving dust arrestor (design figure) (68 °F)			-	-

Date: February 20, 1990 Name: Ho/Ze Sheet No. 5

	US-units	Metric units	US-units	Metric units
Refuse throughput per unit	%		100	
Refuse throughput per unit	lb/h	kg/h	50,000	22,680
HHV (LHV)	Btu/lb	kcal/kg	5,000	2,470

FAN DESIGNF.D. FAN

(80 % of combustion air)

Calculated air quantity	SCFM	Nm ³ /h	61,201	96,888
Margin for fluctuations in c.v.	%		15	
Margin required by DIN	%		-	
Total margin	%		15	
Design air quantity	SCFM	Nm ³ /h	70,381	111,421
Design air temperature	°F	°C	~ 104	~ 40
Air pressure under grate	in WG	mm WG	~ 16	~ 400
Design capacity	CFM	m ³ /h	75,186	127,737
Design stat. pressure	in WG	mm WG	-	-

I.D. FAN

Flue gas quantity at fan inlet	SCFM	Nm ³ /h	85,996	136,140
Margin for fluctuations in c.v.	%		15	
Margin required by DIN	%		-	
Total margin	%		15	
Design flue gas quantity	SCFM	Nm ³ /h	98,895	156,561
Design temperature	°F	°C	572	300
Design capacity	CFM	m ³ /h	193,362	328,512
Design static pressure	in WG	mm WG	-	-

OVERFIRE AIR FAN

(35 % of combustion air)

Calculated overfire air quantity	SCFM	Nm ³ /h	26,776	42,389
Margin for fluctuations in c.v.	%		15	
Margin required by DIN	%		-	
Total margin	%		15	
Design overfire air quantity	SCFM	Nm ³ /h	30,792	48,747
Design temperature	°F	°C	~ 104	~ 40
Overfire air pressure at nozzle inlet	in WG	mm WG	~ 18	~ .460
Design capacity	CFM	m ³ /h	32,894	55,885
Design static pressure	in WG	mm WG	-	-

Date: February 20, 1990

Name: Ho/Ze

Sheet No. 6

	US-units	Metric units	US-units	Metric units
Refuse throughput per unit	%		100	
Refuse throughput per unit	lb/h	kg/h	50,000	22,680
HHV (LHV)	Btu/lb	kcal/kg	5,000	2,470

WATER CONSUMPTION EXCLUDING FLUE GAS COOLING

	lb/tons	kg/t	-	-
Ash discharger quenching bath	lb/h	kg/h	~ 3,110	~ 1,410
Ash discharger quenching bath	lb/h	kg/h	-	-
Feed chute water jacket	lb/h	kg/h	~ 4,410	~ 2,000
Hydraulic fluid cooling	lb/h	kg/h	-	-
Total	lb/h	kg/h	-	-

FLUE GAS COMPOSITION (System exit):

wet:		
CO ₂	% by volume	8.537
O ₂	% by volume	9.189
N ₂ + Ar	% by volume	69.242
H ₂ O	% by volume	12.979
SO ₂	% by volume	0.011
HCl	% by volume	0.042
HF	% by volume	-

dry:		
CO ₂	% by volume	9.817
O ₂	% by volume	10.566
N ₂ + Ar	% by volume	79.617

Max. content of noxious gases in wet flue gases (theoretical):

SO ₂	ppm	117
HCl	ppm	421
HF	ppm	-

BOILER DESIGN DATA		Date: 02-05-1992	Name: Flr	Sheet: No: 1	4P 9919 21
Project: LEE COUNTY Fl.		M.C.R. 600 tpd - 5000 Btu/lb			
Our No.: 9919		(DISTRAL Doc. January 15/92)			
		Units of Measurement			
		US- units	Metric units	US- units	Metric units
Refuse throughput per unit	%	%		100.00	100.00
Refuse quantity per unit	sht/h	t/h		25.00	22.68
	lb/h	kg/h		50,000	22,680
Calorific value of refuse	Btu/lb	kcal/kg		5,000	2,470
Ash	%	%		20.90	20.90
Moisture	%	%		20.70	20.70
Combustible matter	%	%		58.40	58.40
Design pressure (approx.)	psig	atue		1,095	77.0
Drum pressure (approx.)	psig	atue		996	70.0
Live steam pressure	psig	atue		865	60.8
Live steam temperature	F	C		830	443
Saturated steam temperature	F	C		546	285
Feedwater temperature	F	C		300	149
Flue gas temperature at boiler outlet	F	C		425	218
Preheated air temperature	F	C		300	149
Ambient temperature	F	C		80	27
Boiler efficiency ,calcul .	%	%		73.61	82.24
,guarant.	%	%		72.11	80.56
Steam output,calcul.	lb/h	kg/h		172,554	78,270
guarant.	lb/h	kg/h		169,049	76,680
(2 % blow-down considered)					
Quantity of injected water (calculated)					
First stage: SH1-SH2 :	lb/h	kg/h		3,880	1,760
Second stage: SH2-SH3 :	lb/h	kg/h		4,365	1,980
Total (steam temp. control)	lb/h	kg/h		8,245	3,740
Part load	%	%		80	80
Gross heat release				250.00	56.02
Heat input from preh. air	10 ⁶ x Btu/h	Gcal/h		18.36	4.63
Total heat input				268.36	60.65
Combustion air quantity	SCFM	Nm3/h		76,502	121,110
Flue gas quantity, Furnace	SCFM	Nm3/h		85,997	136,140
Flue gas quantity system exit	SCFM	Nm3/h		85,997	136,140

Project: LEE COUNTY Fl.	Date: 02-05-1992	Name: Flr	Sheet: No: 3	4P 9919 21
	US- units	Metric units	US- units	Metric units
Refuse throughput per unit	%	%	100.00	100.00
Refuse quantity per unit	lb/h	kg/h	50,000	22,680
Calorific value of refuse	Btu/lb	kcal/kg	5,000	2,470
RADIANT FURNACE CHAMBER (2nd pass) <i>1 curtain wall / boiler center</i>				
Tube diameter	inch	mm	3	76.20
Tube pitch	inch	mm	4	101.60
Flue gas temperature at inlet	F	C	1,724	940
Flue gas temp. at outlet	F	C	1,515	824
Average flue gas velocity	fps	m/s	16.73	5.10
Fouling factor	-	-	0.60	0.60
EVAPORATION SURFACE in the 3-rd pass				
Tube diameter	inch	mm	2 3/4	69.85
Tube pitch, transverse	ft-inch	mm	1- 0	304.80
longitudinal	inch	mm	4	101.60
Flue gas temperature at inlet	F	C	1,515	824
Flue gas temp. at outlet	F	C	1,245	674
Average flue gas velocity	fps	m/s	21.13	6.44
Fouling factor	-	-	0.65	0.65
RADIANT FURNACE CHAMBER (3rd pass)				
Tube diameter	inch	mm	3	76.20
Tube pitch	inch	mm	4	101.60
Flue gas temperature at inlet	F	C	1,245	674
Flue gas temp. at outlet	F	C	1,218	659
Average flue gas velocity	fps	m/s	14.96	4.56
Fouling factor	-	-	0.70	0.70

Project: LEE COUNTY Fl.	Date: 02-05-1992	Name: Flr	Sheet: No: 4	4P 9919 21
	US- units	Metric units	US- units	Metric units
Refuse throughput per unit	%	%	100.00	100.00
Refuse quantity per unit	lb/h	kg/h	50,000	22,680
Calorific value of refuse	Btu/lb	kcal/kg	5,000	2,470
. PASSAGE THROUGH SCREEN TUBES (3rd pass / superheater)				
Tube diameter	inch	mm	-	-
Tube pitch, transverse	inch	mm	-	-
longitudinal	inch	mm	-	-
Flue gas temperature at inlet	F	C	-	-
Flue gas temp. at outlet	F	C	-	-
Average flue gas velocity	fps	m/s	-	-
Fouling factor	-	-	-	-
SUPERHEATER 3				
Tube diameter	inch	mm	1 1/ 2	38.10
Tube pitch, transverse	inch	mm	5	127.00
longitudinal	inch	mm	5	127.00
Flue gas temperature at inlet	F	C	1,218	659
Flue gas temp. at outlet	F	C	1,083	584
Steam temperature at inlet	F	C	703	373
Steam temperature at outlet	F	C	830	443
Average steam velocity	fps	m/s	70.28	21.42
Average flue gas velocity	fps	m/s	13.22	4.03
Fouling factor	-	-	0.74	0.74
SUPERHEATER 2				
Tube diameter	inch	mm	1 1/ 2	38.10
Tube pitch, transverse	inch	mm	5	127.00
longitudinal	inch	mm	5	127.00
Flue gas temperature at inlet	F	C	1,083	584
Flue gas temp. at outlet	F	C	964	518
Steam temperature at inlet	F	C	644	340
Steam temperature at outlet	F	C	748	398
Average steam velocity	fps	m/s	61.12	18.63
Average flue gas velocity	fps	m/s	11.88	3.62
Fouling factor	-	-	0.75	0.75

Project: LEE COUNTY Fl.	Date: 02-05-1992	Name: Flr	Sheet: No: 5	4P 9919 21	
	US- units	Metric units	US- units	Metric units	
Refuse throughput per unit	%	%	100.00	100.00	
Refuse quantity per unit	lb/h	kg/h	50,000	22,680	
Calorific value of refuse	Btu/lb	kcal/kg	5,000	2,470	
SUPERHEATER 1					
Tube diameter	inch	mm	1 1/2	38.10	
Tube pitch, transverse	inch	mm	5	127.00	
longitudinal	inch	mm	5	127.00	
Flue gas temperature at inlet	F	C	964	518	
Flue gas temp. at outlet	F	C	757	403	
Steam temperature at inlet	F	C	546	285	
Steam temperature at outlet	F	C	680	360	
Average steam velocity	fps	m/s	50.23	15.31	
Average flue gas velocity	fps	m/s	10.40	3.17	
Fouling factor	-	-	0.76	0.76	
ECONOMIZER					
Tube diameter	inch	mm	2	50.80	
Tube pitch, transverse	inch	mm	4	101.60	
longitudinal	inch	mm	4	101.60	
Flue gas temperature at inlet	F	C	757	403	
Flue gas temp. at outlet	F	C	425	218	
Feedwater temp. at inlet	F	C	300	149	
Feedwater temp. at outlet	F	C	495	257	
Average flue gas velocity	fps	m/s	18.31	5.58	
Average feedwater velocity	fps	m/s	2.33	0.71	
Fouling factor	-	-	0.77	0.77	
VOLUMES AND HEAT RELEASES					
Volume of 1st boiler pass	cuft	m ³	27,794	787	
Heat release of 1st boiler pass	Btu / cuftxh	kcal / m ³ xh	8,995	71,181	
Volume of all radiant furnace chambers	cuft	m ³	41,073	1,163	
Heat release of all radiant furnace chambers	Btu / cuftxh	kcal / m ³ xh	6,087	48,168	

Project: LEE COUNTY Fl.	Date: 02-05-1992	Name: Flr	Sheet: No: 6	4P 9919 21
	US- units	Metric units	US- units	Metric units
Refuse throughput per unit	%	%	100.00	100.00
Refuse quantity per unit	lb/h	kg/h	50,000	22,680
Calorific value of refuse	Btu/lb	kcal/kg	5,000	2,470
HEATING SURFACES (approx.) (as used for calculation)				
Furnace (1st pass), proj. Radiant furnace chamber (1st pass), proj.	sqft	m ²	2,680	249
Screen between 1st and 2nd pass	sqft	m ²	2,734	254
Radiant furnace chamber (2nd pass), proj.	sqft	m ²	0	0
Evaporation surface in the 3rd pass	sqft	m ²	3,940	366
Radiant furnace chamber (3rd pass), proj.	sqft	m ²	5,640	524
Screen between 3rd pass and superheater	sqft	m ²	1,033	96
Monowalls in superheater area, proj.	sqft	m ²	0	0
Superheater 3	sqft	m ²	2,056	191
Superheater 2	sqft	m ²	5,070	471
Superheater 1	sqft	m ²	5,156	479
Economizer	sqft	m ²	12,325	1,145
	sqft	m ²	33,724	3,133
Total, approx.	sqft	m ²	74,358	6,908
Comments:				
Boiler losses (US - units) :				
Heat loss due to radiation			: 0.45 %	
Loss by sensible heat in flue gases			: 23.16 %	
Unaccounted for losses			: 1.50 %	
Corresponding drawings No. DEC 90004-0108-0001/Rev.P and 90004-0109-0002 from 01/15/92				



LOAD PLAN

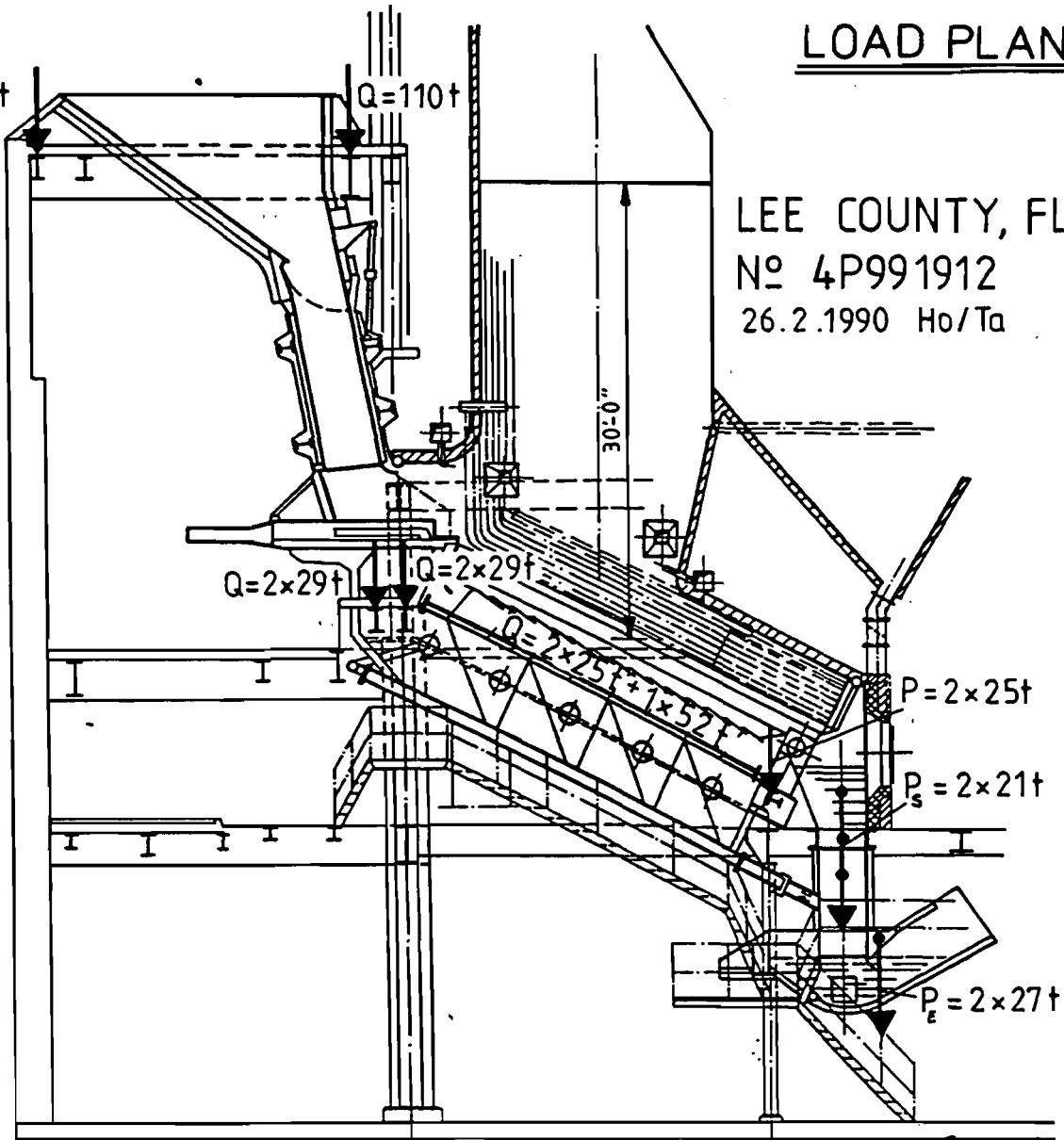
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LEE COUNTY, FL

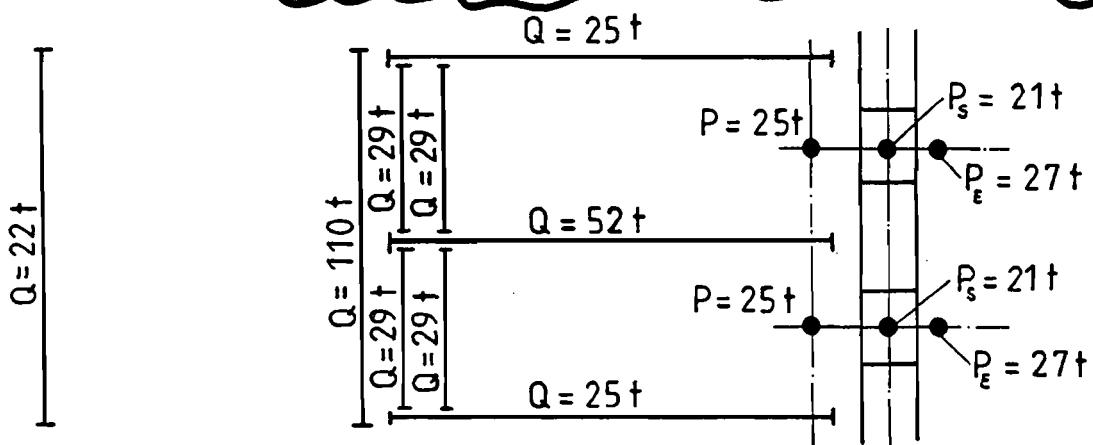
No 4P991912

26.2.1990 Ho/Ta



t = "sht"

**REFER ALSO TO MARTIN DWG.
1A000235**



ATTACHMENT 5

FAN SPECIFICATION

The following fan specification(s) are included as part of this boiler specification. Contractor shall complete all Fan Data Sheets included in these specification(s), and furnish them with his proposal.

Fan specification(s) included are:

SM-104 - Forced Draft, Induced Draft, Overfire, Seal and Reverse

Air Fans

ATTACHMENT 6

MOTOR SPECIFICATION(S)

The following motor specification(s) are included as part of this boiler specification. Contractor shall complete all Motor Data Sheets included in these specification(s), and furnish them with his proposal.

Motor specification(s) included are:

SE-211 - Squirrel Cage Induction Motors Below 600 Volts

SE-212 - Squirrel Cage Induction Motors Above 2000 Volts

ATTACHMENT 7

TECHNICAL DATA SUPPLIED BY CONTRACTOR

PERFORMANCE GUARANTEES

1. Steam output, based on firing the specified refuse fuel, 300 °F feedwater, 300 °F under-fire and ~~300~~ °F overfire air, 100 % excess air 169,270 lb/hr
Steam output, based on firing the specified auxiliary fuel with the burner at 100% burner load, 300 °F feedwater 80,000 lb/hr
2. Superheated steam pressure at the steam non-return valve outlet 865 psig
3. Maximum steam ~~purity~~^{impurity} leaving the superheater, based on appropriate ABMA boiler water concentrations for the normal operating pressure 0.5 ppm
4. Total boiler steam/water side pressure drop at MCR, from feedwater terminal point to main steam terminal point 220 psi
5. Maximum flue gas exit temperature rise from 425 °F to no more than 500 °F after 4000 hours accumulated operation and no manual cleaning of fireside surfaces YES
6. Control range of 80% of steam flow as guaranteed in item 1 above, while maintaining the outlet steam temperature of 830 °F plus or minus 10°F (FOR MSW) YES
7. Maximum total fan motor power consumption (kW) when operating at 100%, as per item 1 above 270 kW
8. Economizer water flow mass rate (minimum water mass flow rate 400,000 lb/sq. ft-hr) 400,000 lb/sq. ft-hr

3

COMBUSTION/STEAM GENERATION UNITS

- | | |
|--|---|
| 1. <u>Number of Units</u> | <u>Two (2)</u> |
| 2. <u>Type</u> | <u>Single Drum,
Natural Circulation</u> |
| 3. <u>Manufacturer</u> | <u>Distral S.A.</u> |
| 4. <u>Maximum Continuous Rating (MCR)
Solid Waste Capacity</u> | <u>600 TPD</u> |

Note: All data in Items 4 through 24 shall be per Steam Generation Unit

- | | | |
|--|------------------|--------------|
| 5. <u>Design Data (MCR)</u> | | |
| a) Continuous steam output | <u>169,270</u> | <u>lb/hr</u> |
| b) Blowdown | <u>3,450</u> | <u>lb/hr</u> |
| c) Steam pressure (at superheater
non-return valve outlet) | <u>865</u> | <u>psig</u> |
| d) Steam temperature (at superheater
non-return valve outlet) | <u>830</u> | <u>°F</u> |
| e) Feedwater temperature | <u>300</u> | <u>°F</u> |
| 6. <u>Boiler Design Pressure/Economizer</u> | <u>1095/1250</u> | <u>psig</u> |

7. Heat Loss Calculation Summary

<u>Item</u>	<u>Btu/hr</u>	<u>%</u>
a. Heat Input	<u>268,463,445</u>	<u>100.00</u>
b. Heat Output	<u>193,888,390</u>	<u>72.22</u>
c. Losses:		
i Dry Gas		
ii Moisture:	<u>61,612,360</u>	<u>22.95</u>
iii Residue:	<u>7,973,364</u>	<u>2.97</u>
iv Convection & Radiation:	<u>966,468</u>	<u>0.36</u>
v Manufacturer's Margin:	<u>4,026,952</u>	<u>1.50</u>
Total Losses	<u>74,579,144</u>	<u>27.78</u>
d. Boiler Efficiency		<u>72.22</u>

8. Boiler Drum(s) Description

	<u>Dia.</u> <u>(in ID)</u>	<u>Minimum</u> <u>Thickness</u> <u>(in)</u>	<u>Max.</u> <u>Metal</u> <u>Temp.</u>	<u>Material</u>
Top Drum	<u>60</u>	<u>3.125</u>	<u>600</u>	<u>SA516Gr70</u>
Bottom Drum, if applicable	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

9. Tube Description

Furnace waterwalls (1st pass)	<u>3</u>	<u>0.180</u>	<u>650</u>	<u>SA178A</u>
Furnace arch (above refractory)	<u>3</u>	<u>0.220</u>	<u>650</u>	<u>SA178A</u>
Furnace exit screen	<u>6.625</u>	<u>0.432</u>	<u>650</u>	<u>SA106B</u>
Radiant Furnace Chamber (2nd pass)	<u>3</u>	<u>0.180</u>	<u>650</u>	<u>SA178A</u>
Convection Evaporator	<u>2.75</u>	<u>0.180</u>	<u>650</u>	<u>SA178A</u>
Primary Superheater I	<u>1.5</u>	<u>0.180</u>	<u>680</u>	<u>SA210A1</u>
Primary Superheater II	<u>1.5</u>	<u>0.180</u>	<u>720</u>	<u>SA210A1</u>
Secondary Superheater I	<u>1.5</u>	<u>0.180</u>	<u>800</u>	<u>SA213T11</u>
Secondary Superheater II	<u>1.5</u>	<u>0.180</u>	<u>900</u>	<u>SA213T11</u>
Superheater Enclosure	<u>3</u>	<u>0.180</u>	<u>650</u>	<u>SA178A</u>
Economizer	<u>2</u>	<u>0.150</u>	<u>500</u>	<u>SA178A</u>

10. Waterwall Tube Pitch

	<u>(in)</u>
Furnace Waterwalls (1st pass)	<u>4</u>
Radiant Furnace Chamber (2nd pass)	<u>4</u>
Superheater Enclosure	<u>5</u>

11. Header Description

	<u>Dia.</u> <u>(in OD)</u>	<u>Minimum</u> <u>Thickness</u> <u>(in-min)</u>	<u>Material</u>
Sidewall	10.75/8.625(*)/6.625(**)	0.9844/ 0.793"-0.756	<u>SA106B</u>
Front and Rear Waterwall	<u>10.75</u>	<u>0.984"</u>	<u>SA106B</u>

(*) Upper Sidewall
 (**) Chill Tubes Wall

	<u>Dia.</u> <u>(in OD)</u>	<u>Minimum</u> <u>Thickness</u> <u>(in)</u>	<u>Material</u>
Furnace Exit Screen	<u>8.625</u>	<u>0.793</u>	<u>SA106B</u>
Convection Evaporator	Outlet <u>8.625</u>	<u>0.710</u>	<u>SA106B</u>
	Inlet <u>10.75</u>	<u>0.875</u>	
Primary Superheater I	<u>10.75</u>	<u>0.629</u>	<u>SA106B</u>
Primary Superheater II	<u>10.75</u>	<u>0.629</u>	<u>SA106B</u>
Secondary Superheater I	<u>10.75</u>	<u>0.629</u>	<u>SA106B/335P11</u>
Secondary Superheater II	<u>10.75</u>	<u>0.629</u>	<u>SA335P11</u>
	Upper <u>6.625</u>	<u>0.756</u>	
Superheater Enclosure	Lower <u>8.625</u>	<u>0.793</u>	<u>SA106B</u>
Economizer Inlet	<u>6.625</u>	<u>0.492</u>	<u>SA-106B</u>
Economizer Outlet	<u>6.625</u>	<u>0.492</u>	<u>SA-106B</u>



12. Tube Shield Description

Evaporative Section Installed at first two rows of evaporator
 Superheater Inlet Screen and screen tubes at first two rows of
 Superheater superheater, at first row of economizer;
 Economiser at first row of either side of soot blower
cavities.

