CDM Camp Dresser & McKee Inc.

environmental services

One Tampa City Center, Suite 1750
Tampa, Florida 33602
Tel: 813 221-2833

Rcvd:
6/17/96
0570261-001-AV

June 14, 1996

Mr. John Brown
State of Florida
Department of Environmental Protection
Division of Air Resource Management
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Title V Permit Application for Hillsborough County Resource Recovery Facility (Facility ID #0570261)

Dear Mr. Brown:

Attached are three (3) copies of the Title V Permit Application for Hillsborough County Resource Recovery Facility (Facility ID # 0570261) as requested. The other copy has been forwarded directly to the Environmental Protection Commission of Hillsborough County.

If you have any questions regarding this application, please feel free to contact me or Denise Wilson at CDM's Tampa office.

Sincerely,

CAMP DRESSER & McKEE

Mary Cummings

Mary Cummings
Project Manager

cc: Jerry Campbell, EPC
Thomas G. Smith, Hillsborough County
Denise Wilson, CDM
Douglas Fredericks, CDM
Daniel Strobridge, CDM
File # 6033-41-PA-APP

CDM Camp Dresser & McKee Inc.

environmental services

One Tampa City Center, Suite 1750
Tampa, Florida 33602
Tel: 813 221-2833

June 14, 1996

Mr. Jerry Campbell
Environmental Protection Commission
Hillsborough County
1410 N. 21st Street
Tampa, Florida 33605

Subject: Title V Application for the Hillsborough County Resource Recovery Facility

Dear Mr. Campbell:

Enclosed, as requested, is one original copy of the Title V application for the Hillsborough County Resource Recovery Facility (facility ID # 0570261). The three other original copies have been provided to DEP in Tallahassee.

If you have any questions regarding this document, please feel free to contact me or Denise Wilson at CDM's Tampa office.

Sincerely,

CAMP DRESSER & McKEE

Mary Cummings
Project Manager

cc: John Brown, DEP-Air, Tallahassee
Thomas G. Smith, Hillsborough County
Denise Wilson, CDM
Douglas Fredericks, CDM
Daniel Strobridge, CDM
File # 6033-41-PA-APP

6/14/96
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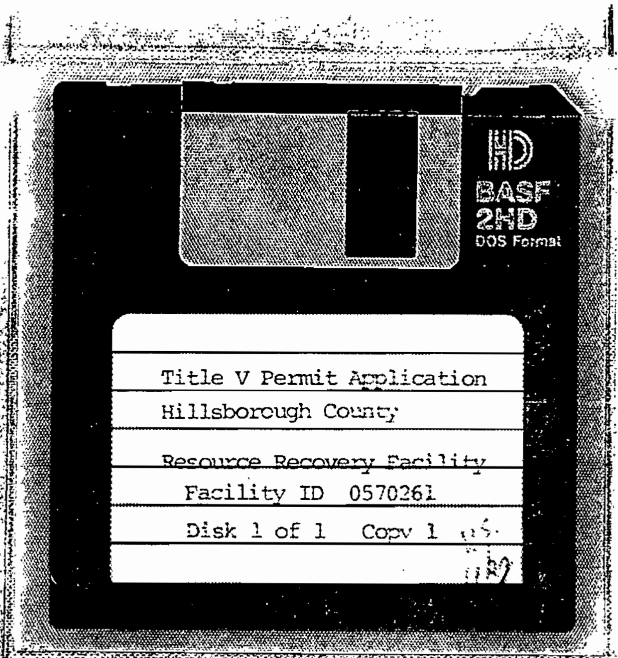
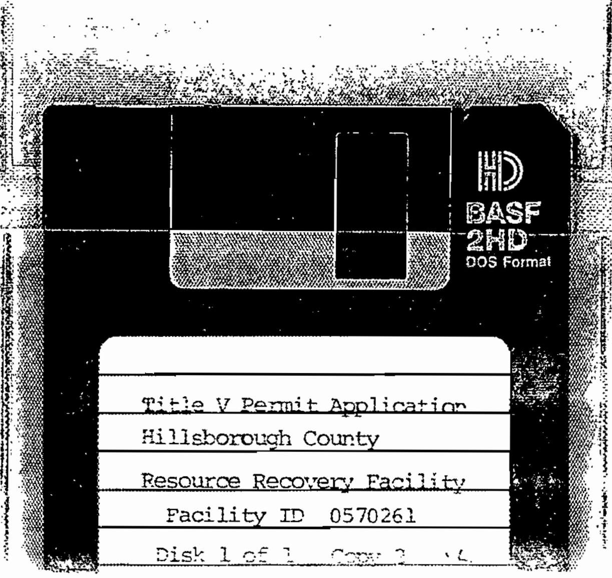