13. Volumes

Volume of 1st furnace pass 26,417 ft³
 Volume of all radiant passes 47,435 ft³

14. Heating Surfaces Summary (projected)

Furnace (1st pass) 2,517 ft²
 Radiant Furnace Chamber (1st pass) 2,512 ft²
 Radiant Furnace Chamber (2nd pass, 3rd pass) 5,233 ft²
 Superheater Enclosure 2,040 ft²
 Total Projected Heating Surface 12,443 ft²

15. Heating Surfaces Summary (Circumferential)

Screen between 1st and 2nd pass	<u>146</u>	ft ²
Screen between 2nd and 3rd pass	<u>N/A</u>	ft ²
Convection Evaporator	<u>5637</u>	ft ²
Screen between Evaporator and Superheater	<u>177</u>	ft ²
Primary Superheater I	<u>6219</u>	ft ²
Primary Superheater II	<u>6108</u>	ft ²
Secondary Superheater I	<u>5150</u>	ft ²
Secondary Superheater II	<u>5069</u>	ft ²
Economizer	<u>33720</u>	ft ²
Total Circumferential Heating Surface	<u>62226</u>	ft ²

16. Weight of the Steam Generator (each)

Boiler drum(s)	<u>97.5</u>	kips
Waterwalls, downcomers, risers, etc.	<u>469.0</u>	kips
Convection evaporator	<u>50.7</u>	kips
Superheaters	<u>203.7</u>	kips
Economizer	<u>216.8</u>	kips
Structural steel (buckstays, etc.)	<u>125.0</u>	kips
Casings, hoppers, ducts	<u>198.8</u>	kips
Lagging, insulation, and setting	<u>314.6</u>	kips
Valves, trim, piping, instruments, sootblowers, oil burners, miscellaneous	<u>80.8</u>	kips
Subtotal	<u>1756.9</u>	kips
Water content (full)	<u>322.6</u>	kips
Estimated ash deposits (load)	<u>1718.0</u>	kips
Total for each steam generator	<u>3797.5</u>	kips

Boilerhouse Support Steel (total for all units)	<u>1418</u>	kips
Platforms and walkways (total for all units)	<u>1098</u>	kips
Estimated square footage of all platforms required (information only)	<u>15620</u>	ft ²

17. Performance Data

MCR = Maximum Continuous Rating
 C.P. = Control Point (80% of MCR)

Air pressure drop after 4000 hours of continuous operation without shutdown for cleaning, in. wg.

<u>4</u>	<u>2.56</u>
----------	-------------

Fluegas pressure drop after 4000 hours of continuous operation without shutdown for cleaning, in. wg.

<u>1.66</u>	<u>1.06</u>
-------------	-------------

Pressure drop from economizer inlet to drum (friction + static), psi

<u>38</u>	<u>30</u>
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Pressure drop from drum to S.H. outlet header, psi

<u>134</u>	<u>85.8</u>
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F.W. piping and valve pressure drop from terminal point to boiler, psi

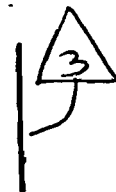
<u>8</u>	<u>6.4</u>
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M.S. piping and valve pressure drop from boiler to terminal point, psi

<u>7</u>	<u>4.5</u>
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Highest safety valve setting, psig

<u>1103</u>	
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CONVECTION EVAPORATOR

Tube diameter	in.	<u>2.75</u>	<u> </u>
Transverse pitch	in.	<u>12.0</u>	<u> </u>
Longitudinal pitch	in.	<u>4"</u>	<u> </u>
No. of tubes wide	--	<u>29</u>	<u> </u>
No. of tubes deep	--	<u>21</u>	<u> </u>
Average effective tube length	ft.	<u>10</u>	<u> </u>
Total heating surface	ft ²	<u>5637</u>	<u> </u>
Fluegas inlet temperature	°F	<u>1506</u>	<u> </u>

<u>MCR</u>	<u>C.P.</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

		MCR	C.P.
Fluegas outlet temperature	Of	1251	
Boiler water temperature	Of	550	
Free gas area	ft ²	237.7	
Average fluegas velocity	fps	21.09	
Fluegas draft loss	in.wg.	0.00	
Water mass flow rate	lb/sqft-hr	----	
Average (cold) water velocity	fps	----	
Fouling factor	--	0.65	

PRIMARY SUPERHEATER I

Tube diameter	in.	1.5	
Transverse pitch	in.	5	
Longitudinal pitch	in.	5	
No. of tubes wide	--	72	
No. of tubes deep	--	14	
Average effective tube length	ft.	15.09	
Total heating surface	ft ²	6,219	
Fluegas inlet temperature	Of	858	
Fluegas outlet temperature	Of	770	
Steam inlet temperature	Of	550	
Steam outlet temperature	Of	596	
Free gas area	ft ²	370.8	
Average fluegas velocity	fps	9.42	
Fluegas draft loss	in.wg.	0.03	
Steam mass flow rate	lb/sqft-hr	315,475	
Average steam velocity	fps	40.79	
Fouling factor	--	0.76	

PRIMARY SUPERHEATER II

Tube diameter	in.	1.5	
Transverse pitch	in.	5	

		MCR	C.P.
Longitudinal pitch	in.	5	
No. of tubes wide	--	72	
No. of tubes deepo	--	14	
Average effective tube length	ft.	15.09	
Total (projected) heating surface	ft ²	6107.8	
Fluegas inlet temperature	°F	963	
Fluegas outlet temperature	°F	858	
Steam inlet temperature	°F	596	
Steam outlet temperature	°F	674	
Free gas area	ft ²	365	
Average fluegas velocity	fps	10.30	
Fluegas draft loss	in.wg.	0.03	
Steam mass flow rate	lb/sqft-hr	315,475	
Average steam velocity	fps	48.65	
Fouling factor	--	0.76	

SECONDARY SUPERHEATER I

Tube diameter	in.	1.5	
Transverse pitch	in.	5	
Longitudinal pitch	in.	5	
No. of tubes wide	--	72	
No. of tubes deep	--	12	
Average effective tube length	ft.	14.75	
Total heating surface	ft ²	5150.4	
Fluegas inlet temperature	°F	1079	
Fluegas outlet temperature	°F	963	
Steam inlet temperature	°F	642	
Steam outlet temperature	°F	743	
Average fluegas velocity	fps	11.30	
Fluegas draft loss	in.wg.	0.03	
Steam mass flow rate	lb/sqft-hr	322577	
Average steam velocity	fps	57.06	
Fouling factor	--	0.75	

SECONDARY SUPERHEATER II

Tube diameter	in.	1.5	
Transverse pitch	in.	5	
Longitudinal pitch	in.	5	
No. of tubes wide	--	72	
No. of tubes deep	--	12	
Average effective tube length	ft.	14.7	
Total heating Surface	ft ²	5069	
Fluegas inlet temperature	°F	1217	
Fluegas outlet temperature	°F	1079	
Steam inlet temperature	°F	698	
Steam outlet temperature	°F	830	
Average fluegas velocity	fps	12.46	
Fluegas draft loss	in.wg.	0.03	
Steam mass flow rate	lb/sqft-hr	331,240	
Average steam velocity	fps	67.78	
Fouling factor	--	0.74	

ECONOMIZER

Tube diameter	in.	2	
Transverse pitch	in.	4	
Longitudinal pitch	in.	4	
No. of tubes wide	--	92	
No. of tubes deep	--	70	
Average effective tube length	ft.	9.67	
Total heating Surface	ft ²	33,720	
No. of tube sections (bans)	--	5	
Fluegas inlet temperature	°F	770	
Fluegas outlet temperature	°F	425	
Water inlet temperature	°F	300	
Water outlet temperature	°F	501	
Free gas area	ft ²	154.9	
Average fluegas velocity	fps	18.57	



		MCR	C.P.
Fluegas draft loss	in.wg.	0.59	
Water mass flow rate	lb/sqft-hr	476,428	
Average water velocity	fps	2.45	
Fouling factor	---	0.77	

18. Preliminary Trim List

<u>Items</u>	<u>Qty</u>	<u>Size</u>	<u>Mfgr/Model</u>	<u>Set Point</u>
<u>Safety Valves</u>				
Drum safety valves	2	1.5/2.5	Consolidated 1717A/1737A	1071/1103
Superheater safety valves	1	1.5	1717C	920
Superheater power-activated relief valve	1	2	25121VX	900
<u>Major boiler valves</u>				
Feed valve	1	4"	(*) 4016Y	
Feed check valve	1	4"	4094Y	
Main steam stop/check valve	1	10"	4006Y	
Main steam valve	1	10"	4016Y	
Sootblower steam valve	1	2"	1048Y	

Miscellaneous valves

<u>Items</u>	<u>Qty</u>	<u>Size</u>	<u>Mfgr/Model</u>
Drum vent	2	1-1/2	1048Y
Chemical feed	2	1/2	1048Y/36174
Pressure gauge/transmitter	1	1/2	1048Y
Test gauge-3 way			
Steam and water sampling	4/2	1/2/1	1048Y
Water level transmitter	4	1"	1048Y
Water column	2	1-1/2	VOGT
Water column drain	2	3/4	1048Y
Gauge glass	2	1-1/2	Reliance

(*) All Valves by Edward Unless Otherwise Stated.

Gauge glass drain	2	3/8	1048Y
Probe water column	2	1	VOGT
Probe water column drain	2	1	1048Y
Main steam line drain	2	1	1048Y
Superheater drain	8	1	1048Y
Waterwalls drain	36	1-1/2	36L24
Economizer drain	2	1	1048Y
Attenuator vent	4	1	1048Y
Main steam line vent			1048Y
Sootblower drain (with thermostat control)	4	1	Copes V600

18.1 Preliminary Valve and Additional Trim List

<u>Items</u>	<u>Qty</u>	<u>Size</u>	<u>Mfgr/Model</u>
--------------	------------	-------------	-------------------

19. Steam Coil Air Heater

Manufacturer	<u>LINCHBURG</u> XXXXXXXX - RLT	<u>LINCHBURG</u> XXXXXXXX - RLT	
Effective Heating Surface	<u>10582</u>	<u>4630</u>	sq. ft.
Operating Steam Pressure	<u>120</u>	<u>120</u>	psig
Operating Steam Temperature	<u>350</u>	<u>350</u>	°F
Inlet Air Flow	<u>54770</u>	<u>23470</u>	ACFM
Inlet Air Temperature	<u>80</u>	<u>80</u>	°F
Outlet Air Temperature	<u>300</u>	<u>300</u>	°F
Air Pressure - loss	<u>1.5</u>	<u>1.5</u>	in wg
Steam Flow	<u>13,782</u>	<u>6,038</u>	lb/hr

13

13

Design Pressure	<u>200</u>	<u>200</u> psig
Design Temperature	<u>650</u>	<u>650</u> °F
Material and ASTM Designation	<u>C.S.</u>	<u>C.S.</u>
Bare or Finned, and Fins per inch	<u>Finned - 4</u>	<u>Finned - 4</u>
Fin Type: Parallel, Spiralwound	<u>Helical</u>	<u>Helical</u>
Fin material	<u>C.S.</u>	<u>C.S.</u>
Number of heating sections	<u>6</u>	<u>5</u>
Coils: self-draining, removable	<u>Yes</u>	<u>Yes</u>
Coil Arrangement: vertical or horiz	<u>Horizontal</u>	<u>Horizontal</u>
Air Side Fouling Factor	<u>0.01</u>	<u>0.01</u> hr-ft ² -°F/Btu
Steam Side Fouling Factor	<u>0.001</u>	<u>0.001</u> hr-ft ² -°F/Btu
Maximum Face Velocity	<u>690</u>	<u>690</u> fpm
Casing and Access Section Thickness	<u> </u>	<u> </u> gauge
Access Door Size	<u>18" x 48"</u>	<u>18" x 48"</u> in.

3

20. Sootblowers

<u>Location</u>	<u>Qty</u>	<u>Make</u>	<u>Model</u>	<u>Type</u>	<u>Material</u>	<u>HP Each</u>
<u>Evaporator</u>	<u>8</u>	<u>(*)</u>	<u>T20E</u>	<u>Retract</u>	<u>Alloy S.</u>	<u>0.6</u>
<u>Convection Section</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Superheater</u>	<u>8</u>	<u> </u>	<u>T20E</u>	<u>Retract</u>	<u>Alloy S.</u>	<u>0.6</u>
	<u>12</u>	<u> </u>	<u>D5E</u>	<u>Rotary</u>	<u>Hyvuloy</u>	<u>1/8</u>
<u>Economizer</u>	<u>20</u>	<u> </u>	<u>D5E</u>	<u>Rotary</u>	<u>Steel</u>	<u>1/8</u>
	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

(*) All by Copes Vulcan

Blowing steam flow, lbs/hr	<u>T120, 6480, D5E, 15700</u>
Blowing steam-total quantity, lbs per cycle	<u>T20, 8288, D5E, 5573</u>
Sootblowing duration, min.	<u>T120, 4.8, D5E, 0.70</u>
Steam pressure to sootblowers	<u>Psig 450 at S.B Head, 150 Blowing Press</u>

Are the following furnished:

Supports	<u>Yes</u>
All necessary valves	<u>Yes</u>
All necessary piping	<u>Yes</u>
Provisions for future sootblowers in second furnace pass	<u>Yes</u>

Are the locations of base and future sootblowers clearly shown on outline and section arrangement drawings	<u>Yes</u>
--	------------

Sootblower Control Panel

Manufacturer	<u>Copes Vulcan</u>
Model	<u>Msc.</u>
Additional Features	<u></u>

Contractor shall attach additional descriptions as required to clearly describe offering.

21. Attemperation

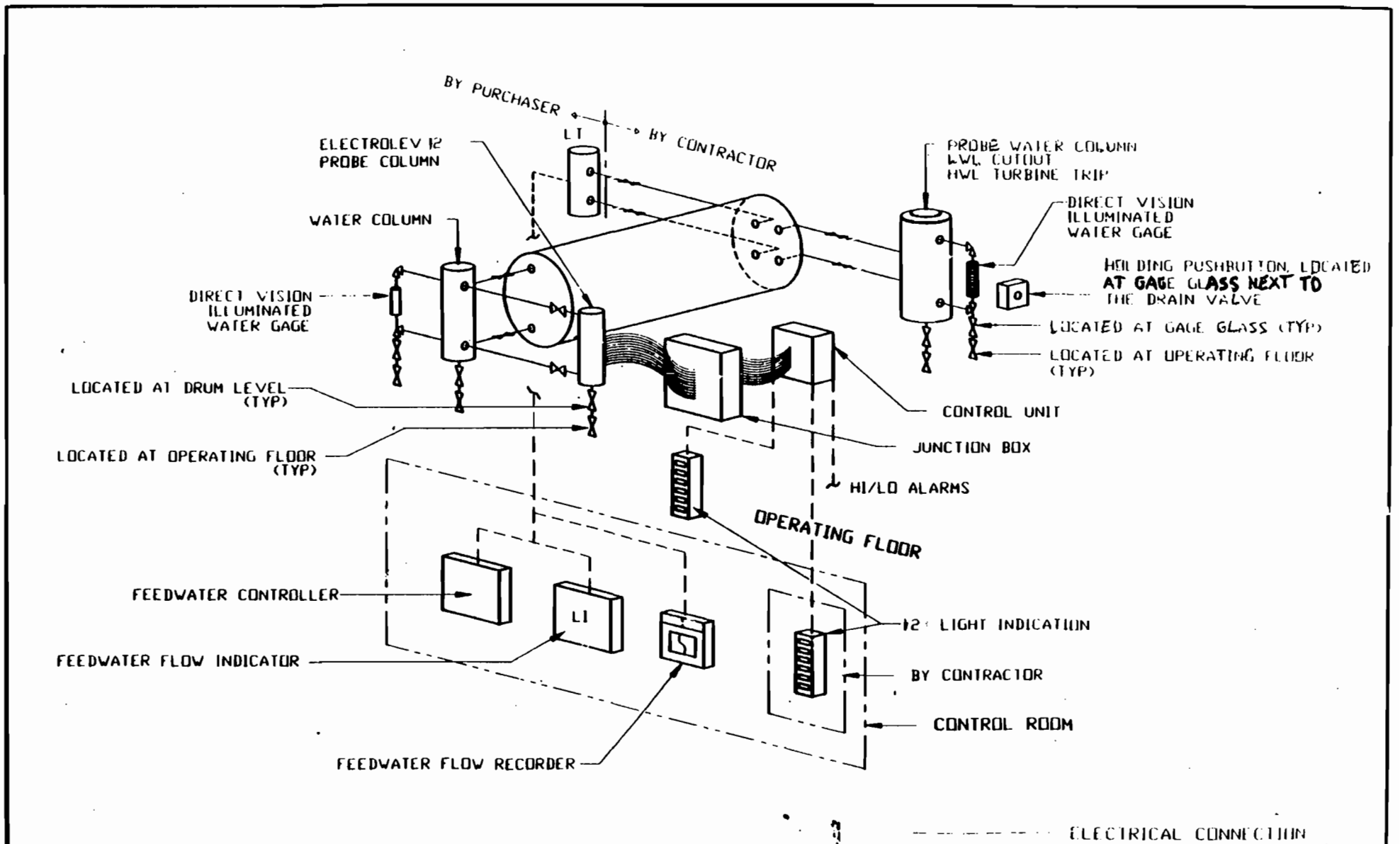
No. of stages	<u>2</u>
Superheat load control point	<u>80</u> °F
Superheater outlet temperature	<u>830</u> °F
Control description:	<u>Spray</u>

Contractor shall include additional descriptions as required to clearly describe offering.

22. Auxiliary Burner(s)

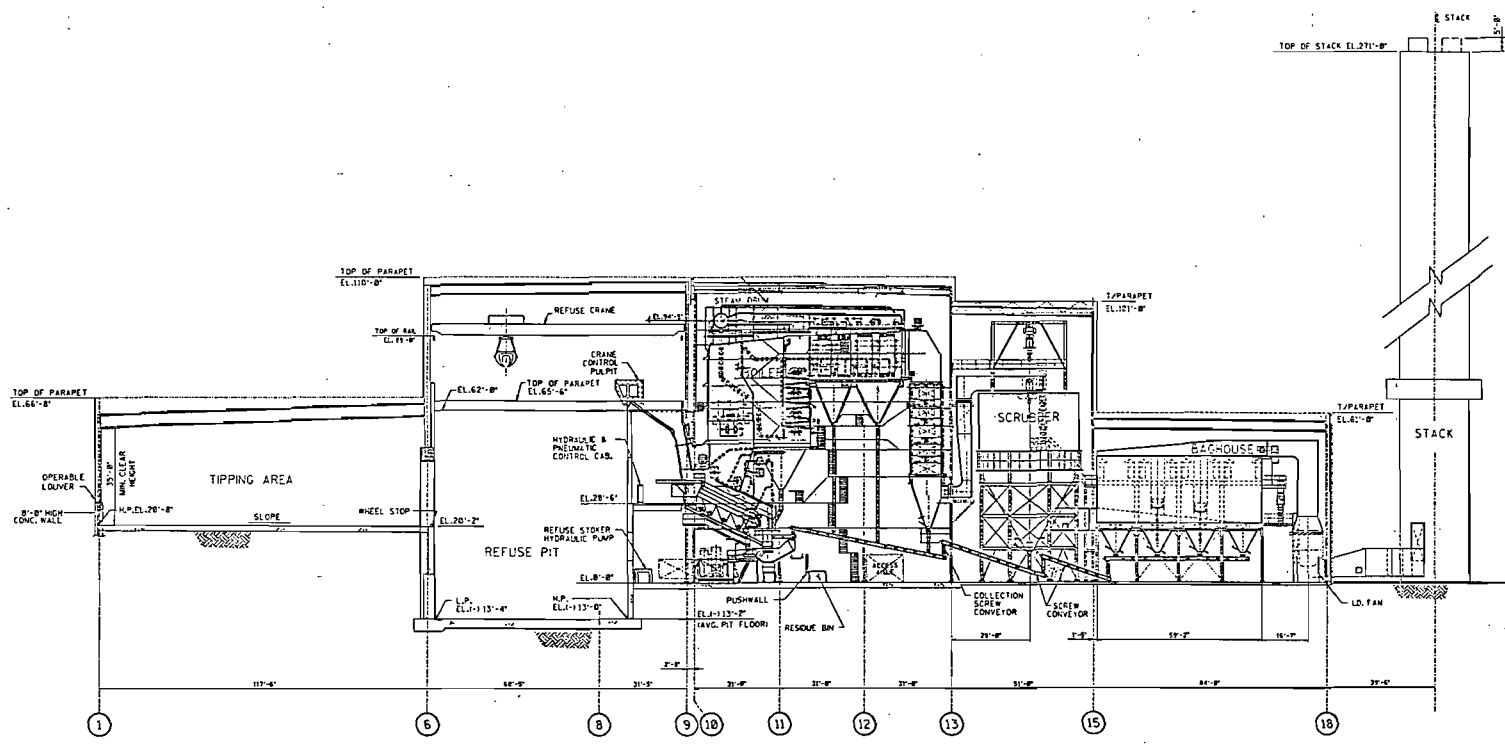
No. of burners per steam generator	<u>Two</u>	
Design heat input per burner	<u>50</u>	MBTU/hr
Fuel oil	<u>N/A</u>	
Type/No.		
Fuel consumption at design heat input	<u>N/A</u>	
Fuel pressure required at Purchaser's supply point	<u>N/A</u>	
Atomizing medium	<u>N/A</u>	
Atomizing medium consumption at design heat input	<u>N/A</u>	SCFM(air)
lb/hr (steam)	<u>N/A</u>	
Atomizing medium pressure required at Purchaser's supply point		psig
Propane		
Fuel consumption at design heat input	<u>39683</u>	SCFH
Fuel pressure required at Purchaser's supply point	<u>15</u>	psig

Burner Description:



ATTACHMENT 3
 DRUM LEVEL TRIM
 AND ACCESSORIES

OGDEN PRODUCTS, INC.	
<i>OGDEN</i>	4/91
1 OF 1	0



SECTION A-A

REVISIONS

1	11/17/82	PRELIMINARY	SEE ISSUE FOR CLIENT REVIEW & COMMENTS.
2	12/15/82	REVISED	REVISED TO SHOW SOLID WASTE SCRAMBLER, SCRAMBLER, LO FAN & SCREEN CONVEYORS.
3	1/15/83	REVISED	REVISED TO SHOW SCRAMBLER & SCREEN CONVEYORS, FEEDER, CRANE ELEVATION. SEE PLANS FOR CLIENT REVIEW & COMMENTS.

11/17/82 PRELIMINARY
 12/15/82 REVISED
 1/15/83 REVISED
 11/17/82 PRELIMINARY
 12/15/82 REVISED
 1/15/83 REVISED
 11/17/82 PRELIMINARY
 12/15/82 REVISED
 1/15/83 REVISED

NO.	DATE	BY	DESCRIPTION
1	11/17/82
2	12/15/82
3	1/15/83

SUBCONTRACT	FOR	FOR	FOR
...

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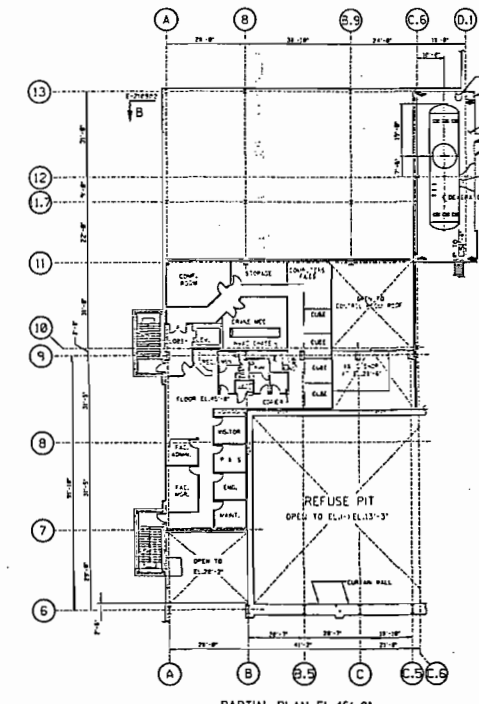
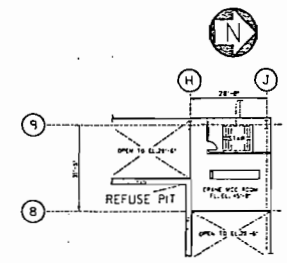
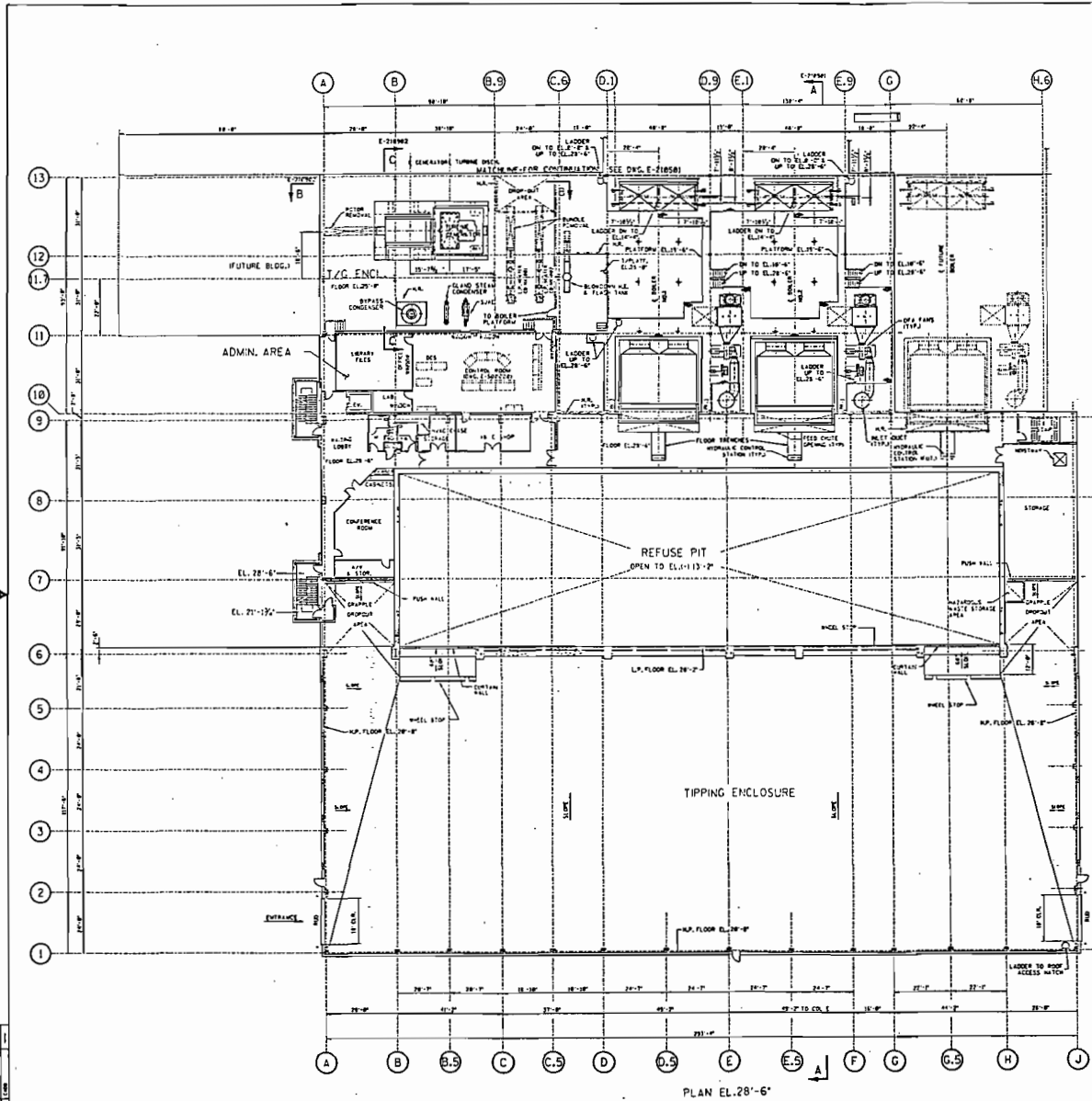
United Engineers & Constructors
 A Bechtel Company

GENERAL ARRANGEMENT
 SECTION A-A
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	11/17/82	SCALE	AS SHOWN
PROJECT NO.	C-1033	DATE	11/17/82
PROJECT NAME	7102-E-210981	SCALE	AS SHOWN

8 7 6 5 4 3 2 1



REVISIONS	
NO.	DESCRIPTION
1	AS SHOWN FOR ELEMENTS TO BE CONSTRUCTED
2	REVISIONS TO REFUSE PIT
3	CONSTRUCTION OF REFUSE PIT
4	REVISIONS TO REFUSE PIT
5	REVISIONS TO REFUSE PIT
6	REVISIONS TO REFUSE PIT
7	REVISIONS TO REFUSE PIT
8	REVISIONS TO REFUSE PIT
9	REVISIONS TO REFUSE PIT
10	REVISIONS TO REFUSE PIT
11	REVISIONS TO REFUSE PIT
12	REVISIONS TO REFUSE PIT
13	REVISIONS TO REFUSE PIT

DATE	BY	CHECKED	APPROVED	TITLE

SUBJECT	FOR	BY	DATE	REVISION

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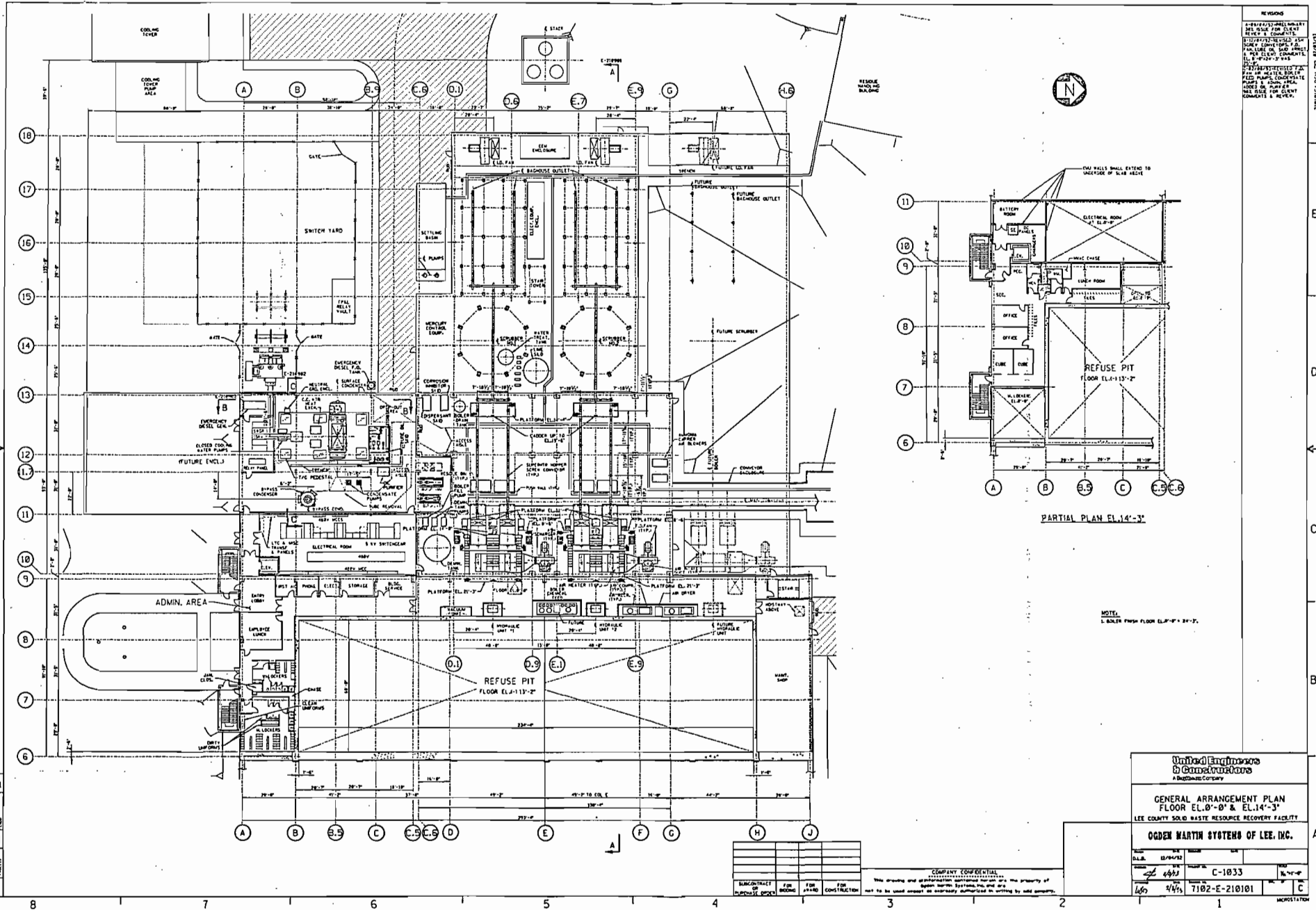
**United Engineers
& Constructors**
A Bechtel Company

GENERAL ARRANGEMENT PLAN
FLOOR EL. 28'-6" & EL. 45'-0"
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

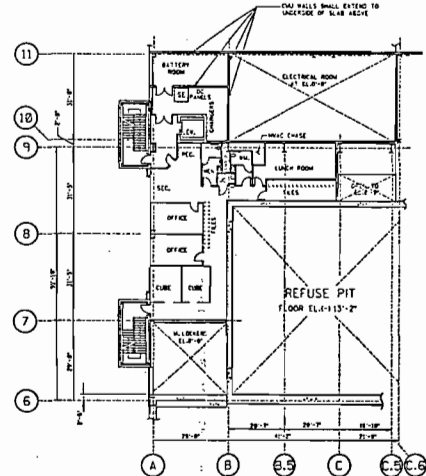
OGDEN EARTH SYSTEMS OF LEE, INC.

DATE	BY	CHECKED	APPROVED	TITLE
12/24/82				

C-1033
7102-E-210201



REVISIONS
 1. REVISIONS TO BE MADE BY THE ARCHITECT
 2. REVISIONS TO BE MADE BY THE ENGINEER
 3. REVISIONS TO BE MADE BY THE ARCHITECT
 4. REVISIONS TO BE MADE BY THE ENGINEER
 5. REVISIONS TO BE MADE BY THE ARCHITECT
 6. REVISIONS TO BE MADE BY THE ENGINEER
 7. REVISIONS TO BE MADE BY THE ARCHITECT
 8. REVISIONS TO BE MADE BY THE ENGINEER
 9. REVISIONS TO BE MADE BY THE ARCHITECT
 10. REVISIONS TO BE MADE BY THE ENGINEER



PARTIAL PLAN EL.14'-3"

NOTE:
 1. BALTER FINISH FLOOR EL.0'-0" & EL.14'-3".

NO.	DATE	DESCRIPTION
1		
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12/14/82	4493	7102-E-210101
1/20/83	4493	7102-E-210101
2/10/83	4493	7102-E-210101
3/10/83	4493	7102-E-210101
4/10/83	4493	7102-E-210101
5/10/83	4493	7102-E-210101
6/10/83	4493	7102-E-210101
7/10/83	4493	7102-E-210101
8/10/83	4493	7102-E-210101
9/10/83	4493	7102-E-210101
10/10/83	4493	7102-E-210101
11/10/83	4493	7102-E-210101
12/10/83	4493	7102-E-210101

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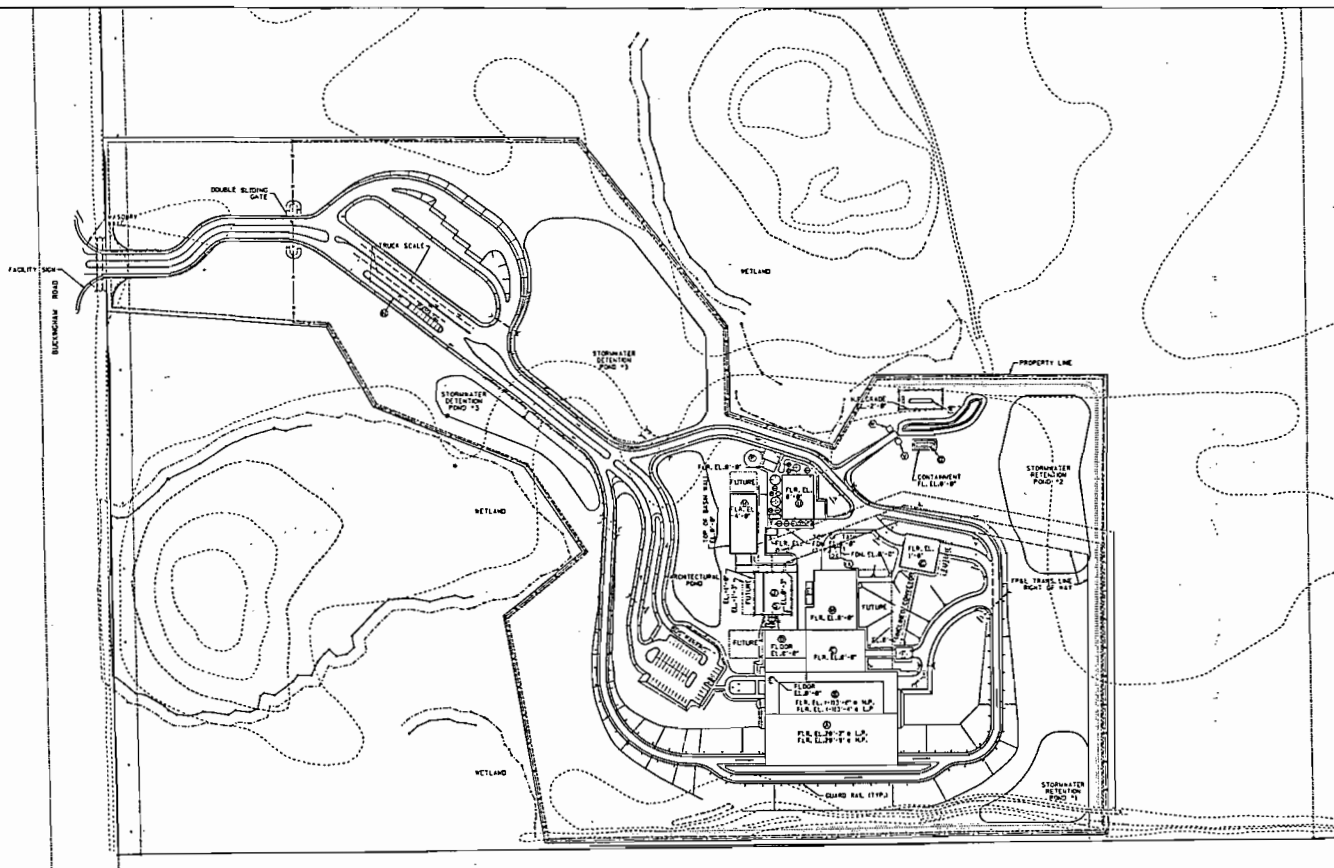
United Engineers & Constructors
 A Suddards Company

GENERAL ARRANGEMENT PLAN
 FLOOR EL.0'-0" & EL.14'-3"
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	BY	FOR
12/14/82	4493	7102-E-210101
1/20/83	4493	7102-E-210101
2/10/83	4493	7102-E-210101
3/10/83	4493	7102-E-210101
4/10/83	4493	7102-E-210101
5/10/83	4493	7102-E-210101
6/10/83	4493	7102-E-210101
7/10/83	4493	7102-E-210101
8/10/83	4493	7102-E-210101
9/10/83	4493	7102-E-210101
10/10/83	4493	7102-E-210101
11/10/83	4493	7102-E-210101
12/10/83	4493	7102-E-210101

Best Available Copy



REVISIONS

1-REVISED PRELIMINARY SET ISSUE FOR CLIENT REVIEW & COMMENTS

2-REVISED ACCORD TO CLIENT COMMENTS

3-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

4-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

5-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

6-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

7-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

8-REVISED TO REFLECT CHANGES TO SCALE & PROPOSED ELEVATIONS

REFERENCE DRAWINGS:

F-210000 G.A. RESOLVE HANDLING BUILDING

E-210000 G.A. SCALE BUILDING

E-210000 G.A. WASTE WATER TREATMENT BUILDING

- SPRING AREA
- RESOLVE PFD AREA
- BOLLER AREA
- TURBINE/GENERATOR AREA
- FACILITY ADMINISTRATION AREA
- SCALE BUILDING
- RESOLVE HANDLING BUILDING
- COOLING TOWER
- PFD SA TOWNS
- STAKE
- SETTLING BASIN
- APC AREA
- SCALE HOUSE
- FINE WATER TANK & PUMP HOUSE
- GARBAGE STORAGE
- PROPANE STORAGE
- ENTICEMANT
- CHALCINATION BUILDING
- WATER TREATMENT BUILDING
- AMMONIA UNLOADING STATION
- PROPANE UNLOADING STATION
- DIESEL OIL TANK & FUELING STATION

NOTES

1. BOLLER PACE FLOOR ELEV. = 24'-3"

NO.	DATE	BY	CHKD.
1	12/15/98	WJ	WJ
2	1/15/99	WJ	WJ
3	2/15/99	WJ	WJ
4	3/15/99	WJ	WJ
5	4/15/99	WJ	WJ
6	5/15/99	WJ	WJ
7	6/15/99	WJ	WJ
8	7/15/99	WJ	WJ

DATE	BY	CHKD.
12/15/98	WJ	WJ
1/15/99	WJ	WJ
2/15/99	WJ	WJ
3/15/99	WJ	WJ
4/15/99	WJ	WJ
5/15/99	WJ	WJ
6/15/99	WJ	WJ
7/15/99	WJ	WJ

CONFIDENTIAL

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United Engineers & Constructors
A Bechtel Company

GENERAL ARRANGEMENT PLOT PLAN
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE: 12/15/98
BY: WJ
CHKD.: WJ

PROJECT NO.: C-1033

SCALE: AS SHOWN

7102-E-210000

Best Available Copy

REVISIONS
 1. 11/27/87 BY JRM/MSK
 2. 12/15/87 FOR CLIENT REVIEW & COMMENT.
 3. 12/22/87 REVISED PER CLIENT COMMENTS.
 4. 12/29/87 REVISED PER CLIENT COMMENTS.
 5. 1/5/88 FOR CLIENT REVIEW & COMMENT.
 6. 1/12/88 FOR CLIENT REVIEW & COMMENT.

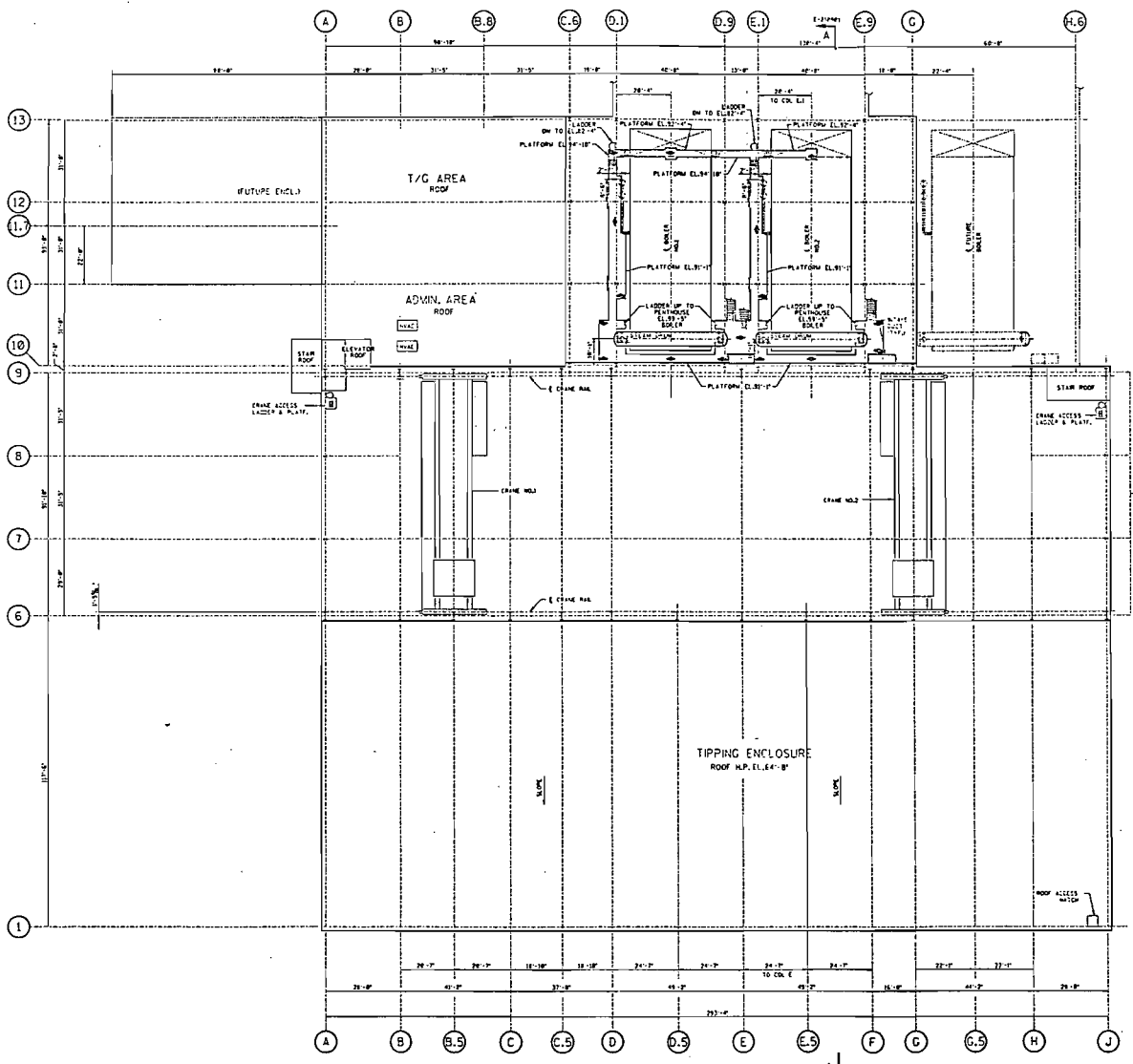
MAYOR L. MORTON

E

D

B

A



NO.	DATE	BY	CHKD.
1	11/27/87	JRM/MSK	
2	12/15/87		
3	12/22/87		
4	12/29/87		
5	1/5/88		
6	1/12/88		

SUBCONTRACTOR	FOR WORKING	FOR ASBID	FOR CONSTRUCTION

COMPANY CONFIDENTIAL
 This drawing and specifications are the property of OGDEN MARTIN SYSTEMS, INC. and are not to be used except as expressly authorized in writing by said company.

OGDEN MARTIN SYSTEMS OF LEE, INC.
 GENERAL ARRANGEMENT PLAN
 STEAM DRUM EL. 94'-5" &
 REFUSE CRANE EL. 89'-0"
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

DATE	BY	CHKD.
11/27/87	JRM/MSK	
12/15/87		
12/22/87		
12/29/87		
1/5/88		
1/12/88		
PROJECT NO.	C-1033	DATE
1/12/88		
SCALE	AS SHOWN	BY
		JRM/MSK
PROJECT	7102-E-210401	DATE
		1/12/88

8 7 6 5 4 3 2 1

0124E
 DISTRAL S.A.
 DEC-91-002

AUXILIARY BURNERS

DISTRAL S. A. shall furnish for each boiler two (2) flexi-pak lox NOx auxiliary burner package assemblies, one for each furnace side wall, by Peabody or Purchaser approved equal. The supply per burner is as follows:

- 1 - Windbox fabricated of 1/4" steel plate with open back for welding to the boiler front plate. The following forced draft fan will be fitted for mounting on top of the windbox.
- 1 - Northern centrifugal forced draft fan, direct connected to a 15 HP, 1800 RPM, TEFC electric motor. The fan will be complete with inlet screen and air control vortex. The capacity will be 10,688 SCFM at 8.79" W.C. at sea level.
- 1 - Bailey Model UP10 rotary actuator for forced draft fan vortex.
- 1 - Burner purge/cooling blower direct connected to a 1750 RPM, T.E.F.C. motor. *

The following equipment will be mounted, piped and wired on the windbox, as far as practicable, except where noted:

- 1 - Peabody type ISC, forced draft burner suitably arranged for balanced furnace firing.
- 1 - Gas care type gas burner.
- 1 - FFM gas-electric ignitor with transformer, electrode and flexible gas hose.
- 1 - Throat sweep

Ignitor Gas Train

- 1 - Ignitor shut-off valve
- 2 - Maxon solenoid shut-off valves
- 1 - Maxon vent solenoid shut-off valve
- 1 - Fisher Y-600 pressure regulating valve
- 1 - "Y" type strainer
- 1 - Leak test cock.
- 1 - 1-1/2" pressure gauge

* INCLUDING INLET ISOLATION VORTEX WITH
 BAILEY ROTARY ACTUATOR.