Title V Permit Application
Hillsborough County
Resource Recovery Facility
Facility ID 0570261
Disk 1 of 1 Copy 1



Title V Permit Application
Hillsborough County
Resource Recovery Facility
Facility ID 0570261
Disk 1 of 1 Copy 2

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official :

Name : Daniel A. Kleman
Title : County Administrator

2. Owner or Authorized Representative or Responsible Official Mailing Address :

Organization/Firm : Hillsborough County
Street Address : 601 E. Kennedy
City : Tampa
State : FL Zip Code : 33602-

3. Owner/Authorized Representative or Responsible Official Telephone Numbers :

Telephone : (813)276-2909 Fax : (813)276-2960

4. Owner/Authorized Representative or Responsible Official Statement :

I, the undersigned, am the owner or authorized representative of the non-Title V source addressed in this Application for Air Permit or the responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions units.*

Daniel A. Kleman
Signature

6-11-96
Date

* Attach letter of authorization if not currently on file.

4. Professional Engineer Statement :

I, the undersigned, hereby certified, except as particularly noted herein, that :*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollutant control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [X] if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [ ] if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permi revision for one or more newly constructed or modified emissions units (check here [ ] if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Signature

6/12/96
Date

* Attach any exception to certification statement.

Facility Supplemental Information

List of Applicable Regulations

PS6T1.1

LIST OF APPLICABLE REGULATIONS
HILLSBOROUGH COUNTY RESOURCE RECOVERY FACILITY
INITIAL TITLE V OPERATION PERMIT APPLICATION

Facility Applicable Regulations:

Florida Title V "Core List" regulations (dated 3/25/96) applicable to the facility and any other regulations applicable to the facility or specific emission units are given below

40 CFR 82	Protection of Stratospheric Ozone (Core List)
FAC 62-4	Permits (Core List)
FAC 62-103	Rules of Administrative Procedure (Core List)
FAC 62-210	Stationary Sources-General Requirements (as listed below)
FAC 62-210.300	Permits Required
FAC 62-210.300(3)(a)5	Exemption for internal combustion engines in boats, aircraft and vehicles used for transportation of passengers or freight (earth moving equipment and solid waste delivery vehicles at resource recovery facility and landfill areas)
FAC 62-210.300(3)(a)16	Exemption for brazing, soldering or welding equipment
FAC 62-210.300(3)(a)20 -(3)(a)21	Exemption for emergency electrical generators, heating units, and general purpose internal combustion engines not subject to Acid Rain Program
FAC 62-210.300(5)	Notification of Startup (for sources shutdown > 1 year)
FAC 62-210.300(6)	Emission Unit Reclassification
FAC 62-210.350	Public Notice and Comment
FAC 62-210.350(3)	Additional Public Notice Requirements...for Title V Sources
FAC 62-210.360	Administrative Permit Corrections
FAC 62-210.370 (3)	Annual Operating Reports
FAC 62-210.550	(GEP) Stack Height Policy
FAC 62-210.650	Circumvention
FAC 62-210.700	Excess Emissions
FAC 62-210.900	Forms and Instructions
FAC 62-213	Operating Permits for Major Sources of Air Pollution (Core List)
FAC 62-256	Open Burning and Frost Protection Fires (Core List)
FAC 62-296	Stationary Sources-Emission Standards (as listed below)
FAC 62-296.320 (2)	Objectionable Odor Prohibited
FAC 62-296.320 (3)	Industrial, Commercial, and Municipal Open Burning Prohibited
FAC 62-296.320(4)(c)	Unconfined Emissions of Particulate Matter
FAC 62-296.416(3)(e)	Specific Emission Limiting and Performance Standards Mercury Emissions Inventory (Testing Requirements)[a]

---

[a] Since the facility does not have acid gas control equipment, the mercury emission limits in FAC 62-296.416 "Waste-to-Energy Facilities" do not apply until the facility is upgraded to meet the USEPA Emission Guideline requirements (FAC 62-296.416(3)(a)2).