2

Gas Train Steel/Welded Train

- 1 - Low pressure switch.
- 2 - Maxon automatic safety shut-off valves with end switches.
- 1 - Maxon vent solenoid shut-off valve.
- 1 - Leak test cock.
- 1 - Fisher 1098 EGR-GIL Series pressure regulating valve.
- 1 - Burner shut-off cock.
- 1 - High pressure switch.
- 2 - 3-1/2" pressure gauges.

Flame Safeguard Equipment

- 1 - NEMA-4 electrical control cabinet with the following mounted and wired to terminal strip:
 - 1 - Flame proving relay, Peabody micro-computer controller.
 - 1 - Allen-Bradley programmer controller including:
 - 1 - Microprocessor CPU
 - 1 - Set, inputs
 - 1 - Set, outputs
 - 1 - Cable I/O expander chasis.
 - 1 - Set, output modules, isolated.
 - 1 - Set, output modules, relay.
 - 1 - Set, status light, ready, purging, ignitor on, module failure, flame proven, flame failure.
 - 1 - Flame strength indicator.
 - 1 - Alarm Horn.
 - 1 - Combustion air flow switch.
 - 1 - High steam pressure operating limit switch.
 - 1 - Flame scanner, Peabody FV-03.
 - 1 - Purge air flow switch.
 - 1 - Excess high steam pressure operating limit switch.

Electric Positioning Combustion Controls

(4-20 MA Signals By Others)

- 1 - Maxon gas control valve with low fire interlock *and actuator.*
- 1 - Bailey Model UP10 rotary actuator.
- ~~1 - Maxon gas control valve with low fire interlock.~~
- 1 - "Manual-Automatic" selector switch.

LA

24. Access Doors and Observation Ports

<u>Item</u>	<u>Location</u>	<u>No.</u>	<u>Dimensions</u>	
Access Doors *	Stoker Enclosure	2	36" x 48"	
	Furnace-1st pass	2	18" DIA.	
	Evaporator-2nd pass	-	N/A	
	Evaporator-3rd pass	6	18" DIA	
	2nd/3rd pass hopper	2	24" x 24"	
	Superheater	6	18" DIA.	
	Superheater hoppers	4	24" x 24"	
	Economizer	10	24" x 24"	
	Economizer hopper	2	24" x 24"	
	Air Ducts	2	24" x 24"	
	FG Ducts	2	24" x 24"	
	Observation Ports	Stoker Enclosure	6	8" x 6"
		Furnace-1st pass	6	8" x 6"

25. Economizer Outlet Connection

Flange connection dimension (L X W)	<u>3'-10" x 30'-8"</u> ft.
Centerline elevation	<u>32'-5 7/8"</u>
Distance from outlet flange to rear wall center line	<u>1</u> ft.

26. Specification Compliance:

Other than those exceptions/clarifications listed here, the Contractor confirms full compliance with the specifications, including all attachments. All exceptions/clarifications listed below must include the applicable Specification Section, reference and explanation. If an exception represents a more cost effective design, the Contractor must bid to the Specification and provide a cost option.

* Exclusive of water wash connections and air heater access doors.
-RLT

ATTACHMENT 8

STORAGE OF MARTIN STOKER EQUIPMENT

The following requirements are part of SM-101, Technical Specification for MSW Steam Generators, and shall be complied with by the Boiler Supplier.

1. Large Components:

Large components (such as longitudinal frames, intermediate longitudinal frames, transverse frames, compartment walls, driving beams, transition pieces, grate siftings hoppers, siftings discharge ducts, ash dischargers and feed chutes) shall be covered with well-fastened tarpaulins to protect them against rain water. Tarpaulins shall be brought to grade and tucked neatly under equipment. The storage ground must be dry. Components shall be laid out on top of beams to avoid contact with soil.

Prior to storage, surface coating and paint shall be checked for good condition. Any damage occurred during transport shall be repaired so that rust formation is avoided.

The components shall not be stored on top of each other. Should stock piling be required, beams shall be inserted between components to avoid deformation and to ensure good ventilation.

All roller bearings and spherical bearings which remain fitted during storage are to be checked for sufficient filling with grease. "Exposed" bearing points shall be wrapped in oil paper.

The protective film on machined, uncoated surfaces shall be checked for good condition, and repaired if necessary.

2. Hydraulic cylinders:

Cylinders which remain fitted shall be checked to ensure that the piston rod has entered the cylinder completely and cannot be moved out.

An anti-corrosive film is applied to the piston rod protruding from the cylinder and its machined surfaces in the workshop. Nevertheless, all these points shall be treated with anti-corrosive agent. The spherical bearings must be filled with a sufficient amount of the appropriate type of grease.

Cylinders filled with oil and sealed are not to be exposed to direct sunlight or temperatures exceeding 120°F.

Hydraulic cylinders shipped in cases must remain in their original packing. They must, however, be checked for damage or exposure to moisture during shipping. If cases are wet, they shall be dried and repacked.

Cases shall be stored in a dry and ventilated room.

3. Pneumatic cylinders:

Pneumatic cylinders are shipped loosely packed in cases. Cylinder insides are slightly oiled and sealed. Cylinders shall remain in their original packing if it is still in good condition and shall be stored in a dry and ventilated room.

4. Driving beam support rollers:

Support rollers are either shipped loose, packed in cases, or must be disassembled and packed on site.

Support rollers shipped loose or in cases, shall remain in their original packing, and shall be stored in a dry room. If the original packing is not in good condition, or if rollers must be packed at site, storage crates must be weather tight.

5. Feed ram support rollers:

These rollers shall be removed, placed in weather tight storage crates and stored in a dry room.

6. Driving beam guide rollers:

These rollers shall remain in place.

7. Undergrate air damper control gear and other components shipped as loose items:

The bearing points shall be greased and the components stored in a dry and ventilated room.

8. Grate and feeder surface elements:

These items are delivered on pallets provided with a protective foil. Each panel contains a bag of drying medium. If this has become ineffective due to sea transport, the foil must be removed. The pallets shall be loaded with the castings and stored in a dry and ventilated room.

9. Seal air and pneumatic piping:

These are to be stored in a dry and ventilated room.

10. Hydraulic Pumping Station:

The hydraulic pumping station will be delivered seaworthy-packed and the tank will be filled with sloshing oil up to its head. If the packing is undamaged, the hydraulic pumping station shall be stored in a dry and ventilated room for no more than 6 months.

11. Hydraulic Pneumatic Cabinets:
Hydraulic-pneumatic cabinets are shipped seaworthy- and vacuum-packed. Units shall be stored in a dry and ventilated room for no more than 6 months.

12. Hydraulic Piping:
Piping up to nominal 1/2-inch is galvanized, with ends sealed with plastic plugs. Larger pipe sizes are protected with anti-corrosive coating and sealed ends. Fittings and mounting brackets are galvanized. Devices such as pressure counterbalance valves are wrapped in oil paper and shipped separately. All pipe shall be inspected for plugs and proper coating and repaired as necessary.

13. Electronic Cabinets:
Electronic cabinets are shipped seaworthy and vacuum-packed. Packing shall be inspected for damage and repaired if necessary. Units shall be stored in a dry and ventilated room.

ATTACHMENT 9

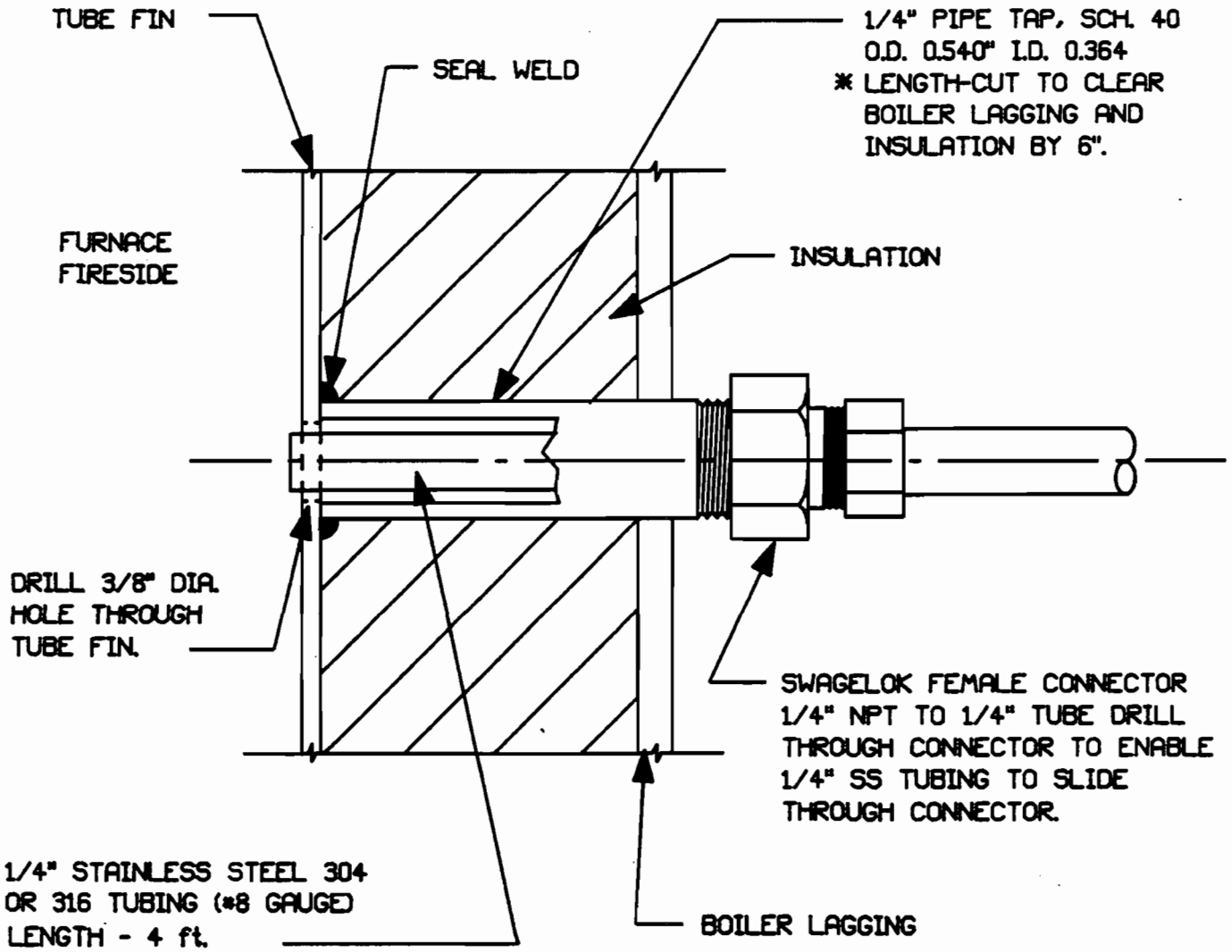
STRUCTURAL STEEL SPECIFICATION

The following structural steel specification, SS-410 Structural Steel, is included as part of this boiler specification. Contractor shall comply with all requirements of this specification.

ATTACHMENT 10

PAINTING SPECIFICATION

The following painting specification, SA-550 Painting Ferrous metals included in Subcontractor's Work, is included as part of this boiler specification. Contractor shall comply with all requirements of this specification.



NOTE: CONTRACTOR SHALL INSTALL PIPE, TAP AND CAP.
PURCHASER WILL PROVIDE PROBE AND FITTINGS.



ATTACHMENT 11
FURNACE SIDEWALL
TEST TAP PENETRATION

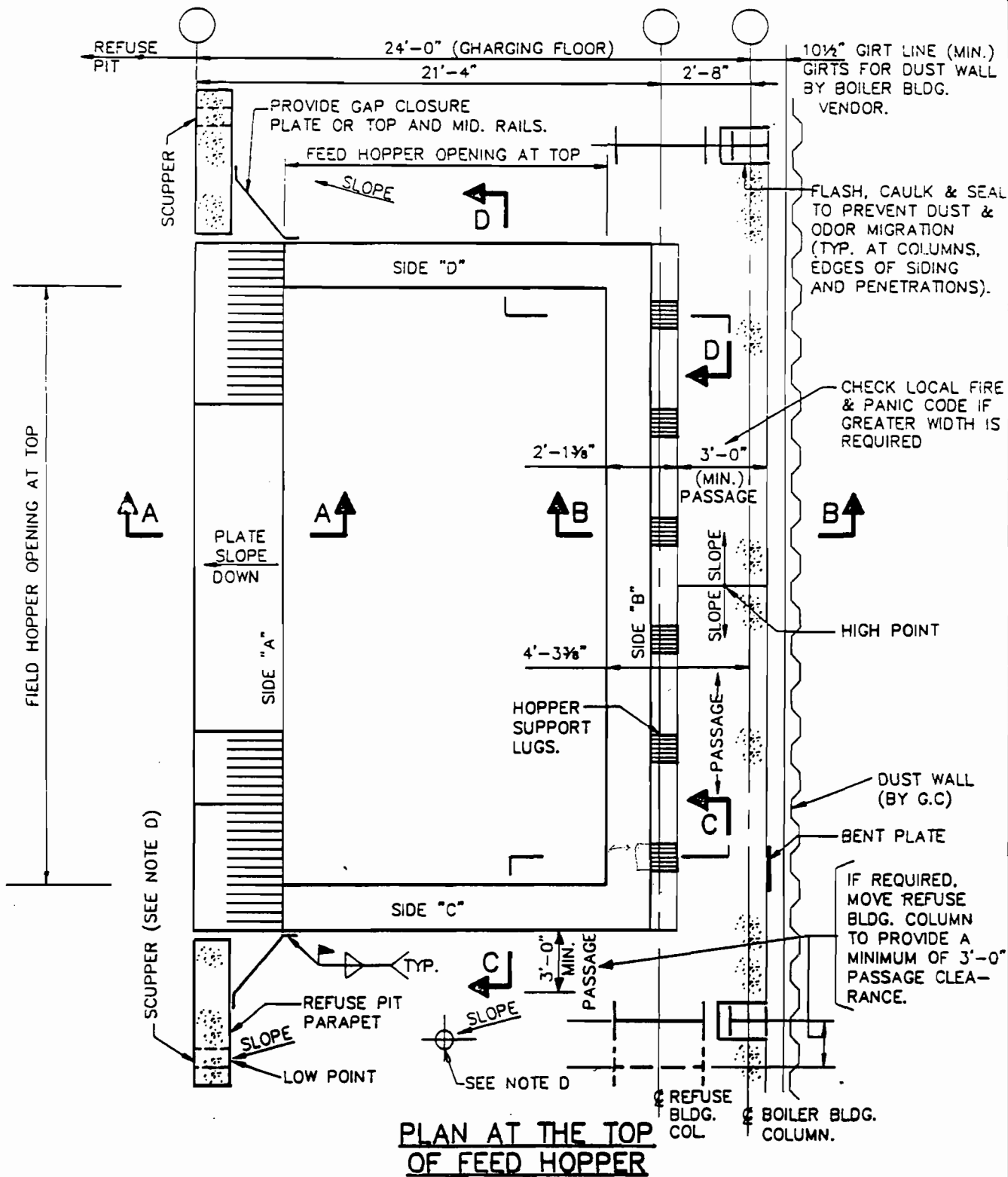
OGDEN PROJECTS, INC.	
APPROVED: <i>[Signature]</i>	DATE: 10-9-90
DWG. No.	REV. 1

ATTACHMENT 12

REFUSE FEED HOPPER SUPPORT AND PASSAGEWAY

The following sketches are included as part of this boiler specification. Contractor shall comply with all requirements of these sketches.

Sketches included are: RS-412A, RS-412B and RS-412C - Martin Feed Hopper Support and Passageway at Charging Floor.



PLAN AT THE TOP OF FEED HOPPER

NOTES:

- A) FEED HOPPER SUPPORTED ON SIDES A & B ONLY.
- B) THERE ARE NO ANCHOR BOLTS CONNECTING FEED HOPPER & SUPPORT BEAM/CONCRETE.
- C) SIDE "B" CARRIES MAXIMUM HOPPER LOAD
- D) WHEN SCUPPERS ARE NOT PERMITTED BY RFP & SERVICE AGREEMENT, USE FLOOR DRAINS.

(ALL ELEVATIONS REFERENCED TO DATUM 0'-0" BOILER FLOOR.)

1 DATUM 0'-0" SUBSTITUTED FOR 100'-0".

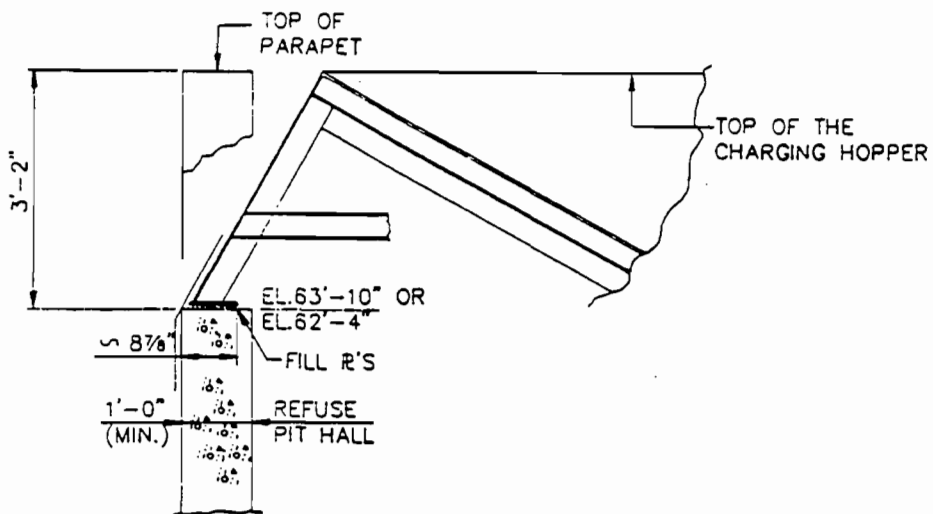
REVISION

OGDEN PROJECTS, INC.

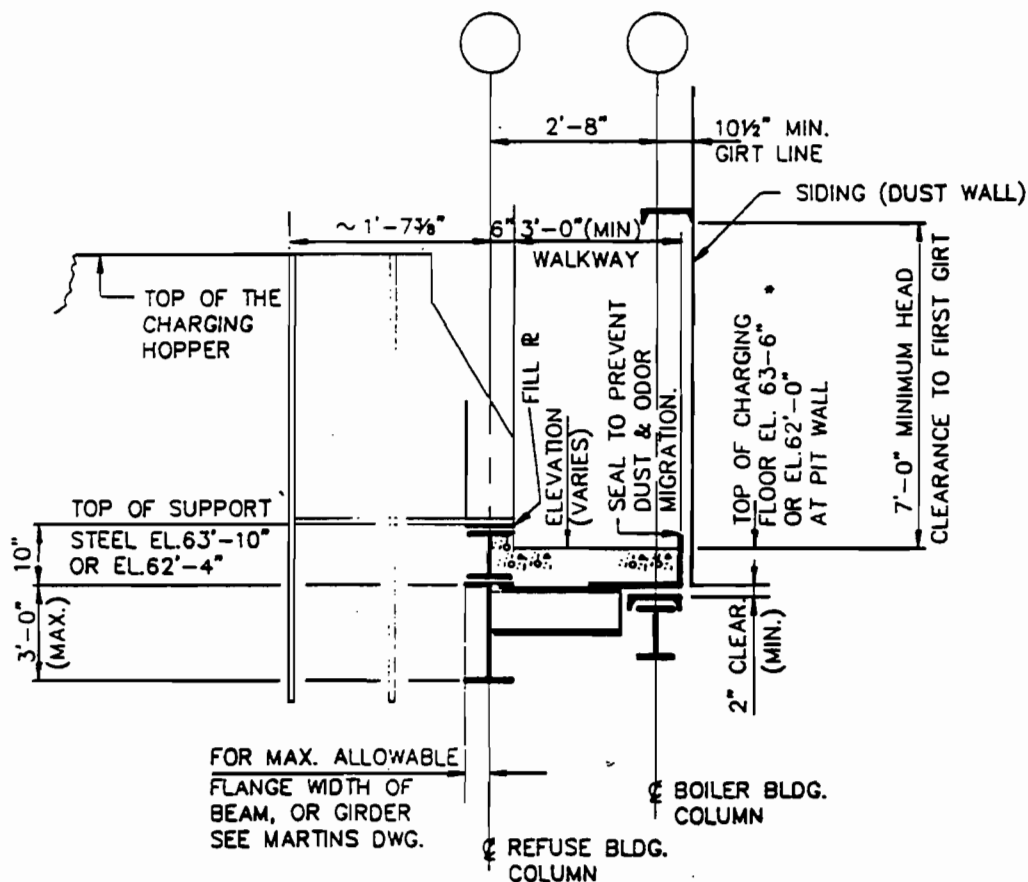
APPROVED PJM	DATE: 8/20/01
DWG. NO. RS-412A	REV. 1



MARTIN REFUSE FEED HOPPER SUPPORT AND PASSAGE WAY AT CHARGING FLOOR



SECTION A-A



SECTION B-B

NOTES:

- * ELEVATION VARIES WITH NUMBER STOKER STEPS
 15 STEPS ELEV.=63'-6"
 18 STEPS ELEV.=62'-0"

WORK THIS STANDARD WITH RS-412A & C

1 DATUM 0'-0" SUBSTITUTED FOR 100'-0".

REVISION

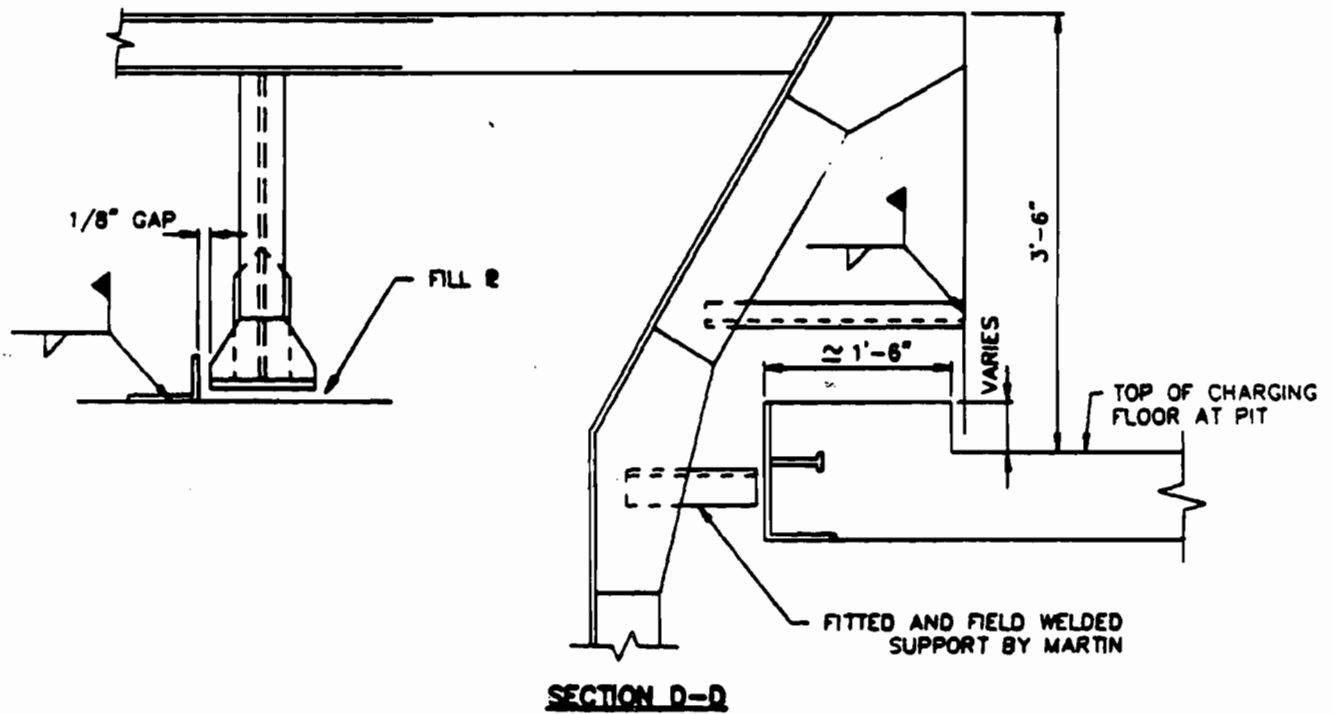
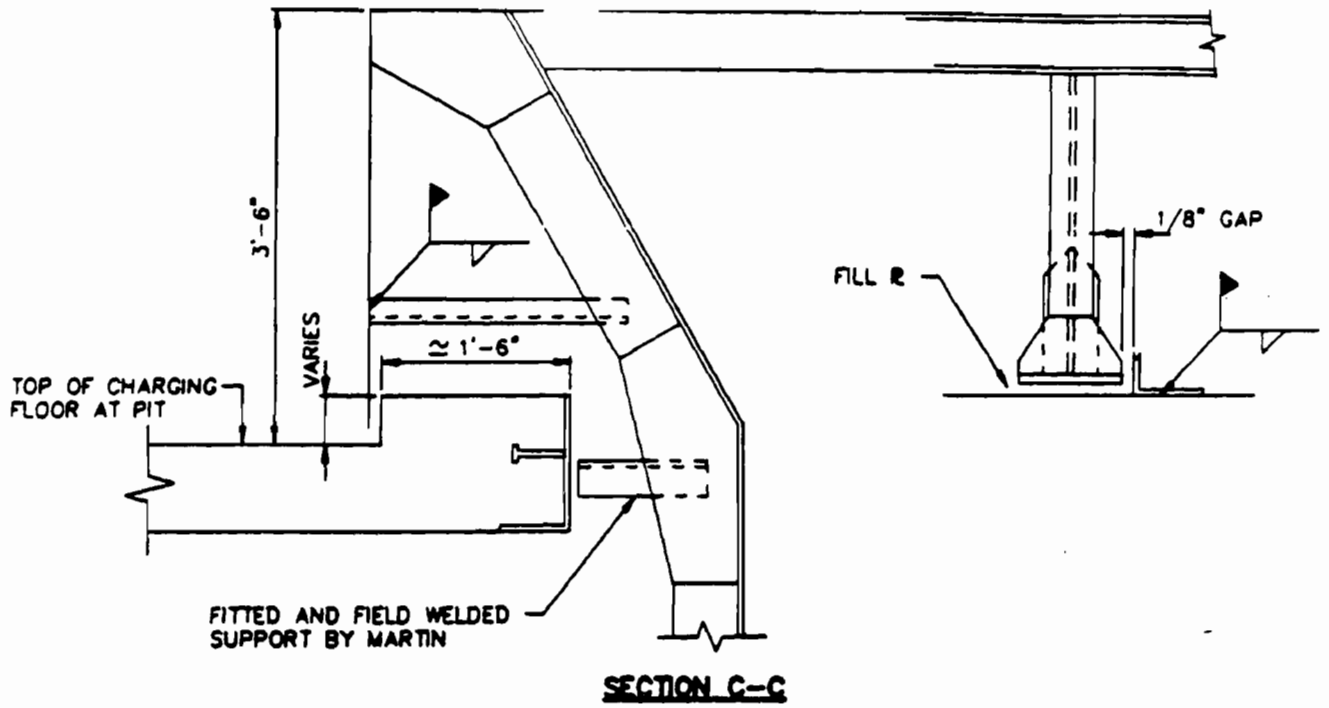
OGDEN PROJECTS, INC.

APPROVED: **PJM** DATE: **8/20/91**

DWG. NO. **RS-412B** REV. **1**



**MARTIN REFUSE FEED HOPPER
 SUPPORT AND PASSAGE WAY**



MARTIN REFUSE FEED HOPPER SUPPORT AND PASSAGE WAY

OGDEN PROJECTS, INC.

APPROVED	DATE
<i>PJM</i>	<i>3/1/70</i>
DRAW. NO.	REV.
RS-412C	0

ATTACHMENT 13

INSTRUCTIONS REGARDING ERECTION OF THE MARTIN STOKER

The following guidelines are part of SM-101, Technical Specification for MSW Steam Generators, and shall be complied with by the Boiler Supplier:

1. Measure and check the grate supporting structure. Fix grate datum point.
2. Hang the undergrate hopper below grate.
3. Fit and bolt the grate front together.
4. Install shop-assembled grate runs. Fit in clinker dam supports and clinker rollers of the field assembled grate runs (for grate with 3 or more runs).
5. Put into place undergrate hoppers and underfire air plenum bottom plates (for grates with 3 or more runs).
6. Fit and bolt bulkheads, grate driving beams, and carrier beams (partly shop-assembled) of the field assembled grate runs.
7. Level out grate front and grate.
8. Weld grate front, grate, and undergrate hopper.
9. Assemble and bolt division plate supports, feed rams, and transition piece.
10. Erect chute as follows:
 - a) Rear wall upper part.
 - b) Side wall upper and center parts. Upper part and center part bolted and welded on the ground.
 - c) Bracing beam.
 - d) Rear wall center parts with chute gates (for grates with 4 or more runs).
 - e) Front wall. Right-hand side front wall upper part, intermediate piece, and center part assembled and welded on the ground. Proceed the same way for left-hand side.
 - f) Hang up buckstays for water jacket front wall on bracing beam or platform (for wide grates).
 - g) Mount segments of water jacket front wall.
 - h) Mount segments of water jacket rear wall.
 - i) Mount water jacket side walls.

- k) Buckstays for water jackets rear and front walls (for wide grates). Chute bolted and welded together.
- 11. Fit in grate structure and adjust as required.
- 12. Mount division plates and compensation blocks between grate runs, side plates and compression plates, top guide assembly for grate driving beams in the field-assembled grate runs, heat shields, seal air lines to driving beam support rollers.
- 13. Put into place ash discharger connecting piece, ash discharger, and ash pit. Complete sifting discharge ducts.
- 14. Assemble and adjust grate surface.
- 15. Fit underfire air control system.
- 16. Run piping systems as follows:
 - a) Chute water jacket supply and drain lines.
 - b) Hydraulic pump, cabinets, and piping.
 - c) Compressed-air piping and cylinders.
 - d) Pressure indicating lines and gauges.
 - e) Grease pump and lines.
 - f) Cooling air lines in grate front.
- 17. Electric systems:
 - a) Limit switch and magnets.
 - b) Local pushbutton stations.
 - c) Measuring transducers for angle of rotation.
 - d) Transmitters.
 - e) Control cabinets.
- 18. Touch-up painting.
- 19. Measures to protect ready-mounted grate:
 - a) Cover grate surface with wood.
 - b) Secure all hydraulic cylinders with piston rods in entered position.
 - c) Secure chute damper in closed position (from top).

Check Sheet

Company Name: LEE COUNTY ENERGY RECOVERY FACILITY
Permit Number: _____
PSD Number: PSD PL-151
Permit Engineer: _____

Application:

- Initial Application
- Incompleteness Letters
- Responses
- Waiver of Department Action
- Department Response
- Other

Cross References:

-
-
-

Intent:

- Intent to Issue
- Notice of Intent to Issue
- Technical Evaluation
- BACT Determination
- Unsigned Permit

Correspondence with:

- EPA
- Park Services
- Other
- Proof of Publication
- Petitions - (Related to extensions, hearings, etc.)
- Waiver of Department Action
- Other

Final Determination:

- Final Determination
- Signed Permit
- BACT Determination
- Other

Post Permit Correspondence:

- Extensions/Amendments/Modifications
- Other

In the folder labeled as follows there are documents, listed below, which were not reproduced in this electronic file. That folder can be found in one of the file drawers labeled Supplementary Documents Drawer. Folders in that drawer are arranged alphabetically, then by permit number.

Folder Name: Lee County Energy Recovery Facility

Permit(s) Numbered:

PSD	FL	-	151
-----	----	---	-----

Period during
which document
was received:

Detailed Description

Period during which document was received:		Detailed Description
APPLICATION 17 JUNE 1993	1.	24"×36" B & W DRAWING: MULTI-FLUE CONCRETE CHIMNEY GENERAL ARRANGEMENT (DRAWING NUMBER: 92-188-1)
17 JUNE 1993	2.	24"×36" B & W DRAWING: FLUE GAS CLEANING SYSTEM GENERAL ARRANGEMENT SIDE ELEVATION (DRAWING NUMBER: 726-GA-02)



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

October 13, 1995

Certified Mail-Return Receipt Requested

Ms. Michelle L. Herman
Environmental Engineer
Ogden Martin Systems, Inc.
40 Lane Road
Fairfield, New Jersey 07007-2615

Dear Ms. Herman:

Enclosed is a copy of an administrative order concerning the request for approval to use the sampling method described in 40 CFR 266 Appendix IX, Section 3.1 for the simultaneous measurement of arsenic (As), beryllium (Be), and lead (Pb) emissions from Ogden Martin's Lee County Solid Waste Resource Recovery Facility, Permit No. PSD-FL-151.

If you have any questions about the above, please call Ramesh Menon at 904/488-6140, or write to me.

Sincerely,

Michael D. Harley, P.E., DEE
P.E. Administrator
Emissions Monitoring Section

Enclosure

cc: Pat Comer, FDEP
David Knowles, South District
Derrick Porter, Ogden Martin
Thomas Eriksen, Ogden Martin

Fold at line over top of envelope to the

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- 1. Addressee's Address
 - 2. Restricted Delivery
- Consult postmaster for fee.

3. Article Addressed to:
 David S. Dee, Esq.
 Sanders + Parsons
 310 West College Ave
 Tallahassee, FL 32301

4a. Article Number
 Z 311 902 920

4b. Service Type
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

7. Date of Delivery
 4-26-95

5. Signature (Addressee)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)
 Amy E. Hendry

Thank you for using Return Receipt Service

Z 311 902 920



Receipt for Certified Mail

No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, March 1993

Sent to	David S. Dee
Street and No.	Sanders + Parsons
P.O., State and ZIP Code	Tall. FL
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	PSD-FI-151(A) 4-25-95
	Lee City Solid Waste

Department of Environmental Regulation
Routing and Transmittal Slip

To: (Name, Office, Location)

1. ~~Clair Jancy~~
2. ~~(Dir) Magrath Center~~
3. ~~MS 5500~~
4. ~~MS 5500~~

Remarks:

4/4
Patty
I believe we need to
modify PSD permit
as of. CLR

AL, 4/6
aren't we processing this?
We have 30 days to
issue the permit (modify)
This is John R's K-
Should be issued after April 14
if no hearing is requested.

From

Richard Wozel

Date

4/3/85

Phone

921-9642

NEWS-PRESS
 Published every morning — Daily and Sunday
 Fort Myers, Florida

Affidavit of Publication

STATE OF FLORIDA
 COUNTY OF LEE

Before the undersigned authority, personally appeared _____

Brenda Leighton

who on oath says that he/she is the _____

Legal Coordinator of the News-Press, a

daily newspaper, published at Fort Myers, in Lee County, Florida; that the

attached copy of advertisement, being a Notice of Intent
to Issue Permit Amended

in the matter of Lee County Solid Waste
Energy Recovery Facility

in the _____ Court

was published in said newspaper in the issues of March 30, 1995

Affiant further says that the said News-Press is a paper of general circulation daily in Lee, Charlotte, Collier, Glades and Hendry Counties and published at Fort Myers, in said Lee County, Florida and that said newspaper has heretofore been continuously published in said Lee County, Florida, each day, and has been entered as a second class mail matter at the post office in Fort Myers in said Lee County, Florida, for a period of one year next preceding the first publication of the attached copy of the advertisement; and affiant further says that he/she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Brenda Leighton

Sworn to and subscribed before me this
thirtieth day of March

19 95 by

Brenda Leighton

who is personally known to me ~~as a person who~~

as identification, and who did or did not take an oath.

Notary Public *Jimmy McDonald*

Print Name _____

My Commission Expires:

CLASS-16



**STATE OF FLORIDA
 DEPARTMENT OF
 ENVIRONMENTAL
 PROTECTION
 NOTICE OF INTENT
 TO ISSUE PERMIT
 AMENDMENT
 PSD-FL-151(A)**

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment to Lee County Solid Waste Energy Recovery Facility, Buckingham Road and State Road 82, Fort Myers, Florida. This facility consists of two mass burn units with a total capacity of 1320 tons per day (550 MMBtu/hr) capable of generating a total of 40 megawatts of power. The amendments include the following: removing the requirement that the furnace roof temperature be maintained at 1270°F, requiring instead that the appropriate minimum furnace roof temperature be established by the Department based on initial startup test data; removing pressure drop monitoring requirements for certain baghouses on non-major sources; and removing the requirement that the flue gases be cooled to an average temperature not to exceed 300°F. These amendments will not cause or contribute to a violation of any air pollution standard or adversely affect the environment.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g) A statement of the re-

lief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

The application/request is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except holidays, at: Department of Environmental Protection, Bureau of Air Regulation, 111 S. Magnolia Drive, Suite 4, Tallahassee, Florida 32301 Department of Environmental Protection, South District, 2295 Victoria Avenue, Suite 364, Fort Myers, Florida 33901

Any person may send written comments on the proposed action to Mr. Al Linero at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered in the Department's final determination.
 P.O. 500615
 Mar 30 No. 9732

AFFIDAVIT OF PUBLICATION

NEWS PRESS

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- 1. Addressee's Address
- 2. Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
David S. Dee, Esq.
Landew & Parsons
310 W. College Ave
Tallahassee, FL
32301

4a. Article Number
Z 311 902 948

4b. Service Type
 Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

7. Date of Delivery
3-23-95

5. Signature (Addressee)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)
Deah Carson

PS Form 3811, December 1991 U.S. GPO: 1993-352-714 **DOMESTIC RETURN RECEIPT**

Thank you for using Return Receipt Service.

Z 311 902 948



Receipt for Certified Mail

No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, March 1993

Sent to <i>D. Dee</i>	
Street and No. <i>Landew & Parsons</i>	
P.O., State and ZIP Code <i>Tall. FL</i>	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date <i>Lee Cty</i>	<i>3-22-95</i>
<i>PSD-FI-151(A)</i>	

Fold at line over top of

Is your RETURN ADDRESS completed on the reverse side

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
 Mr. G. J. Aldina, Sr. Vice Pres.
 Environmental Testing/CEM
 Ogden Projects, Inc.
 40 Lane Road
 CN 2615
 Fairfield, N.J. 07007-2615

4a. Article Number
 Z 751 859 994

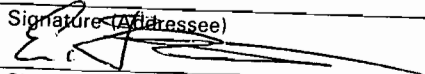
4b. Service Type

Registered Insured

Certified COD

Express Mail Return Receipt for Merchandise

7. Date of Delivery
 OCT 20 1994

5. Signature (Addressee)


8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)

PS Form 3811, December 1991 *U.S. GPO: 1992-323-402

DOMESTIC RETURN RECEIPT

Thank you for using Return Receipt Service.

Z 751 859 994



Receipt for Certified Mail

No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

Sent to Mr. G. J. Aldina	
Street and No. 40 Lane Road	
P. O., State and ZIP Code Fairfield, N.J. 07007-2615	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 10/17/94 PSD-FL-151(A)	

PS Form 3800, March 1993

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece.
- Write "Return Receipt Requested" on the mailpiece below the article number, does not permit.
- The Return Receipt will show to whom the article was delivered and the date delivered.

RECEIVED

MAY 25 1994

Bureau of

I also wish to receive the following services (for an extra fee):

- 1. Addressee's Address
- 2. Restricted Delivery

Consult postmaster for fee.

Article Number

P 872 563 615

Air Regulation

3. Article Addressed to:
Mr. Joseph R. Treshler
Vice President

Ogden Martin Systems, Inc.
350 N. Falkenburg Drive
Tampa, Florida 33619

- 4b. Service Type
- Registered
 - Insured
 - Certified
 - COD
 - Express Mail
 - Return Receipt for Merchandise

7. Date of Delivery

5/16

8. Addressee's Address (Only if requested and fee is paid)

- 5. Signature (Addressee)
S Carr
- 6. Signature (Agent)

PS Form 3811, December 1991... *U.S. GPO: 1992-323-402

DOMESTIC RETURN RECEIPT

Thank you for using Return Receipt Service.

*Re Mailer
5/11/94
note address
blank*

P 872 563 619



Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

Sent to Mr. Joseph R. Treshler	
Street and No. P. O. Box 709	
P.O., State and ZIP Code Brandon, Florida 23509-0709	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 5/5/94 PSD-FL-151	

PS Form 3800, JUNE 1991

P 872 563 615



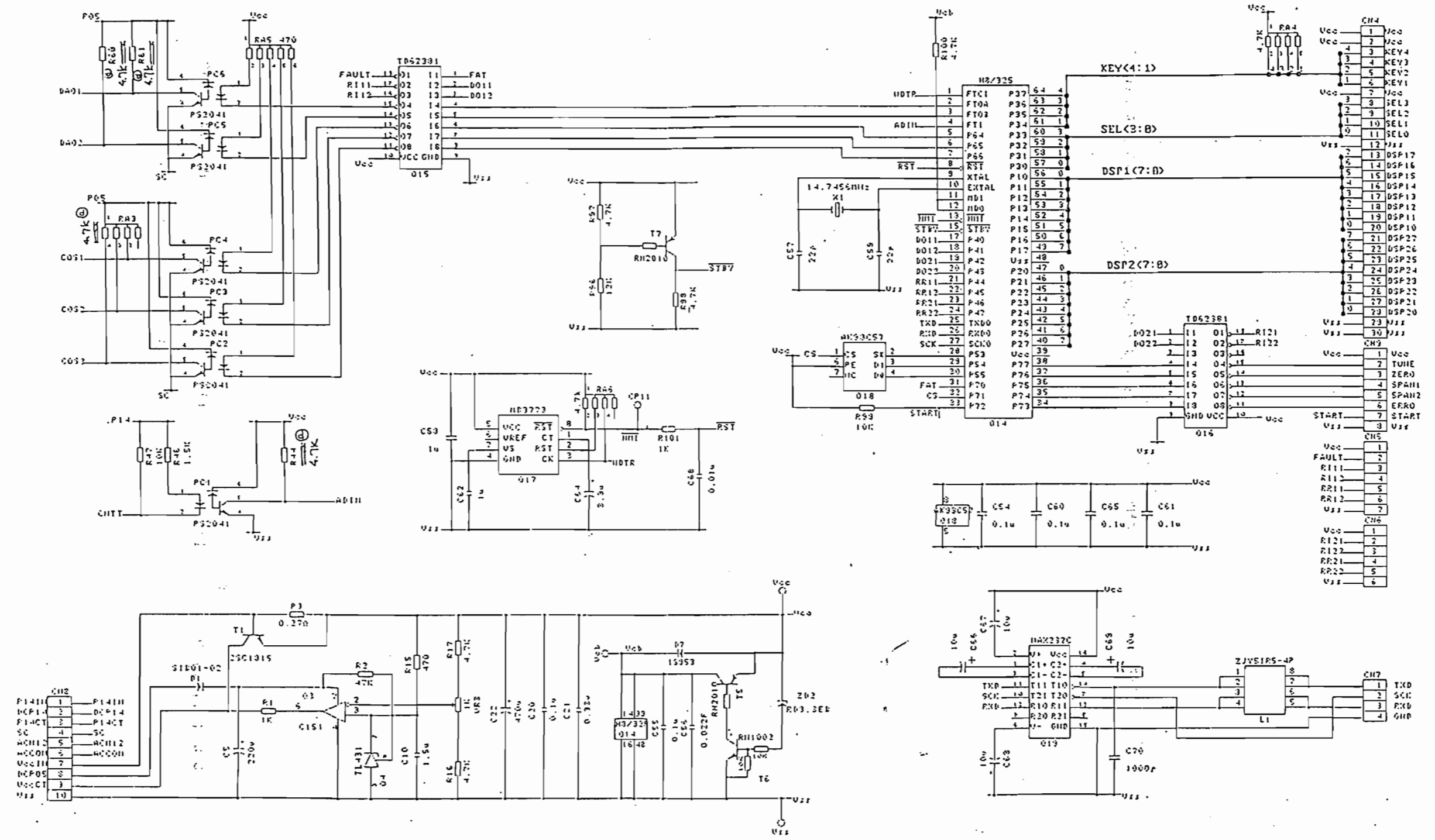
Receipt for Certified Mail

No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

Sent to Mr. Joseph R. Treshler	
Street and No. 350 N. Falkenburg Drive	
P.O., State and ZIP Code Tampa, Florida 33619	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date Mailed: 5/11/94 PSD-FL-151	

PS Form 3800, JUNE 1991

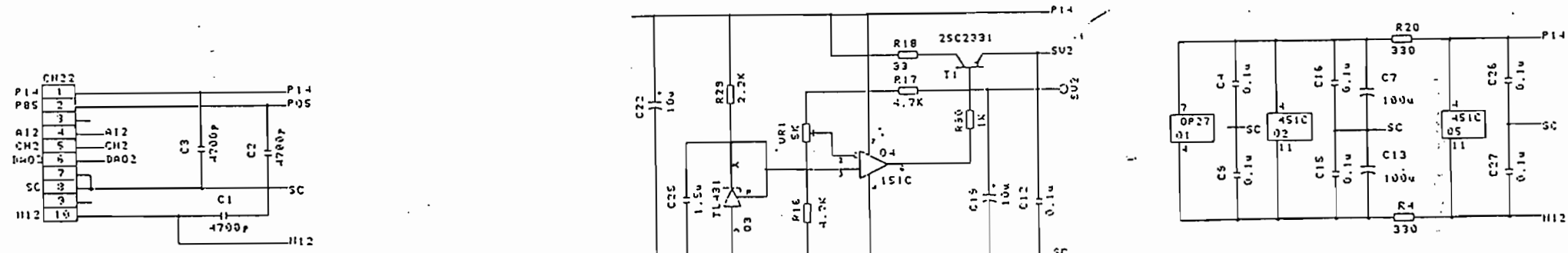
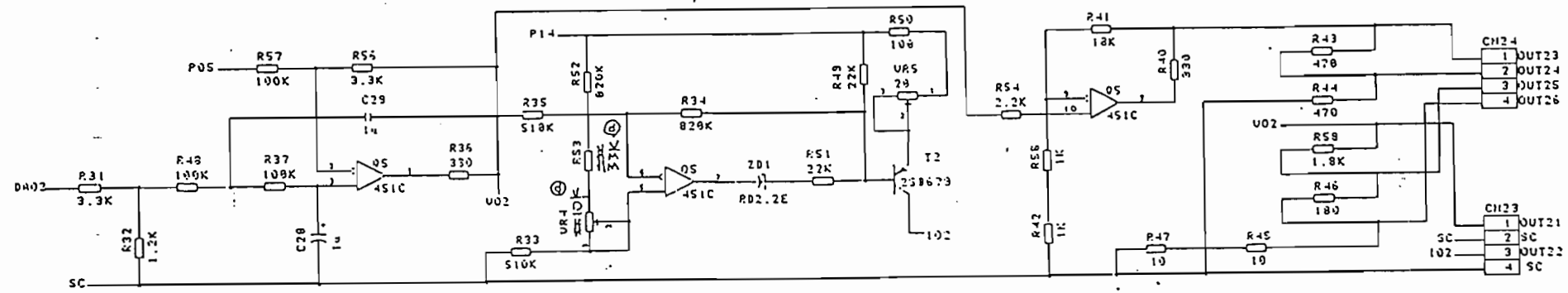
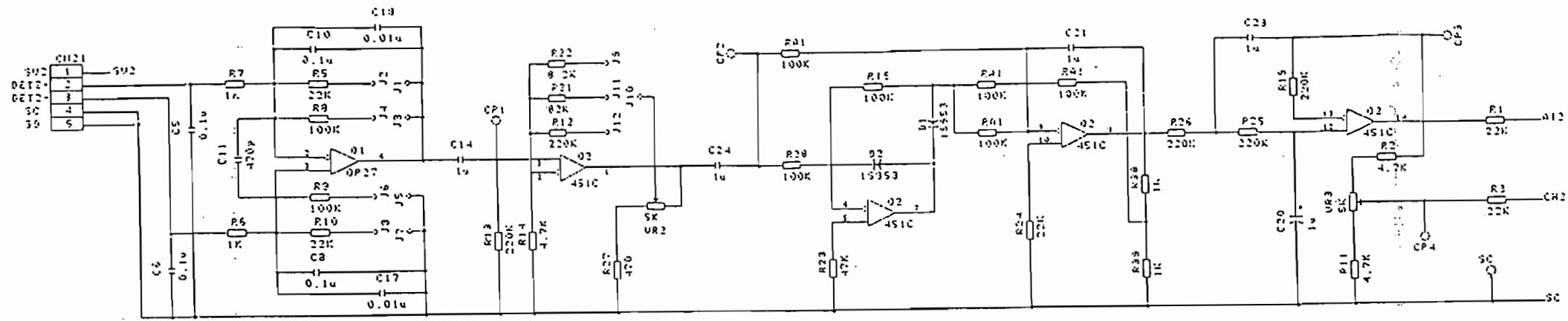
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A
B
C
D

REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DWG CODE
DRAWN					1st COMP. P.C.B (ZRH)	-8.2-
CHECKED						
Fuji Electric Co., Ltd.					REF.	

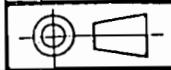
2/2



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REVISIONS	DATE			NAME	APPROVED	SCALE
	DRAWN	CHECKED				

Fuji Electric Co., Ltd.