LIST OF APPLICABLE REGULATIONS
HILLSBOROUGH COUNTY RESOURCE RECOVERY FACILITY
INITIAL TITLE V OPERATION PERMIT APPLICATION
(continued)

Facility Applicable Regulations (Concluded):

Exemptions from Regulations for Facility and Specific Emission Units:

FAC 62-296.320 (4)(a)	General Particulate Emission Limiting Standards[b]
FAC 62-296.500	RACT - VOC and NO_x Emitting Facilities NOT APPLICABLE[c]
FAC 62-296.600	RACT - Lead NOT APPLICABLE[d]
FAC 62-296.700	RACT - Particulate matter NOT APPLICABLE[e]

MWC Units 1 through 3 Applicable Regulations:

40 CFR 60 Subpart A	New Source Performance Standards-General Provisions
40 CFR 60 Subpart E	Standards of Performance for Incinerators

---

[b] Emission units described in this application are not subject to FAC 62-296.320(4)(a). The MWCs are subject to a particulate emission limit elsewhere in this chapter (FAC 62-296.401(3)(a)) and are also exempted by FAC 62-296.320(4)(a)1.b (i.e. burn refuse).

[c] Florida VOC RACT rules at FAC 62-296.500 to .516 or FAC 62-296.401 to .415 could be applicable (except for emission units which received BACT/LAER determinations pursuant to FAC 62-212.400/.500) since Hillsborough County is an ozone maintenance area (as defined at FAC 62-204.340(4)(a)). However, there are no VOC RACT requirements in FAC 62-296.500 to .516 or FAC 62-296.401 to .415 applicable to any emissions unit at the Hillsborough County complex (and the MWCs underwent BACT review as part of the original PSD permits). Also, the VOC and NO_x RACT rules in FAC 62-296.570 are not applicable since these requirements apply only to Broward, Dade, and Palm Beach Counties as described at FAC 62-296.500(1)(b).

[d] Florida PM RACT rules at FAC 62-296.700 to .715 or FAC 62-296.401 to .415 could be applicable since the Hillsborough County complex within a Pb maintenance area (portion of Hillsborough County as defined at FAC 62-204.340(4)(c)) and therefore located within the "area of influence" (i.e., within 50 km of area boundary). However, there are no Pb RACT requirements in FAC 62-296.601 to .605 applicable to any emissions unit at the complex.

[e] Florida PM RACT rules at FAC 62-296.700 to .712 or FAC 62-296.401 to .415 could be applicable (except for emission units which received BACT/LAER determinations pursuant to FAC 62-212.400/.500) since the Hillsborough County complex is located within a PM maintenance area (portion of Hillsborough County as defined at FAC 62-204.340(4)(b)) and therefore located within the "area of influence" (within 50 km of area boundary). Exemptions from or applicability of PM RACT requirements for each emission unit described in this application are given below:

MWC Units 1-3: Exempted by undergoing PSD review and receiving BACT determination (all MWC units meet the PM emission requirement of 0.08 gr/dscf pursuant to FAC 62-296.401(3))

LIST OF APPLICABLE REGULATIONS
HILLSBOROUGH COUNTY RESOURCE RECOVERY FACILITY
INITIAL TITLE V OPERATION PERMIT APPLICATION
(concluded)

FAC 62-210.700	Excess Emissions
FAC 62-296.320(4)(b)	General Visible Emission Standards
FAC 62-296.401(3)	Specific Emission Limiting and Performance Standards Requirements (PM/Odor) for New Incinerators (after 1/18/72) with Charging Rates equal to or greater than 50 tons per day
FAC 62-297.310(1)	Required Number of Tests
FAC 62-297.310(2)	Operating Rate during Testing
FAC 62-297.310(3)	Calculation of Emission Rate
FAC 62-297.310(4)	Applicable Test Procedures
FAC 62-297.310(5)	Required Stack Sampling Facilities
FAC 62-297.310(6)	Frequency of Compliance Tests
FAC 62-297.310(7)	Test Reports

Facility Location Map

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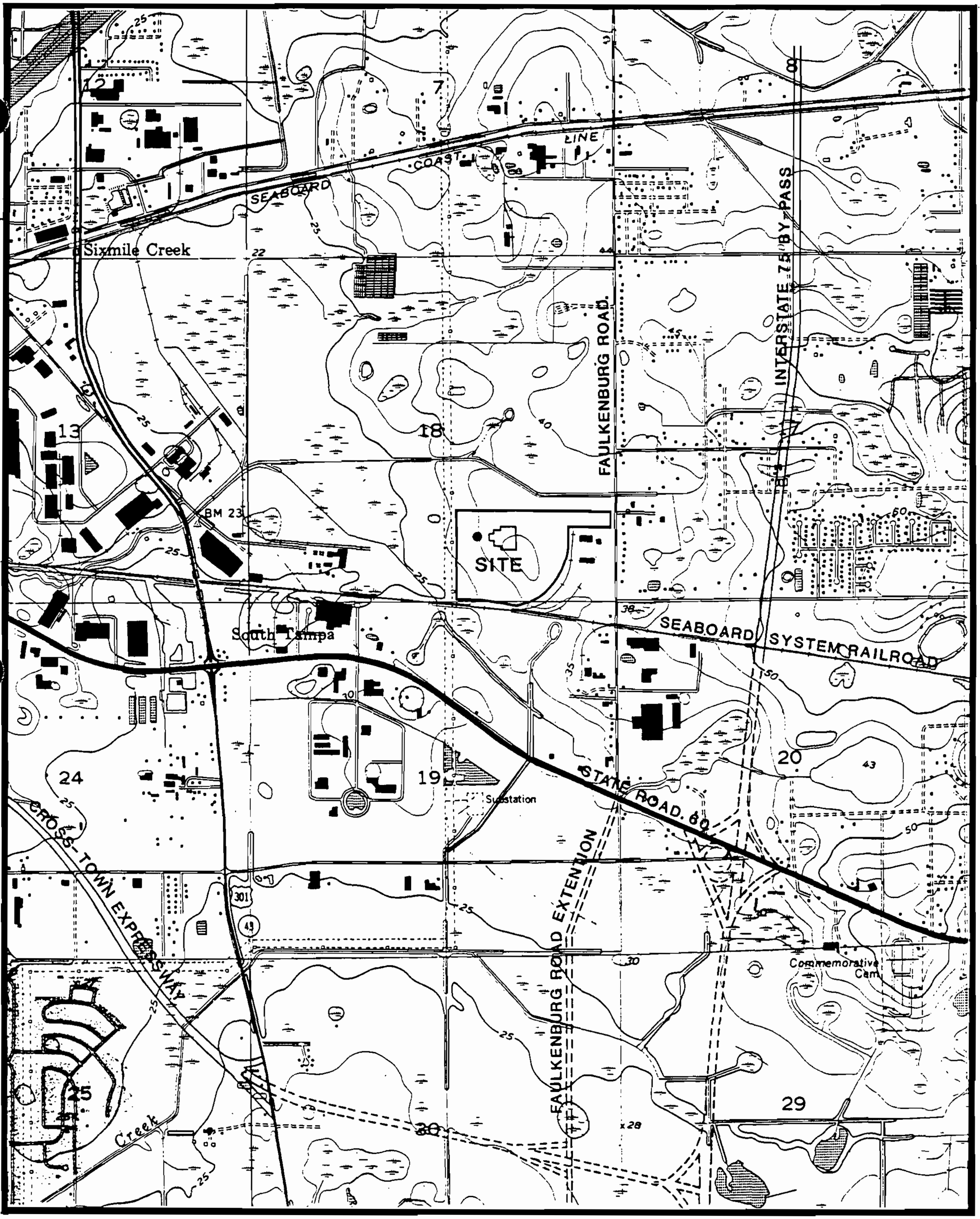
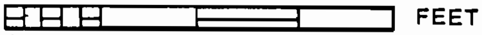