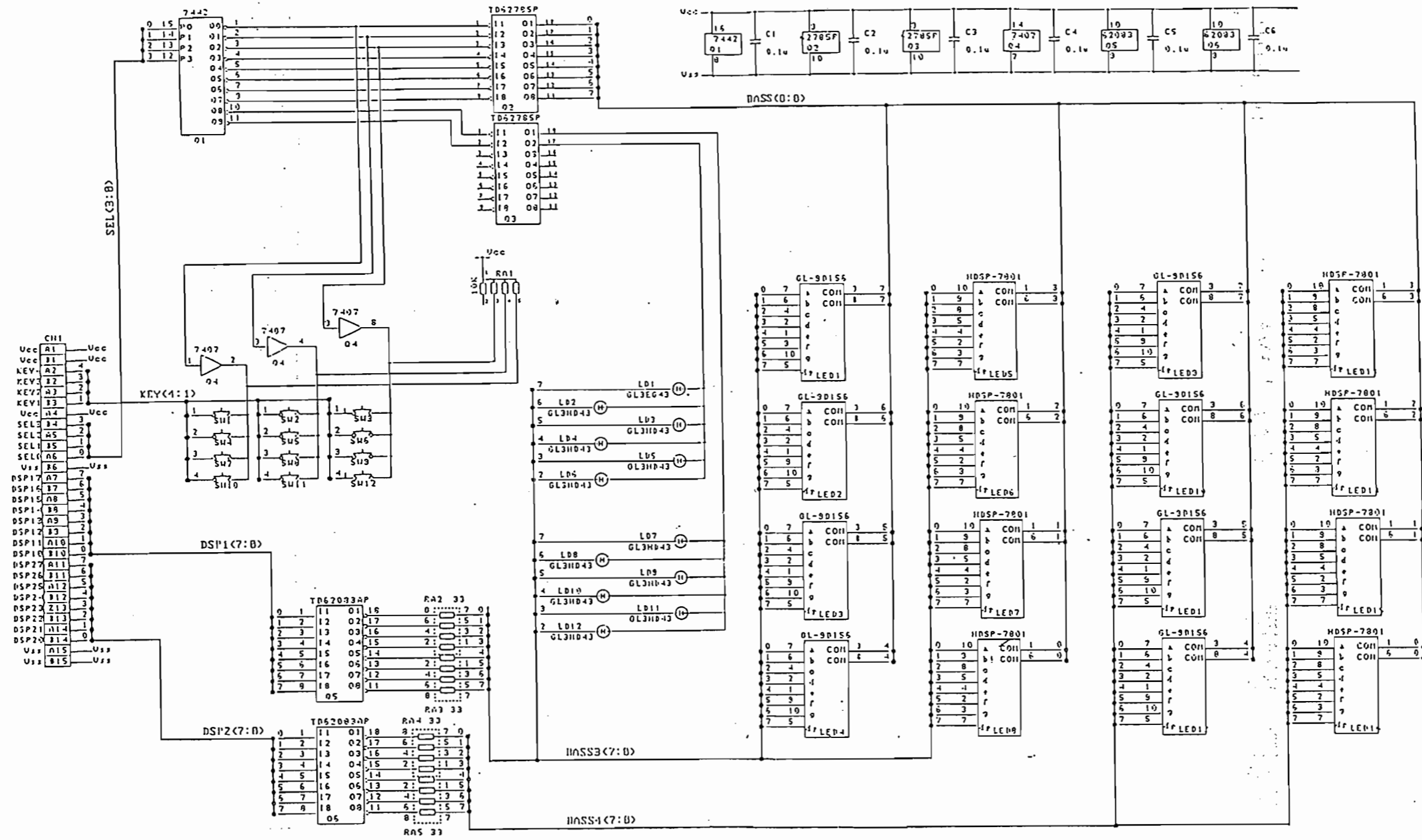
TITLE

2nd COMP. P.C.B
(ZRH)

-8.3-

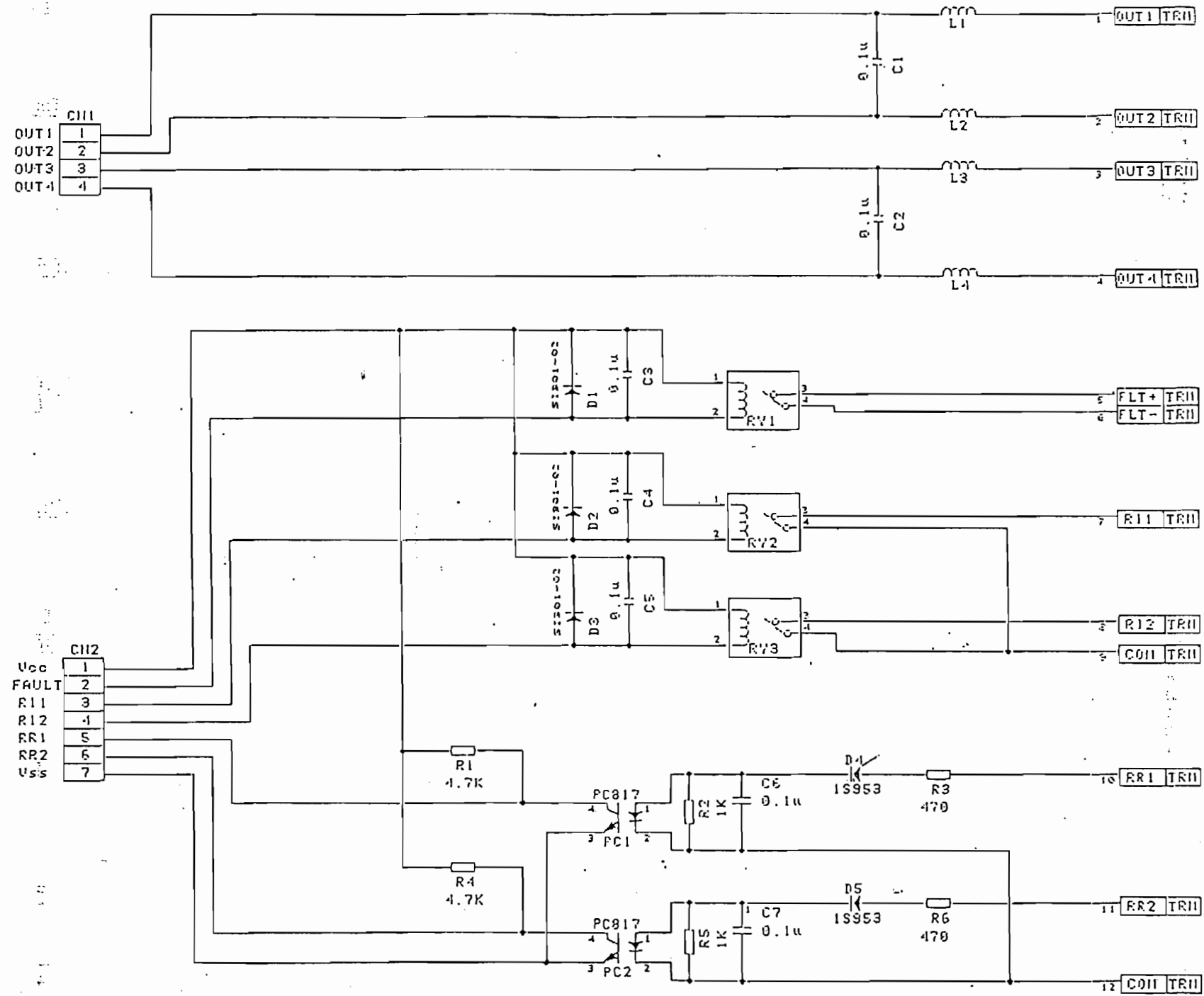
DRAWING NO.	DATE	BY	CHECKED	DATE

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REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO. DWG CODE
	DRAWN	CHECKED				
					DISPLAY P.C.B.	
					(ZRH)	
					-8.4-	

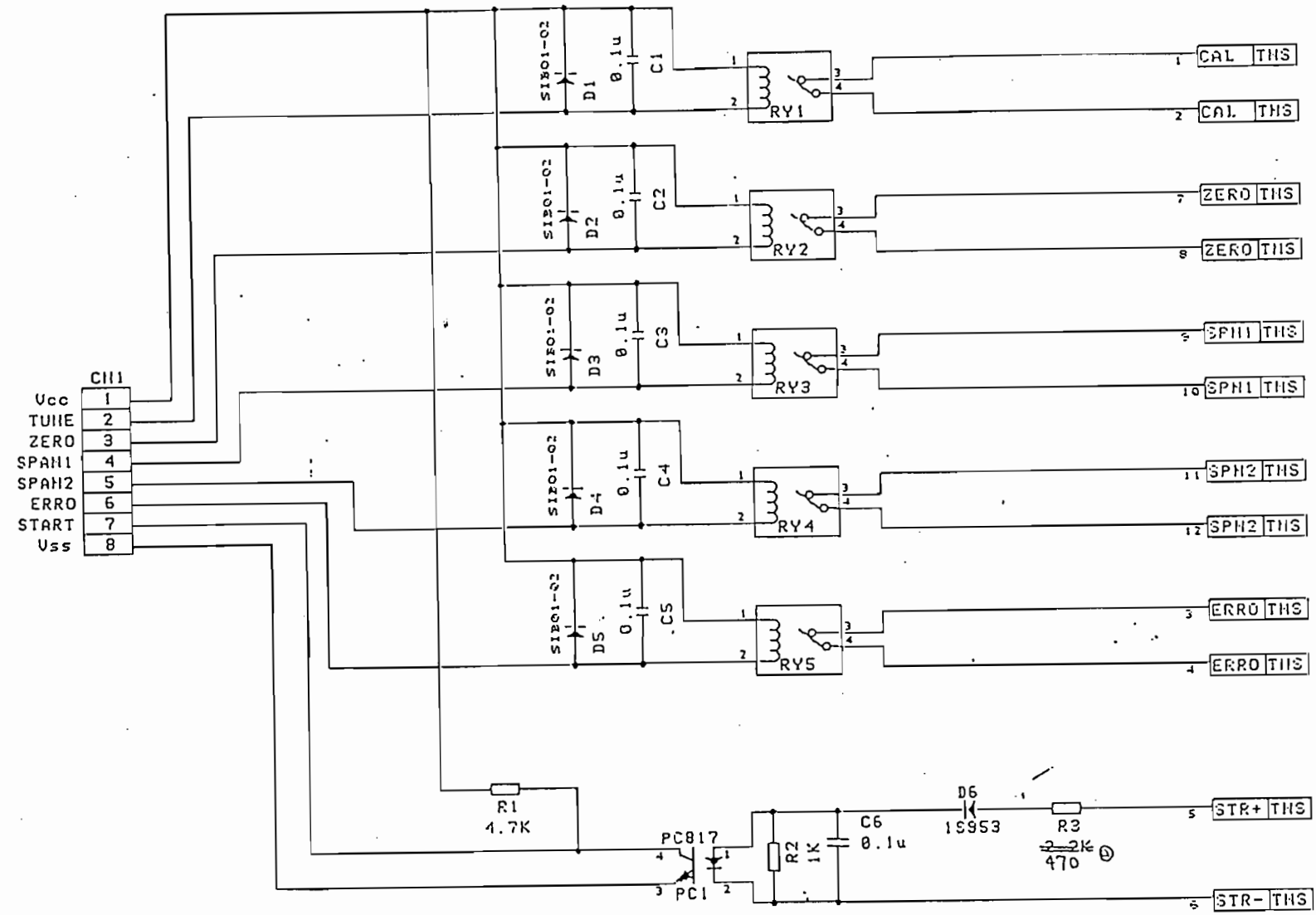
Best Available Copy



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REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO. (Dwg. Code)
	DRAWN	- -				
CHECKED	- -					
Fuji Electric Co., Ltd.				REF.		
					OUTPUT P.C.B (COMP1) (ZRH)	
					-8.5-	

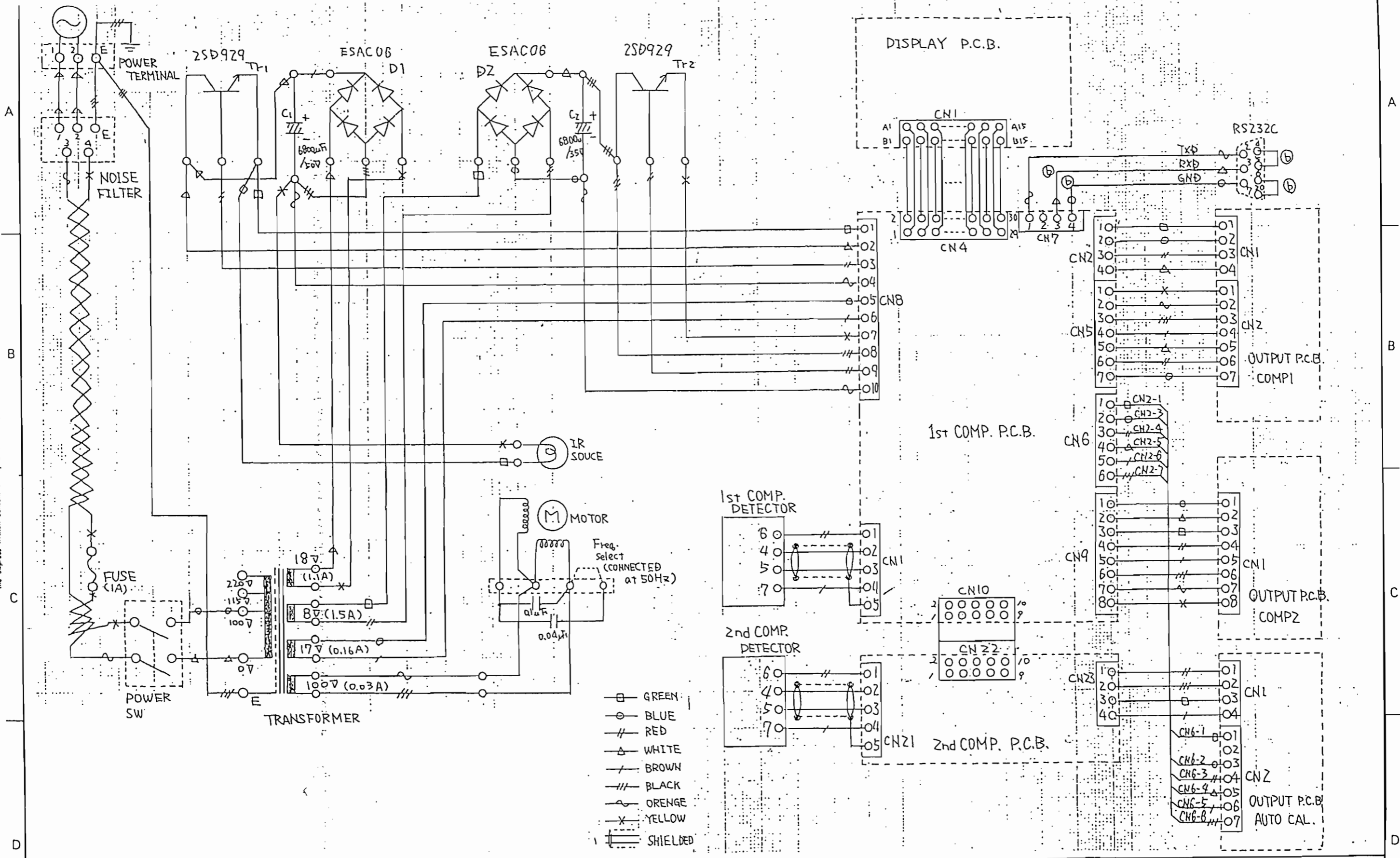
Best Available Copy



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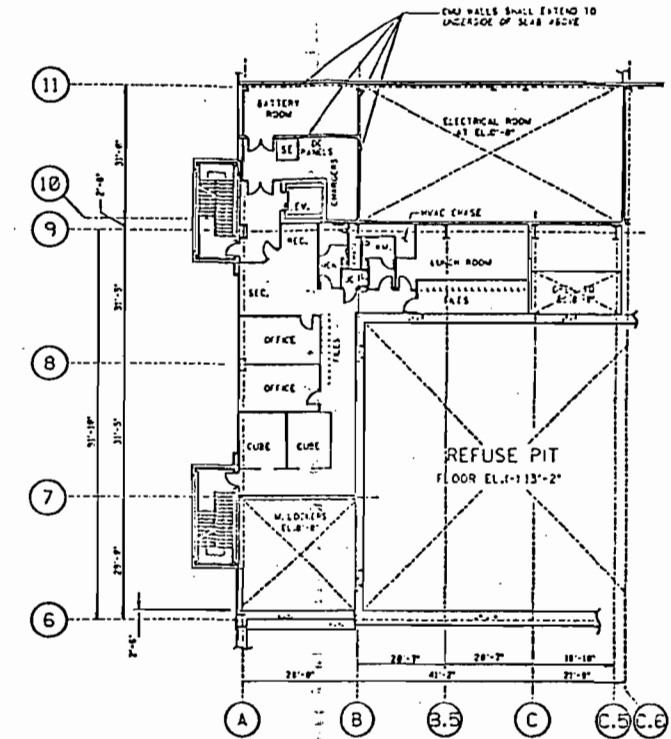
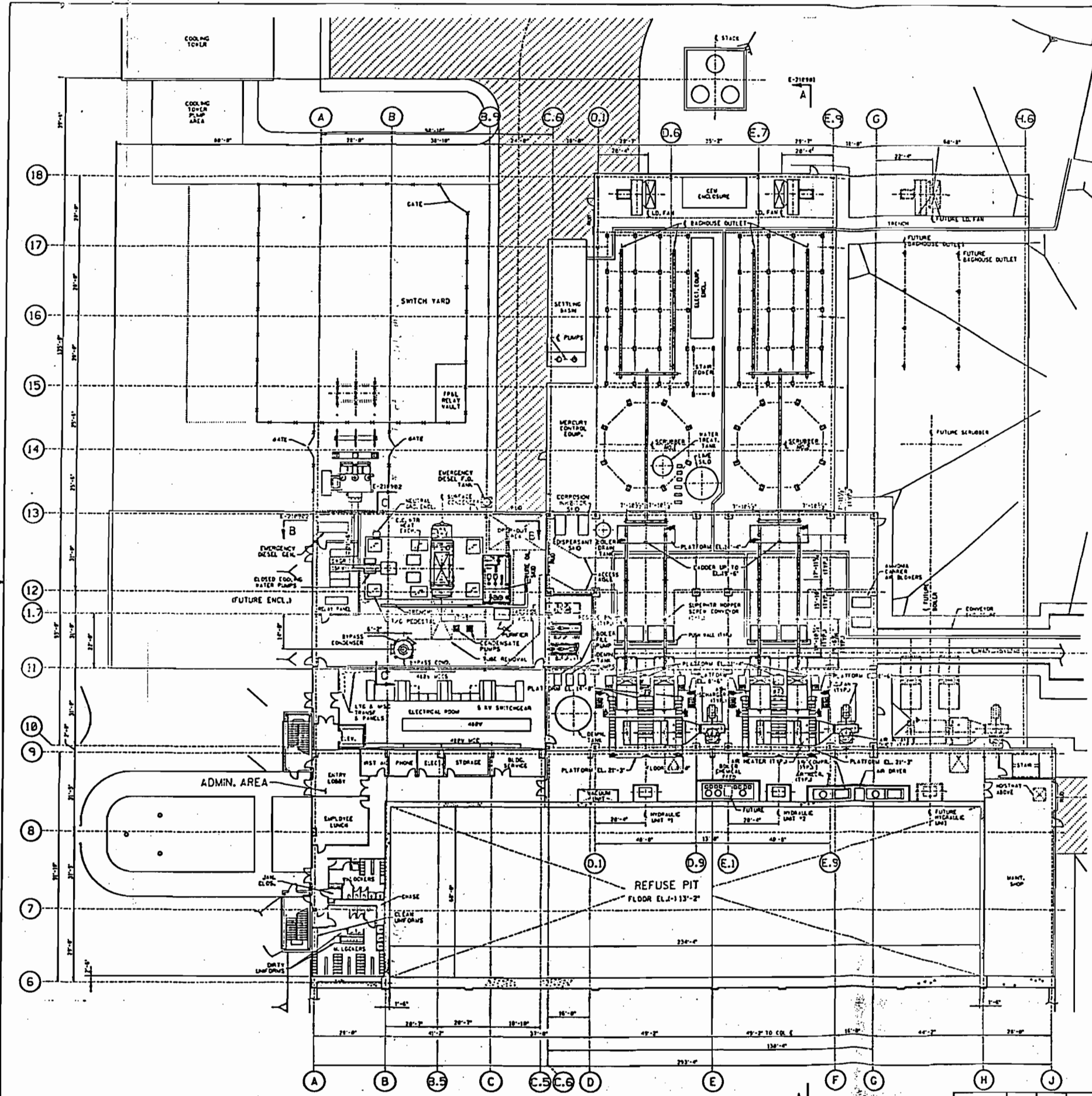
REVISIONS	DRAWN		DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO.	Dwg Code	
	CHECKED									
	Fuji Electric Co., Ltd.				REF.					
	OUTPUT PCB (AUTO CAL)									
	(ZRH)									
								-3.6-		

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- GREEN
- BLUE
- # RED
- △ WHITE
- ∕ BROWN
- ≡ BLACK
- 〰 ORENJE
- × YELLOW
- SHIELDED

REVISIONS	DATE	NAME	APPROVED	SCALE	TITLE	DRAWING NO. DWGCODE
	DRAWN	-	-			
CHECKED	-	-				



PARTIAL PLAN EL.14'-3"

NOTE:
L. BOILER FINISH FLOOR EL.14'-0" ± 24'-2"

SM-105
ATTACHMENT 8
(SHEET 1 OF 2)

REVISIONS

4-28/84/92	PRELIMINARY	SEE ISSUE FOR CLIENT REVIEW & COMMENTS.
5-17/84/92	REVISED 25% SCHEDULE COMPLETION, P.D. FAN, LUBE OIL SMO. UNIT & PER CLIENT COMMENTS. EL. 14'-0" ± 24'-2" WAS 25'-0"	
6-22/84/92	REVISED P.D. FAN AIR HEATER, BOILER FEED PUMPS, CONDENSATE PUMPS & ADMIN AREA. LUBE OIL PURIFIER. SEE ISSUE FOR CLIENT COMMENTS & REVIEWS.	

NO.	DATE	BY	CHKD.	DESCRIPTION
1				
2				
3				
4				

FOR CONTRACT	FOR BOODING	FOR AWARD	FOR CONSTRUCTION

COMPANY CONFIDENTIAL
This drawing and all information contained hereon are the property of OGDEN MARTIN SYSTEMS, INC. and are not to be used except as expressly authorized in writing by said company.