HILLSBOROUGH COUNTY
ENERGY RECOVERY PROJECT

SITE BOUNDARIES



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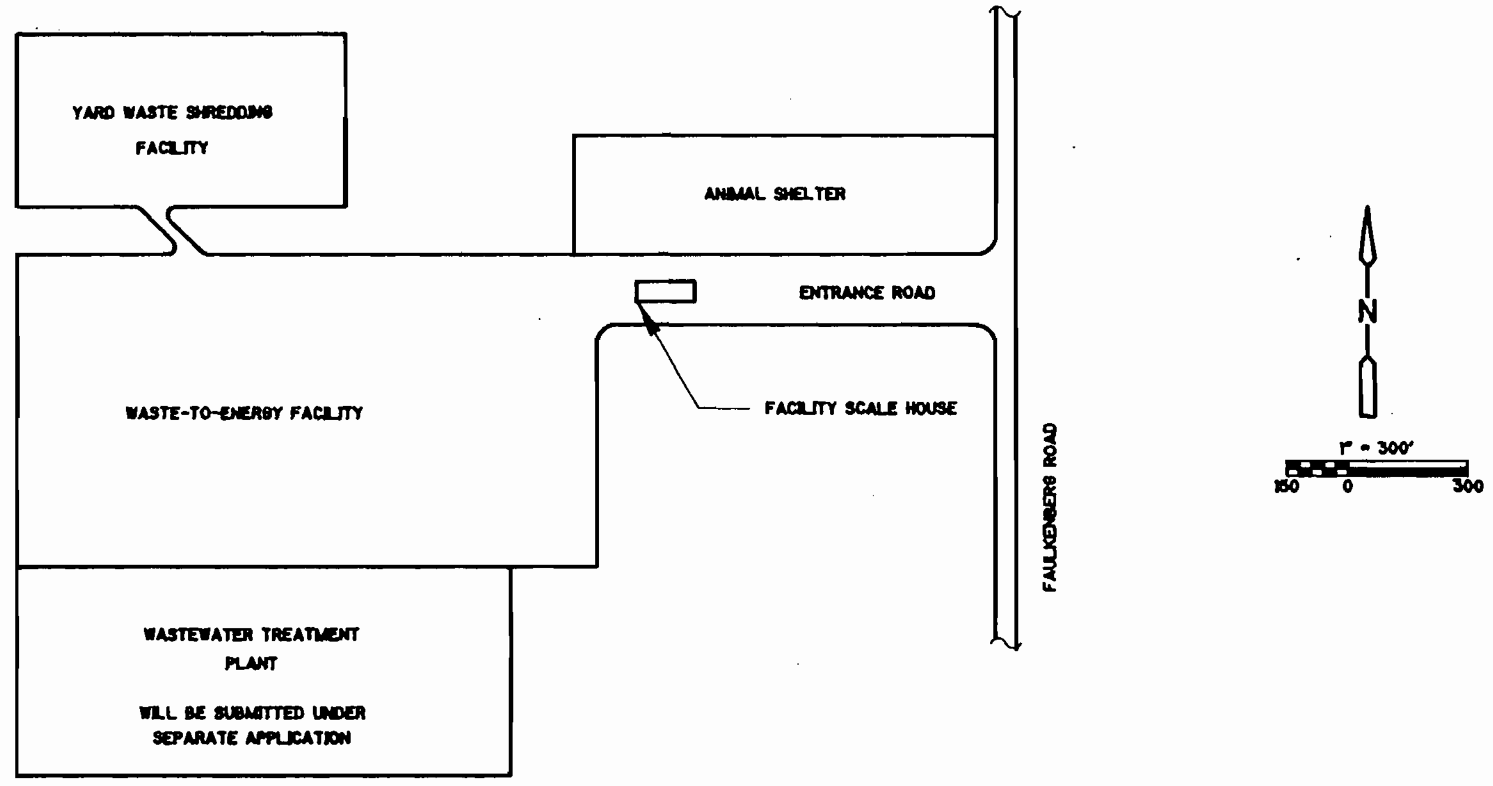


CDM
environmental engineers, scientists, planners, & management consultants

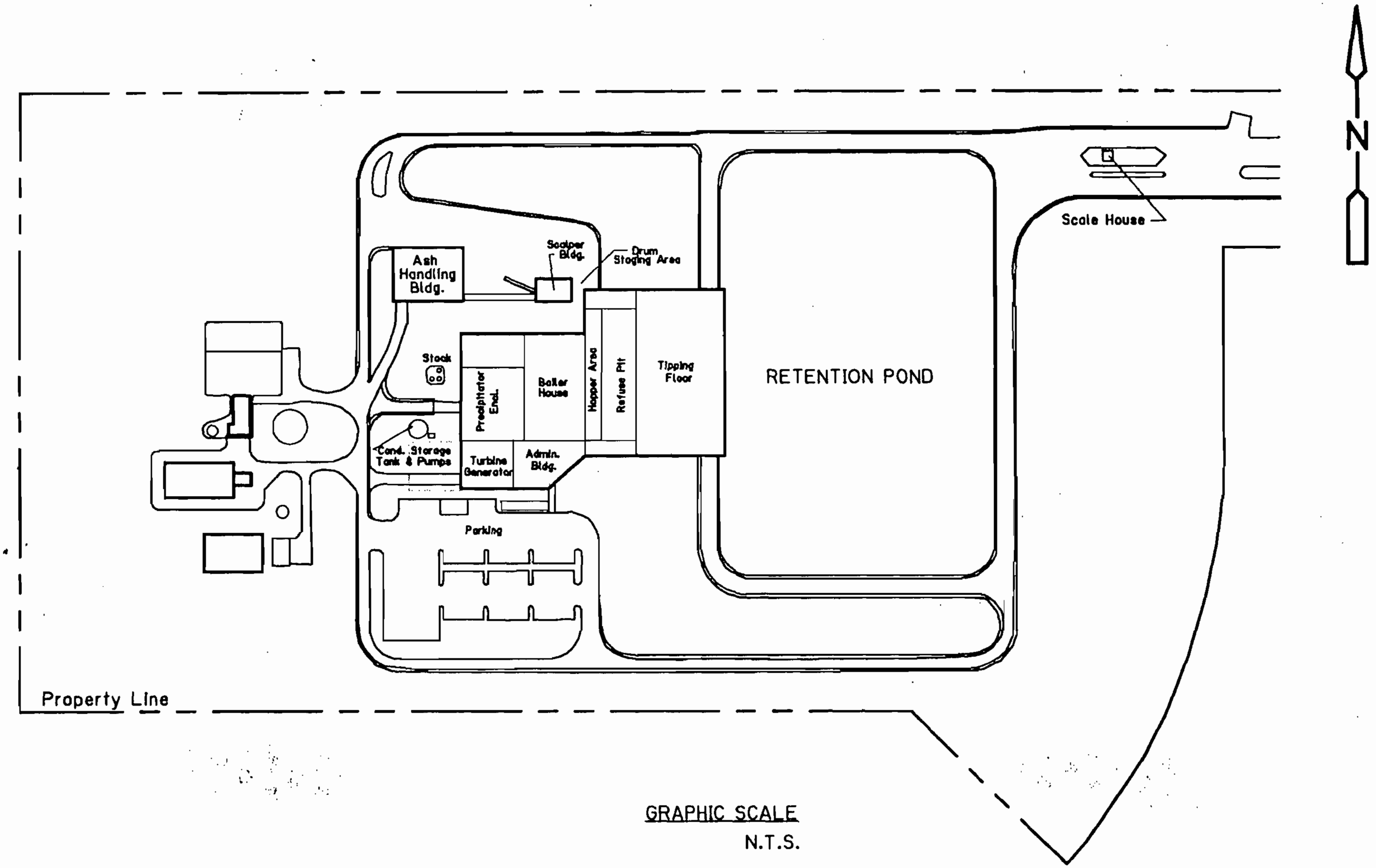
HILLSBOROUGH COUNTY

FAULKENBERG ROAD FACILITY LOCATION MAP

Figure No. A-1

Facility Plot Plan