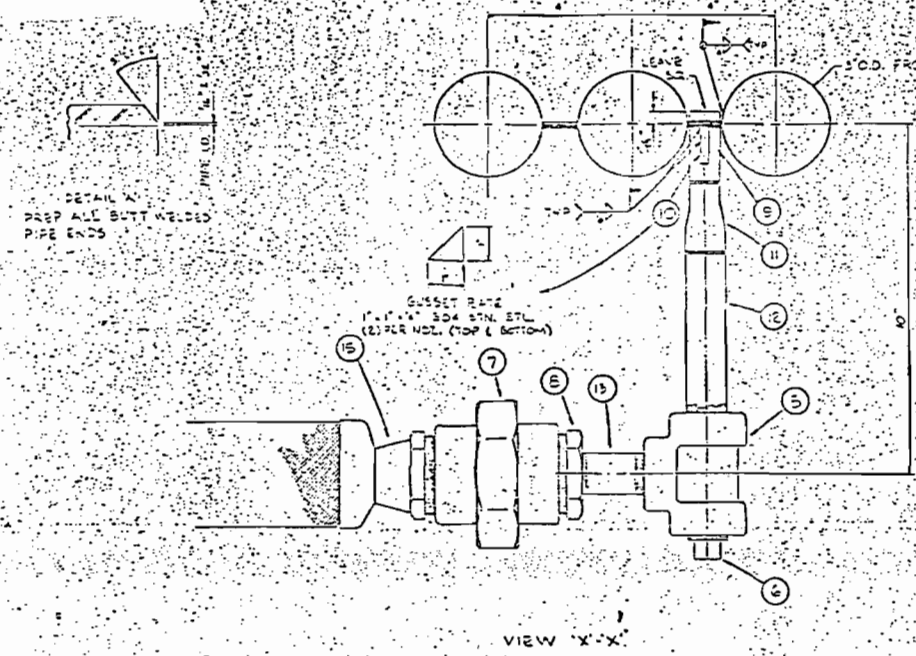
United Engineers & Constructors
A Day & Zimmermann Company

GENERAL ARRANGEMENT PLAN
FLOOR EL. 0'-0" & EL. 14'-3"
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

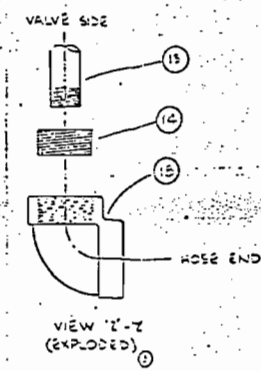
OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	12/28/92	NO.	
BY	gk	PROJECT NO.	C-1033
CHKD.	4/4/93	SCALE	1/4" = 1'-0"
DATE	4/4/93	PROJECT NO.	7102-E-210101

Best Available Copy

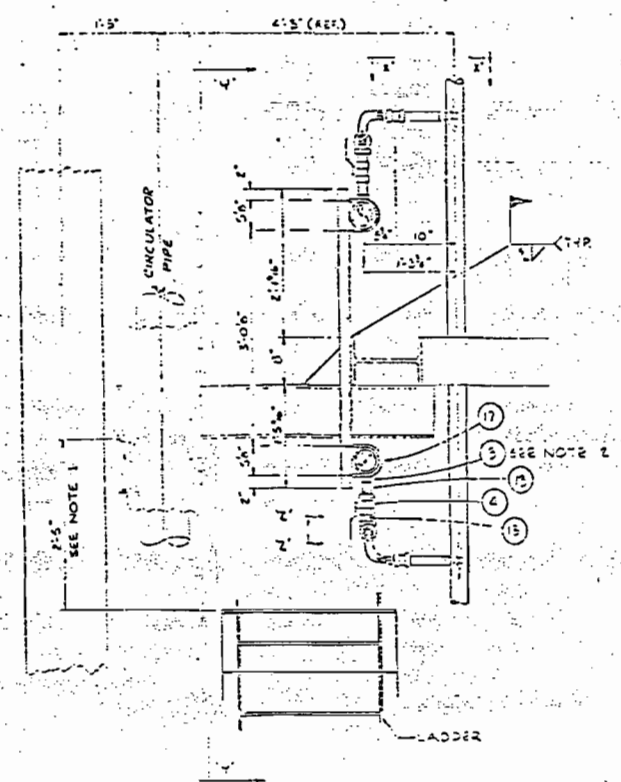
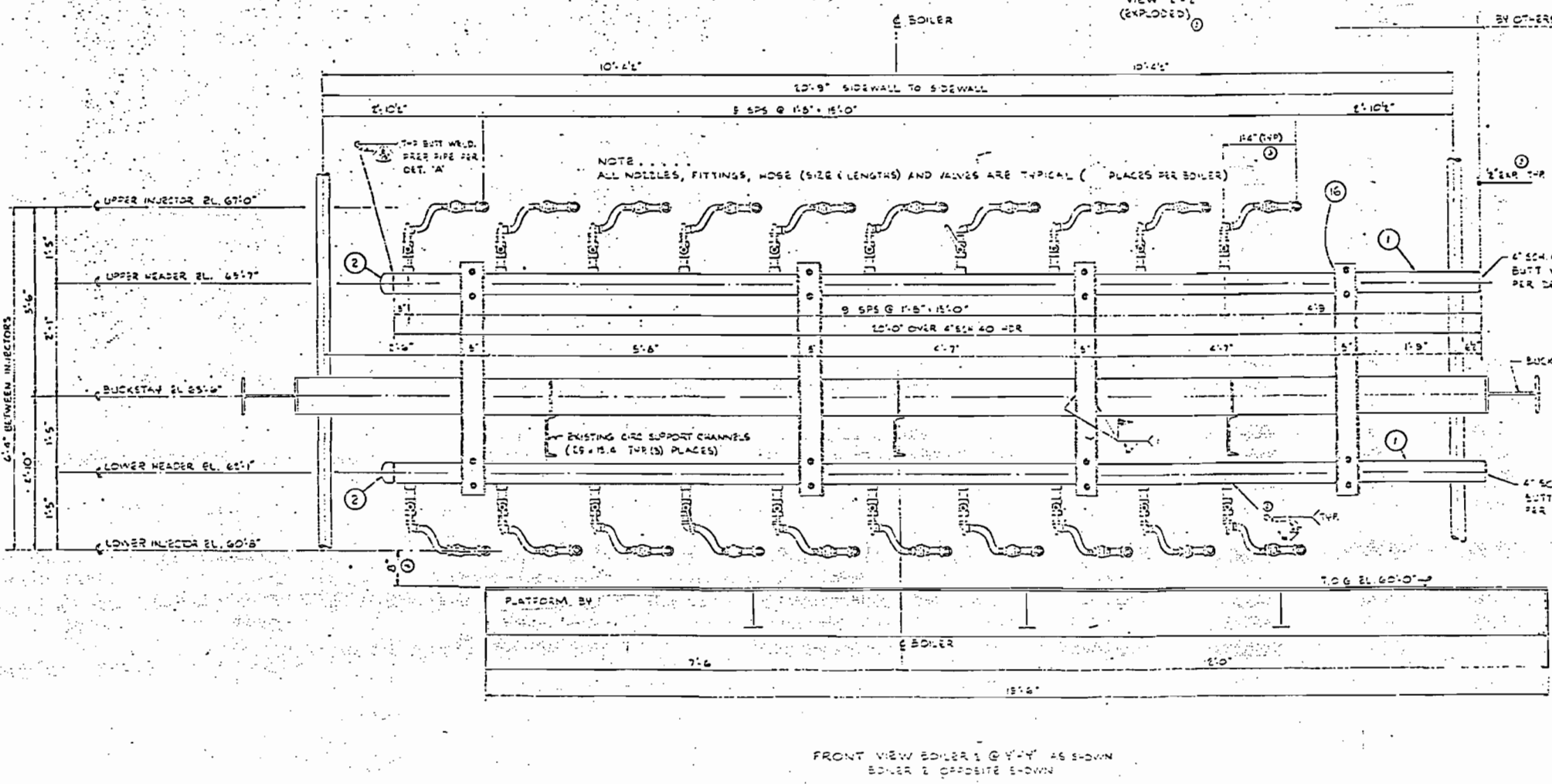


NOTE:
1. ACCESS TO HEADER AND NOZZLE LOCATION WILL BE
RESTRICTED BY (3) CIRCULATOR SUPPORT CHANNELS HUNG
OFF THE BUCKSTAY AT THE FRONT OF THE BOILER.
2. BDRS SIDE FOR 1" THRODLET IN HEADER & 1/2"
3. QUANTITIES SHOWN ARE FOR (1) UNIT.



ITEM NO.	QTY	DESCRIPTION
1	2	PIPE, (HEADER) 4" SCH. 40 x 20'0" LG. SA-106-B
2	2	CAP, 4" SCH. 40, SA-106 WPB, BUTT WELD
3	10	THRODLET, 3/4" x 1-1/2" LG. A-106 F.S.
4	10	BALL VALVE, 1" STL, SCR ENDS, TEFLOON SEALS, JAMESBURN NO. 251220TL, OR EQUAL
5	10	TEE, 1-1/2" LG. A-106 SCR.
6	10	PLUG, 1" SQ HD. F.S. A-106 SCR.
7	10	UNION, FEMALE, 2" x 1-1/2" LG. A-106 F.S. SCR.
8	10	BUSHING, HEX HEAD, 2" x 1-1/2" LG. A-106 F.S. SCR.
9	10	PIPE, 1" SCH. 40 316 STAINLESS STL, NOZZLE x 2' LG.
10	40	GUSSET PLATE, 7" x 1" x 1/4" STN. STL. SCA
11	10	REDUCER, CONCENTRIC 1" x 2", 316 STN. STL. OR 304 STN. STL. S/W
12	10	PIPE NIPPLE, 1" SCH. 80 x 3/4" LG. SA-106-B (T.O.E.)
13	10	PIPE NIPPLE, 1" SCH. 80 x 3" LG. SA-106-B (THREADED)
14	10	FLUSH BUSHING, 2" x 1-1/2" LG. A-106 F.S.
15	10	HOSE, FLEXIBLE, 2" I.D. x 2'0" LG. FLEXONICS TYPE 401, 304 STN. STL. W/ WALLE PIPE ENDS, OR EQUAL
16	4	CHANNEL, C S 16.7 IS A-36
17	8	U-BOLT W/NUTS, FIGURE 104, 4" PIPE SIZE, POWER DRIVING, OR EQUAL
18	10	ELBOW, 2" x 90° A-106 F.S. SCREWED

DESIGN CONDITIONS:
MEDIA: AIR & AMMONIA MIXTURE
DESIGN PRESSURE: 50 PSIG
DESIGN TEMPERATURE: 250° F



ATTACHMENT 1A

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

If you also wish to receive the following services (for an extra fee):

1. Addressee's Address
2. Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30308

4a. Article Number

P 832 538 757

4b. Service Type

- Registered Insured
 Certified COD
 Express Mail Return Receipt for Merchandise

7. Date of Delivery**5. Signature (Addressee)****6. Signature (Sender)****8. Addressee's Address (Only if requested and fee is paid)**

PS Form 3800, October 1990

U.S. GPO: 1990-273-861

DOMESTIC RETURN RECEIPT

P 832 538 757

**Certified Mail Receipt**

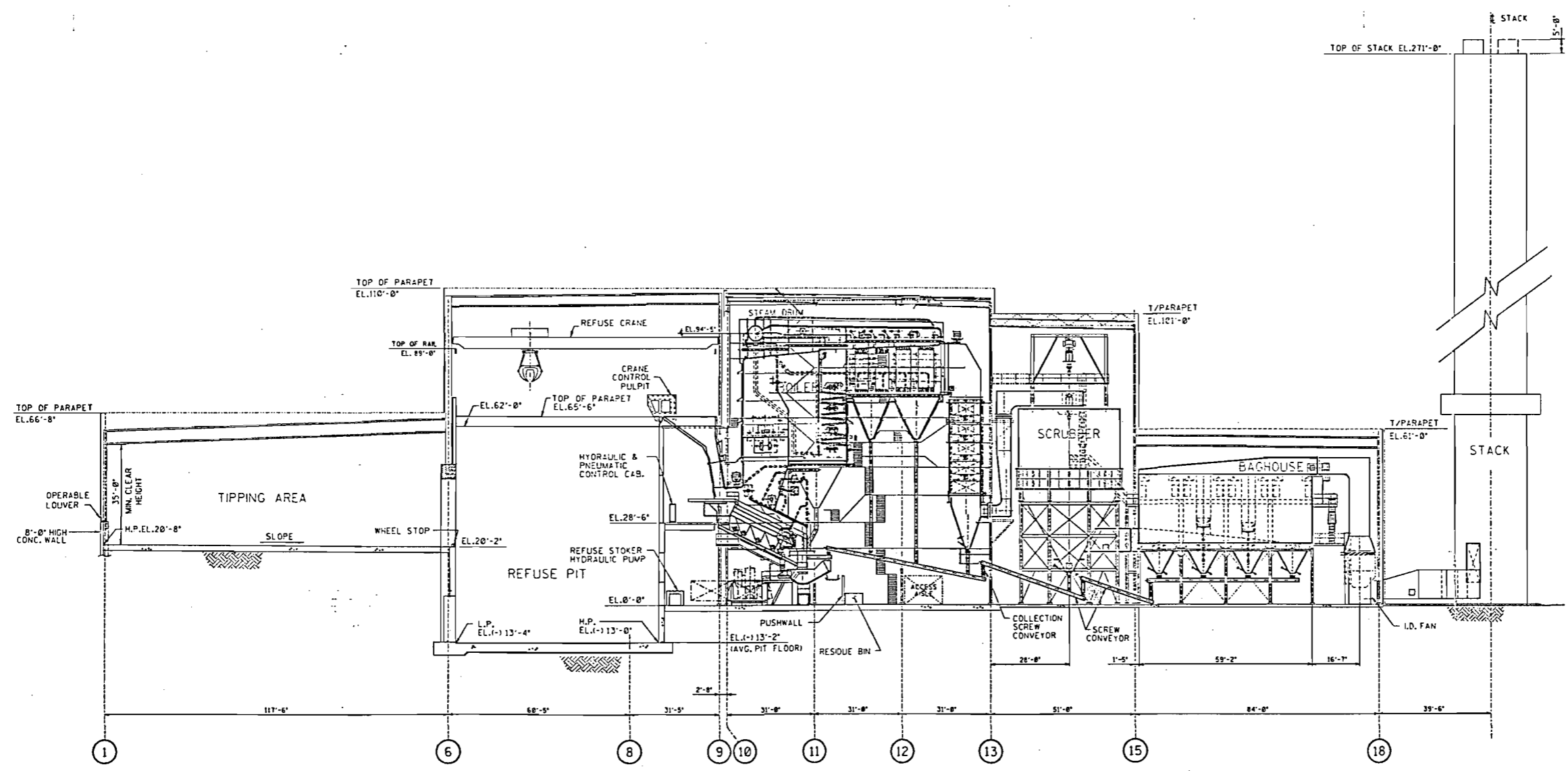
No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

Sent to	
Ms. Jewell A. Harper, EPA	
Street & No.	
345 Courtland Street, N.E.	
P.O., State & ZIP Code	
Atlanta, Georgia 30308	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Address of Delivery	
TOTAL Postage & Fees	\$
Postmark or Date	
Mailed: 12-17-91	
Permit: PSD-FL-151	

PS Form 3800, June 1990

REVISIONS
 A-85/84/92-PRELIMINARY
 1ST ISSUE FOR CLIENT
 REVIEW & COMMENTS.
 B-12/84/92-REVISED
 BOILER AREA, SCRUBBER,
 BAGHOUSE, LD. FAN &
 SCREW CONVEYORS
 C-02/88/93-REVISED
 APC AREA & SCREW
 CONVEYORS, REFUSE
 CRANE ELEVATION
 982 ISSUE FOR CLIENT
 REVIEW & COMMENTS.

2109901A.DGN 02/03/93



SECTION A-A

NO.	REVISION	DATE	BY	CHKD BY
1	ISSUE FOR CONSTRUCTION			
2	ISSUE FOR CONSTRUCTION			
3	ISSUE FOR CONSTRUCTION			
4	ISSUE FOR CONSTRUCTION			
5	ISSUE FOR CONSTRUCTION			
6	ISSUE FOR CONSTRUCTION			
7	ISSUE FOR CONSTRUCTION			
8	ISSUE FOR CONSTRUCTION			

SUBCONTRACT OR PURCHASE ORDER	FOR BIDDING	FOR AWARD	FOR CONSTRUCTION

COMPANY CONFIDENTIAL
 This drawing and all information contained herein are the property of Oden Martin Systems, Inc. and are not to be used except as expressly authorized in writing by said company.

United Engineers & Constructors
 A Raytheon Company

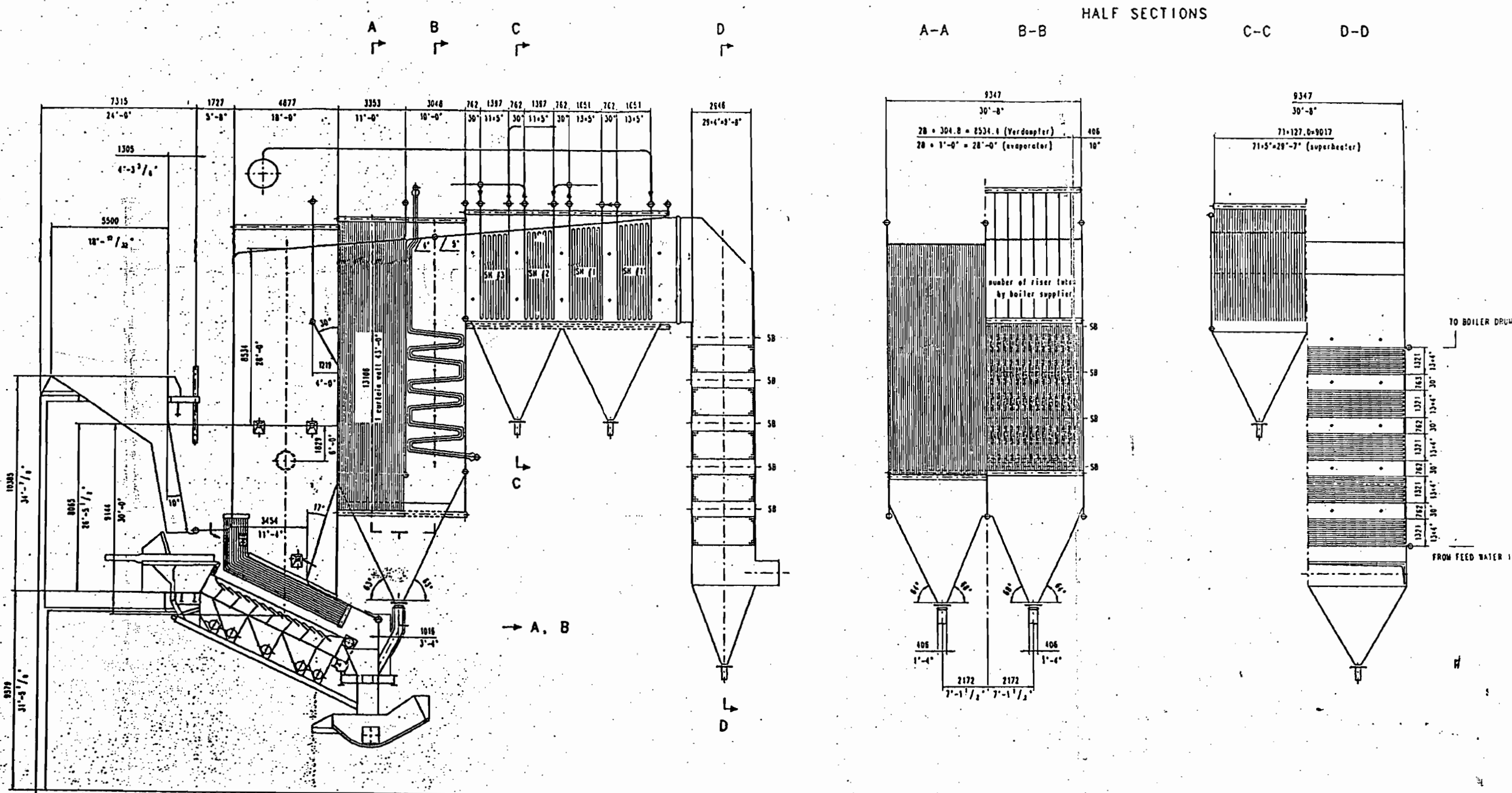
GENERAL ARRANGEMENT
 SECTION A-A
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

ODEN MARTIN SYSTEMS OF LEE, INC.

DATE	REV	REVISION	BY
D.A.B.	12/84/92		
DATE	REV	PROJECT NO.	SCALE
2/4/93		C-1033	1/4"=1'-0"
DATE	REV	PROJECT NO.	SCALE
2/4/93		7102-E-210901	C

MICROSTATION 1

Best Available Copy

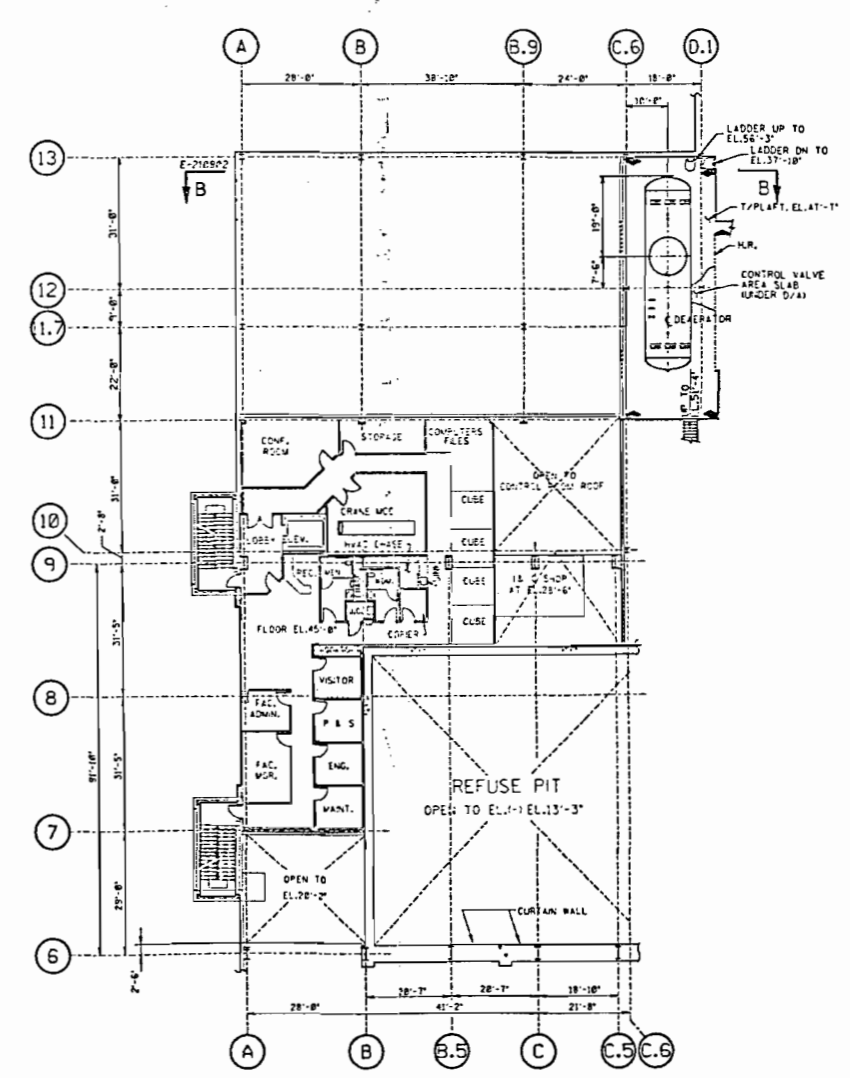
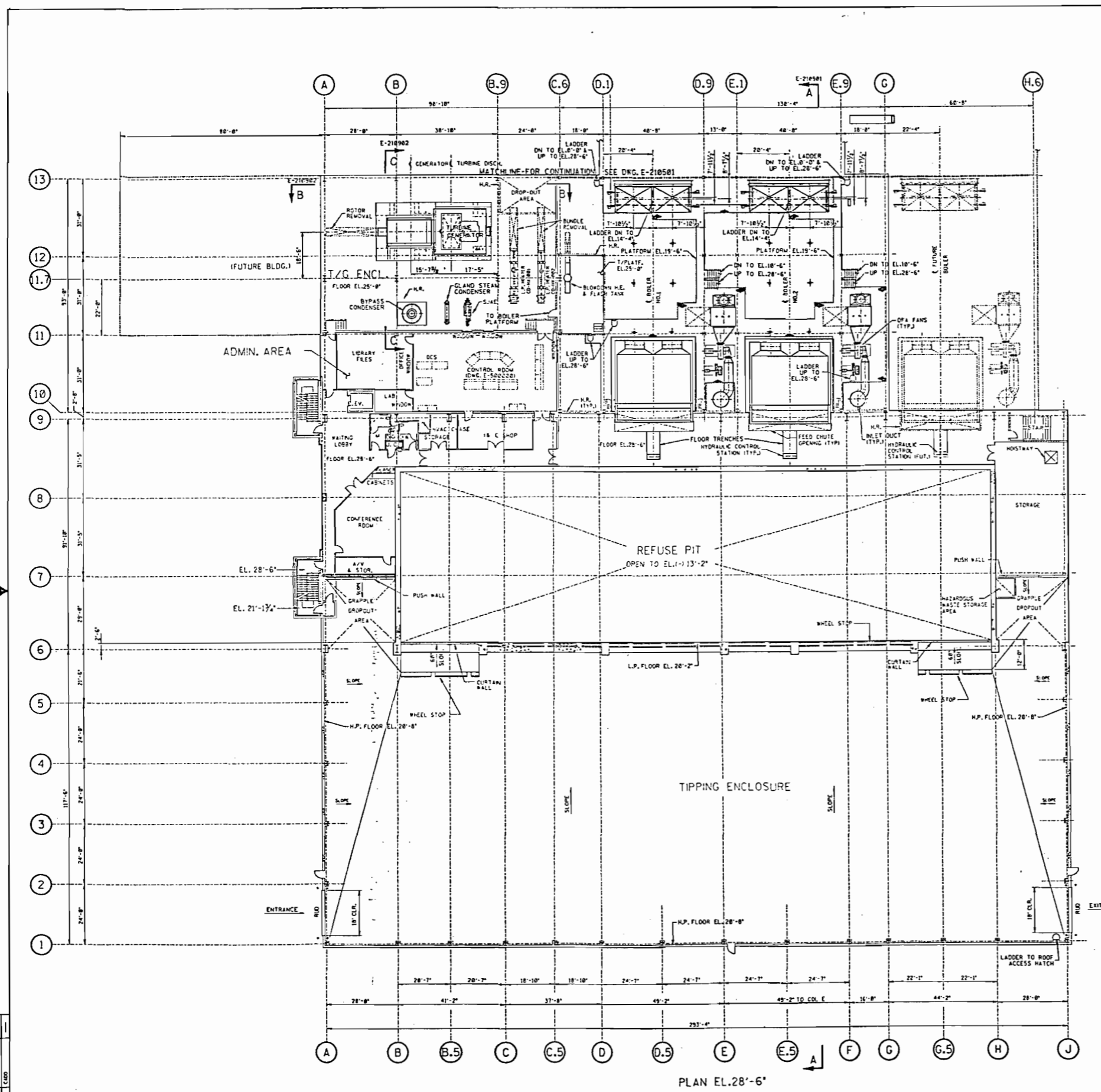


MARTIN stoker: 13 steps
 stoker width: 8,980 mm = 29'-5 1/2"
 steam rate: 172,554 lb/h
 steam temperature: 830 °F
 steam pressure: 665 psig
 boiler width: 30'-8" = 92 x 4"
 evaporator: 29 sections
 superheater: 72 flows
 economizer: 30 flows

Project	U.S. 10/68/90: evaporator, Dopper 2nd/3rd pass
Scale	1/8" = 1'-0"
MARTIN GMBH für Umwelt- und Energie-technik Leopoldstr. 249, 8505 Nürnberg 40	
Client	RESOURCE RECOVERY FACILITY LEE COUNTY
Contract No.	0099.19
Capacity	600 TPD + 3 UNITS - 5,000 BTU/LE
Drawing No.	1A000.19.1

REVISIONS

A-05/04/92	PRELIMINARY 30% ISSUE FOR CLIENT REVIEW & COMMENTS.
B-12/04/92	REVISED PER CLIENT COMMENTS.
C-02/08/93	REVISED GENERATOR STORAGE TR. ADMIN. AREA & OVER FAN. AIR HEATER RELOCATED. CLAND STEAM COND. & SLURRY ISSUE FOR CLIENT REVIEW & COMMENTS.