C:\[illegible]3-40\ C200104 02/17/95 15:05:18 0:15:54 Carrie Lawrence



HILLSBOROUGH COUNTY SOLID WASTE ENERGY RECOVERY FACILITY

SITE PLAN

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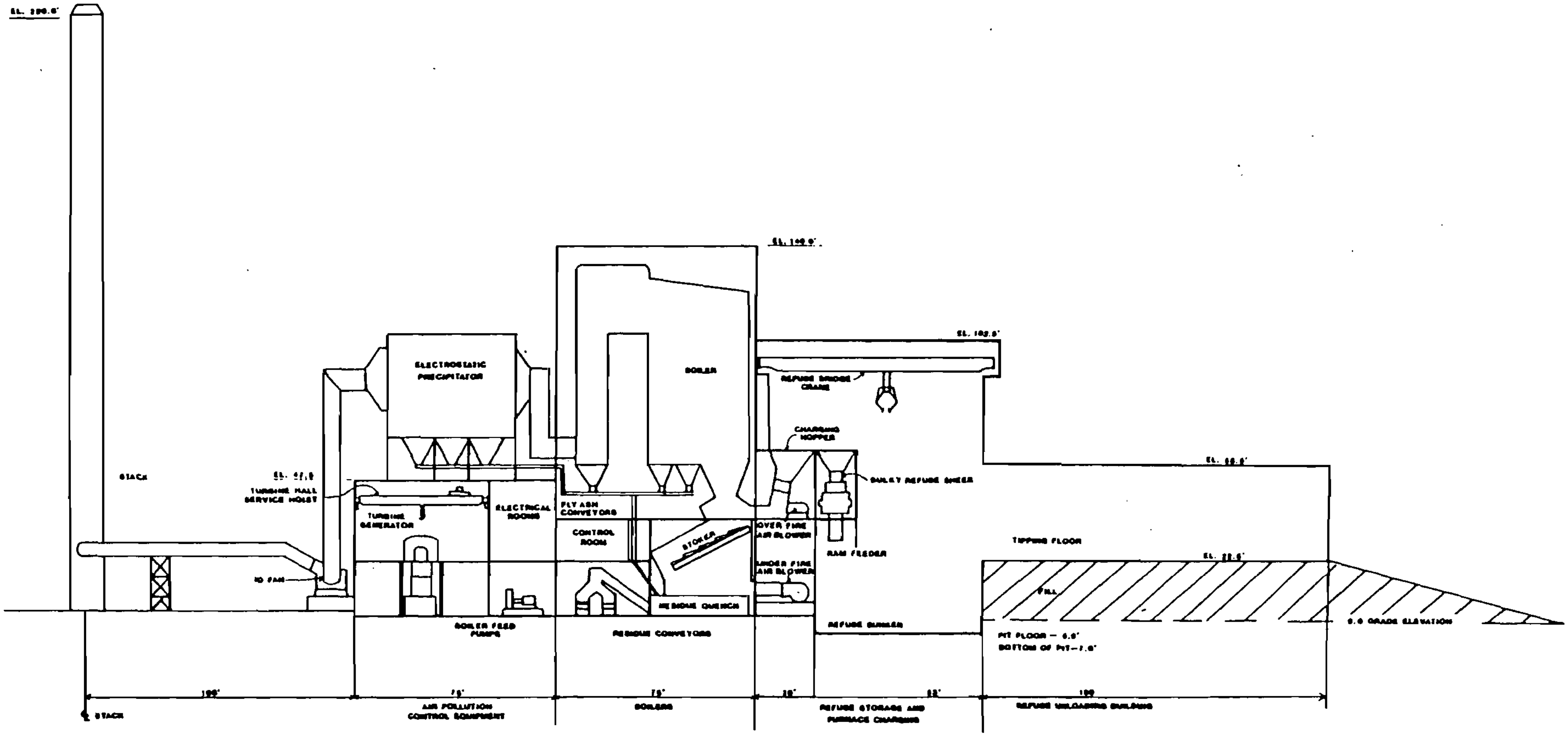
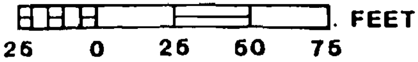