NO.	DESCRIPTION	DATE	BY
1	STRUCTURAL	12/04/92	WJS
2	M.E.C. POWER	01/05/93	WJS
3	ELECTRICAL	01/05/93	WJS
4	MECHANICAL	01/05/93	WJS
5	CONSTRUCTION	01/05/93	WJS
6	PROCESS	01/05/93	WJS

FOR PURCHASE (CHECK)	FOR BIDDING	FOR AWARD	FOR CONSTRUCTION

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United Engineers & Constructors
 A Heery Company

GENERAL ARRANGEMENT PLAN
 FLOOR EL. 28'-6" & EL. 45'-0"
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

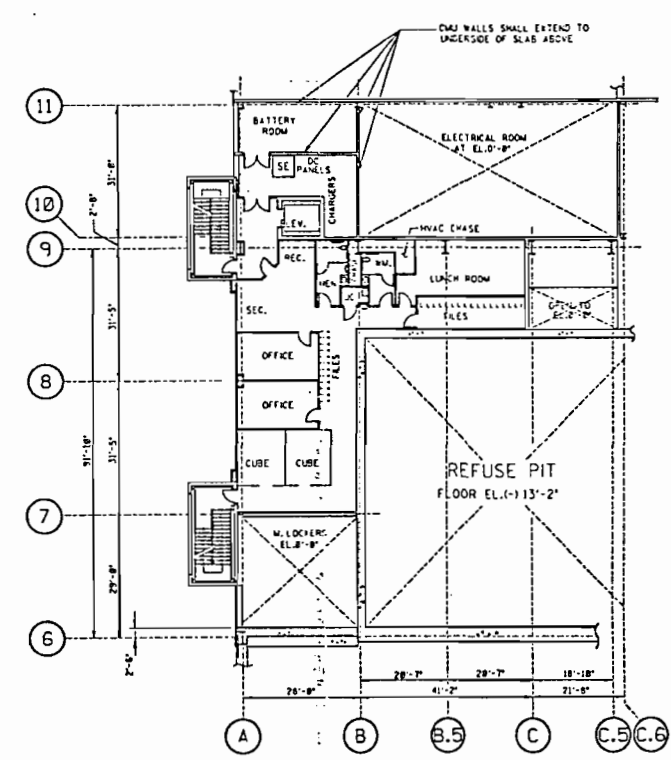
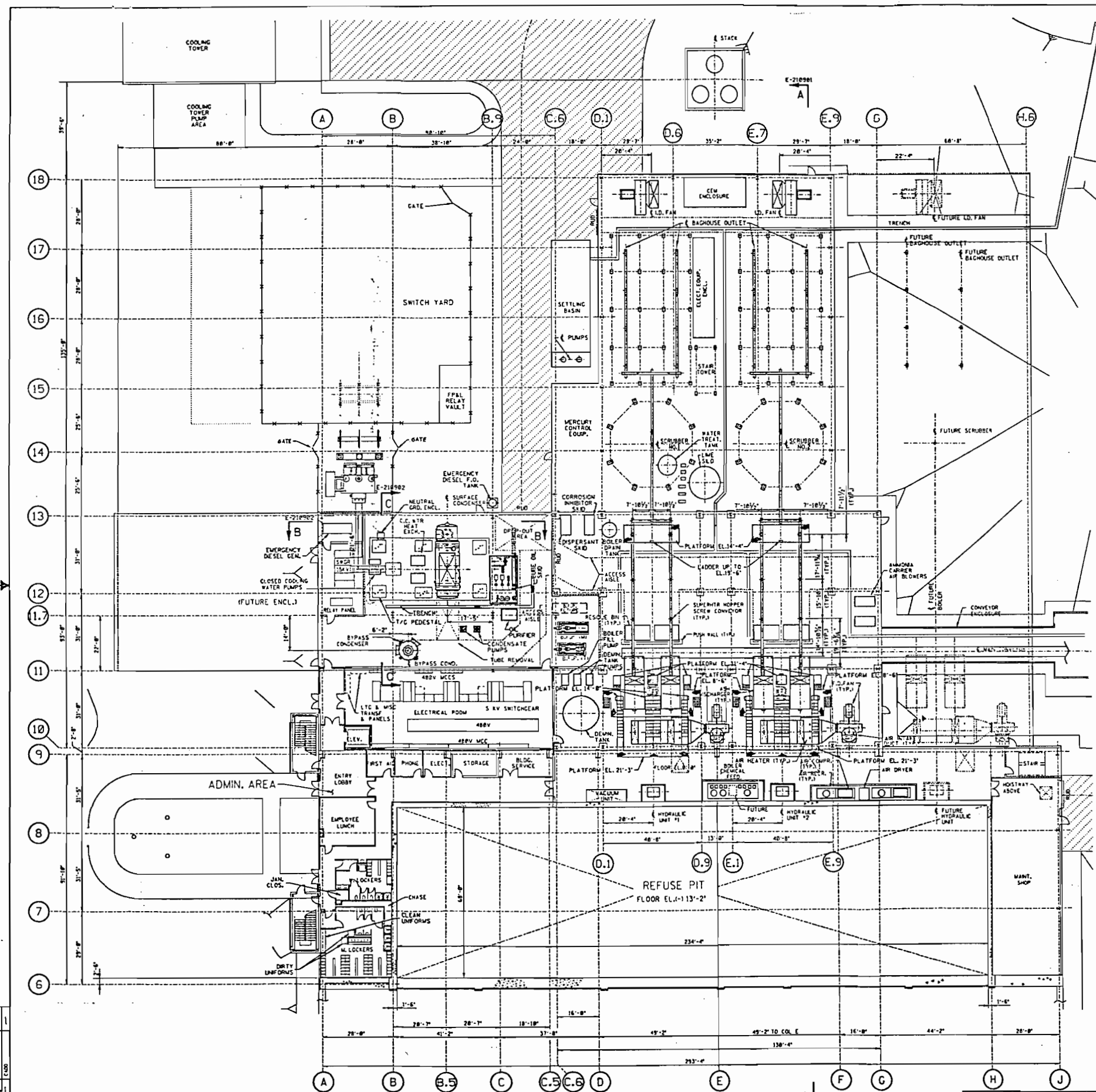
OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	12/04/92	SCALE	1/4" = 1'-0"
DRAWN BY	WJS	PROJECT NO.	C-1033
CHECKED BY	WJS	SHEET NO.	7102-E-210201
DATE	01/05/93	SCALE	1/4" = 1'-0"
DRAWN BY	WJS	PROJECT NO.	7102-E-210201
CHECKED BY	WJS	SHEET NO.	C

REVISIONS

A-02/04/92-PRELIMINARY 30% ISSUE FOR CLIENT REVIEW & COMMENTS.
B-12/04/92-REVISED ASH SCREEN CONVEYORS, F.O. FAN, LUBE OIL S&D HINGE & PER CLIENT COMMENTS. EL. 8'-0" & 24'-3" WAS 25'-0"
C-02/08/93-REVISED F.O. FAN AIR HEATER, BOILER FEED PUMPS, CONDENSATE PUMPS & ADMIN AREA. ADDED OIL PURIFIER. 90% ISSUE FOR CLIENT COMMENTS & REVIEW.

210101A.DWG T 02/03/93



PARTIAL PLAN EL. 14'-3"

NOTE:
1. BOILER FINISH FLOOR EL. 8'-0" & 24'-3".

NO.	DESCRIPTION	DATE BY	DATE
1	ISSUED FOR PERMIT	12/04/92	12/04/92
2	ISSUED FOR BIDDING	02/08/93	02/08/93
3	ISSUED FOR CONSTRUCTION		

SUBCONTRACT OR PURCHASE ORDER	FOR BIDDING	FOR AWARD	FOR CONSTRUCTION

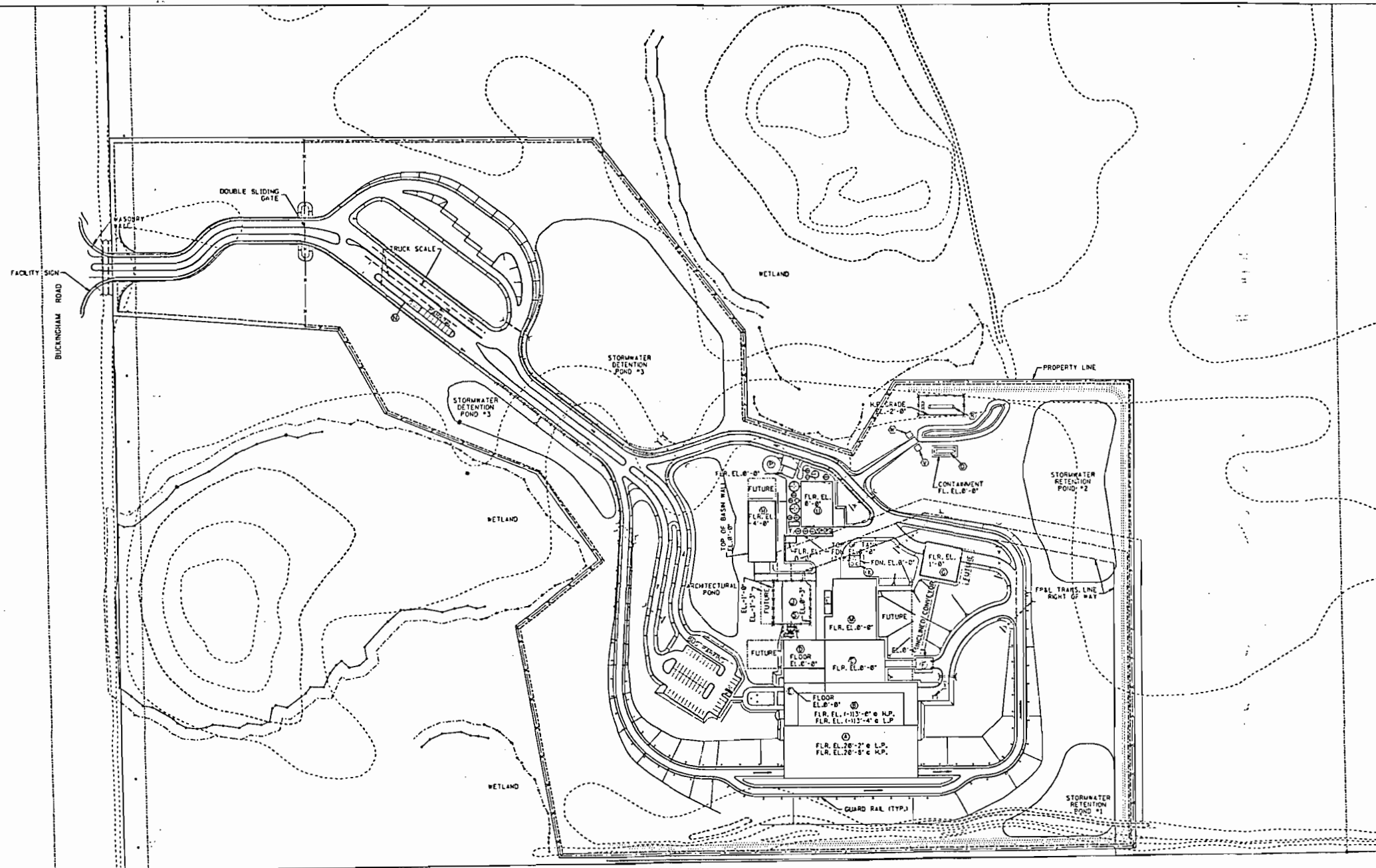
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United Engineers & Constructors
A Day & Zimmermann Company

GENERAL ARRANGEMENT PLAN
FLOOR EL. 0'-0" & EL. 14'-3"
LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	BY	DATE	BY
12/04/92	12/04/92		
02/08/93	02/08/93		
PROJECT NO.	C-1033	SCALE	1/8"=1'-0"
DRAWN BY	7102-E-210101	CHECKED BY	C



REVISIONS
 A-09/04/92-PRELIMINARY
 30% ISSUE FOR CLIENT
 REVIEW & COMMENTS.
 B-12/04/92-ADDED DIESEL
 OIL TANK & REFUELING
 DRUMS. RELOCATED
 AMMONIA STORAGE &
 UNLOADING STATION.
 REVISED ELEVATIONS &
 WATER TREATMENT AREA.
 DELETED CHLORINATION
 BUILDING
 C-02/08/93-ADDED
 CHLORINATION BUILDING
 40% ISSUE FOR CLIENT
 REVIEW & COMMENTS.

REFERENCE DRAWINGS:
 E-210001 G.A. RESIDUE HANDLING BUILDING
 E-210002 G.A. GRIZZLY BUILDING
 E-210004 G.A. WASTE WATER TREATMENT BUILDING

- ① TIPPING AREA
- ② REFUSE PIT AREA
- ③ BOILER AREA
- ④ TURBINE-GENERATOR AREA
- ⑤ FACILITY ADMINISTRATION AREA
- ⑥ GRIZZLY BUILDING
- ⑦ RESIDUE HANDLING BUILDING
- ⑧ COOLING TOWER
- ⑨ F&B SWITCHYARD
- ⑩ STACK
- ⑪ SETTLING BASIN
- ⑫ APC AREA
- ⑬ SCALE HOUSE
- ⑭ FIRE WATER TANK & PUMP HOUSE
- ⑮ AMMONIA STORAGE
- ⑯ PROPAANE STORAGE
- ⑰ SWITCHYARD
- ⑱ CHLORINATION BUILDING
- ⑳ WATER TREATMENT BUILDING
- ㉑ AMMONIA UNLOADING STATION
- ㉒ PROPAANE UNLOADING STATION
- ㉓ DIESEL OIL TANK & FUELING STATION

NOTES:
 1. BOILER FRESH FLOOR EL. 8'-0" ± 24'-3".

NO.	DATE	BY	DESCRIPTION
1	12/04/92	JW	ISSUE FOR CLIENT REVIEW & COMMENTS
2	02/08/93	JW	ADDED CHLORINATION BUILDING

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United Engineers & Constructors
 A TRC Company

GENERAL ARRANGEMENT
 PLOT PLAN
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

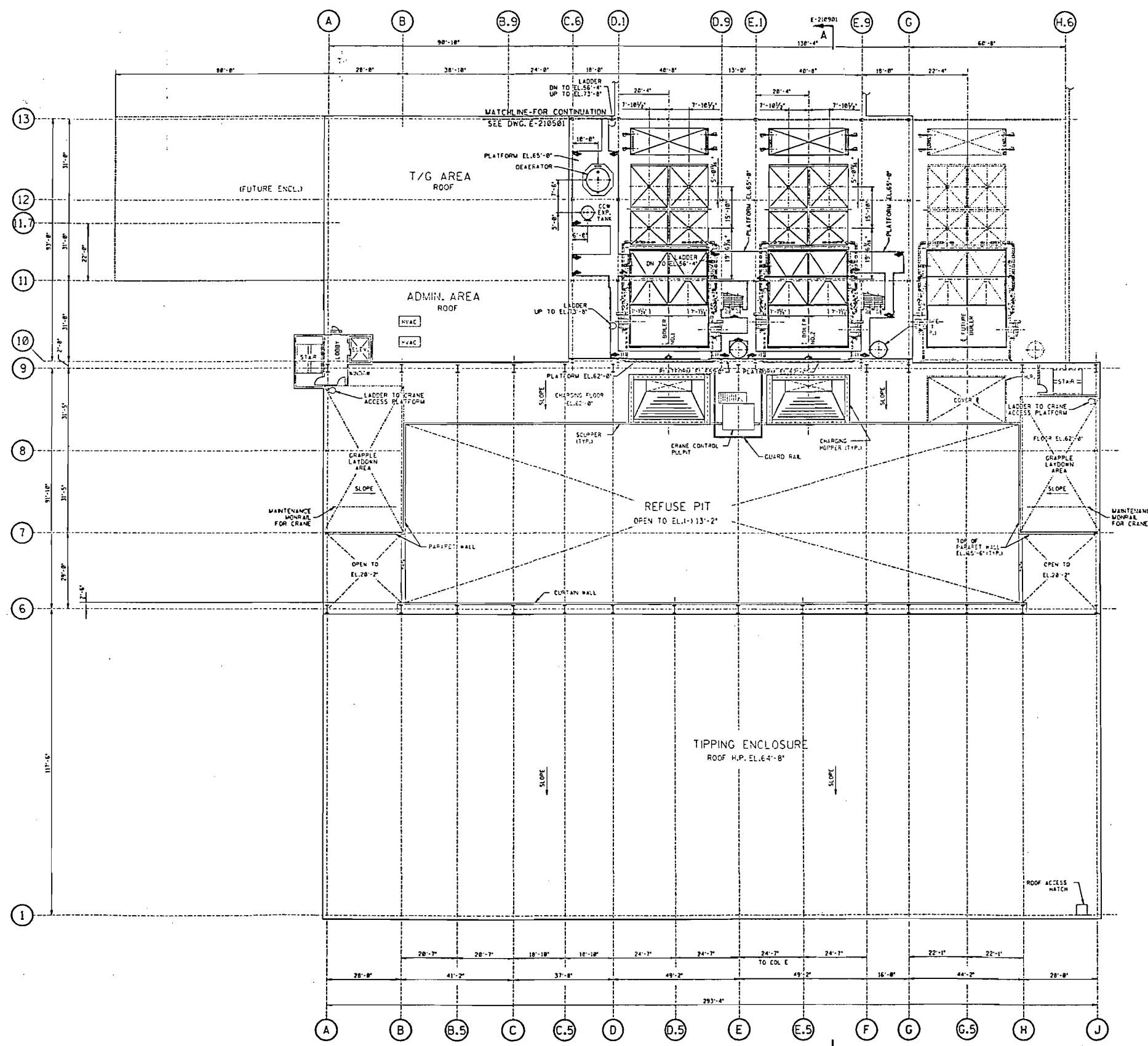
DATE	12/04/92	PROJECT NO.	C-1033
DRAWN BY	JW	SCALE	1"=100'-0"
CHECKED BY	WJ	PROJECT	7102-E-210000
DATE	02/08/93	BY	JW



REVISIONS

A-05/04/92	PRELIMINARY SET ISSUE FOR CLIENT REVIEW & COMMENTS.
B-12/04/92	REVISED PER CLIENT COMMENTS.
C-02/02/93	REVISED DEGENERATOR, ADDED CCM EXP. TANK SET ISSUE FOR CLIENT REVIEW & COMMENTS.

NOTE:
 1. PROVIDE ACCESS TO ALL ROOF AREAS, EITHER BY MANDOR FROM ADJACENT STRUCTURE OR WHEN NO ADJACENT STRUCTURE, LADDER AND ROOF HATCH. EXTERIOR LADDERS TO ACCESS ROOF AREAS ARE NOT ACCEPTABLE.



REV	DATE	BY	CHKD BY
C			

SUBCONTRACT OR PURCHASE ORDER	FOR BIDDING	FOR AWARD	FOR CONSTRUCTION

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United Engineers & Constructors
 A Parsons Company

GENERAL ARRANGEMENT PLAN
 CHARGE FLOOR EL. 62'-0"
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

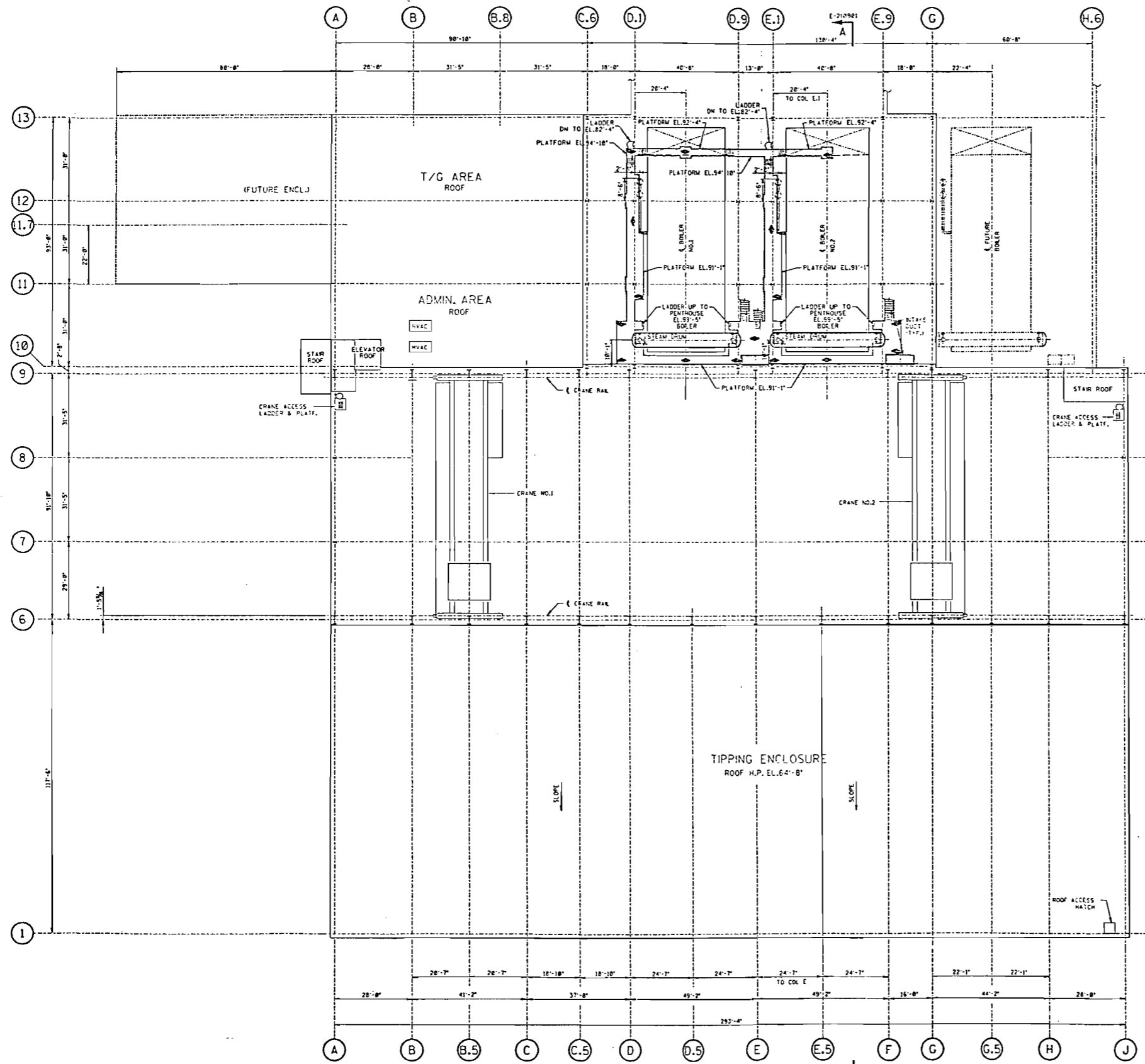
DATE	12/04/92	PROJECT NO.	C-1033
SCALE	1/4"=1'-0"	DWG. NO.	7102-E-210301

210301A.DWG 11/82/93



REVISIONS

A-05/04/92	PRELIMINARY 30% ISSUE FOR CLIENT REVIEW & COMMENTS.
B-12/04/92	REVISED PER CLIENT COMMENTS.
C-02/04/93	REVISED PER CLIENT COMMENTS. 90% ISSUE FOR CLIENT COMMENTS & REVIEW.



NO.	DATE	BY	DESCRIPTION
1			ISSUE FOR REVIEW
2			ISSUE FOR CONSTRUCTION

DATE	BY	REVISION
12/04/92		
02/04/93		

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United Engineers & Constructors
 A Bechtel Company

GENERAL ARRANGEMENT PLAN
 STEAM DRUM EL. 94'-5" &
 REFUSE CRANE EL. 89'-0"
 LEE COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY

OGDEN MARTIN SYSTEMS OF LEE, INC.

DATE	BY	REVISION
12/04/92		
02/04/93		

C-1033

7102-E-210401

210401GADON T 12/03/93

E

D

C

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A