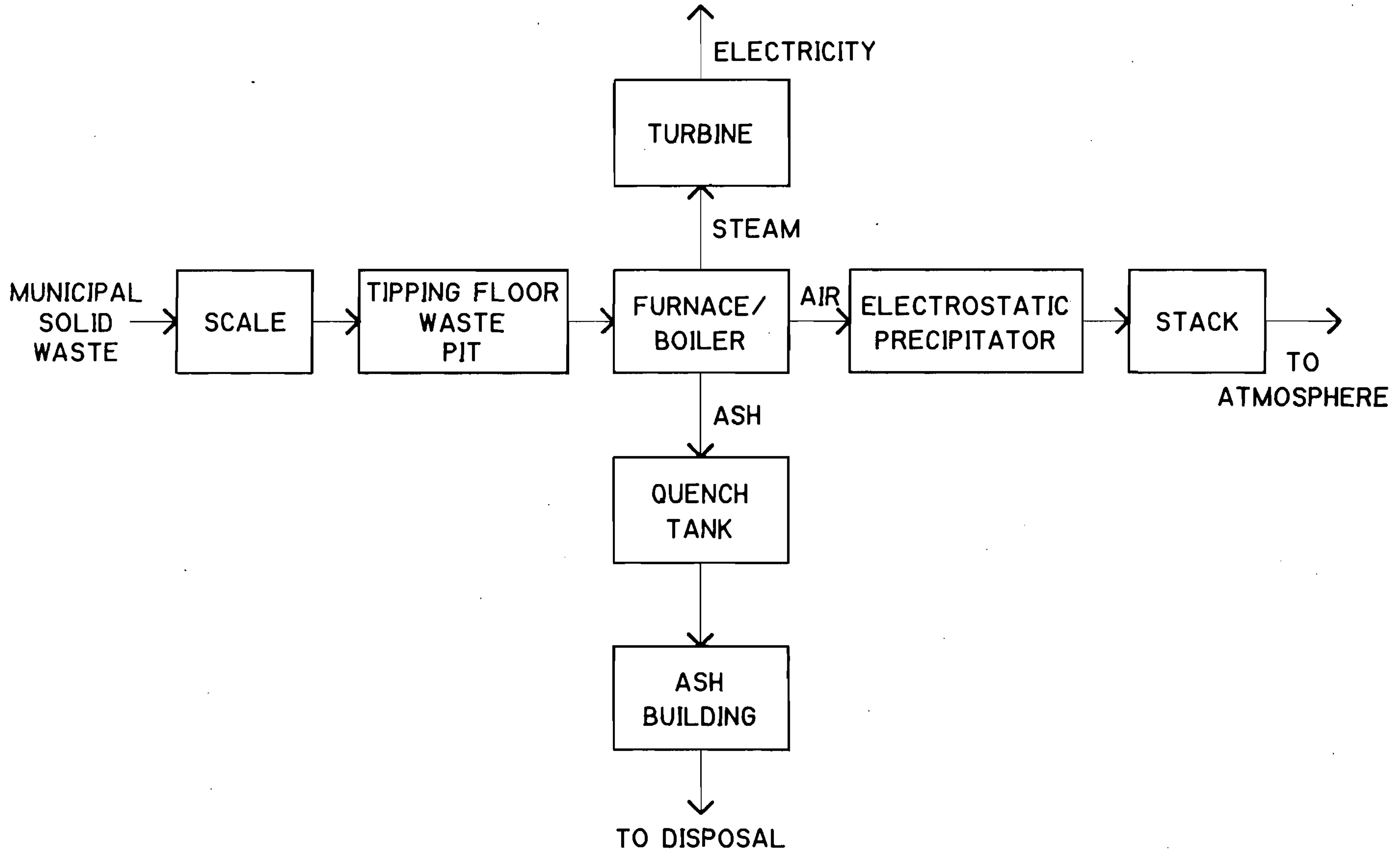
HILLSBOROUGH COUNTY
ENERGY RECOVERY PROJECT

FIGURE 3.2

FACILITY PROFILE



Process Flow Diagram



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HILLSBOROUGH COUNTY

PROCESS FLOW DIAGRAM

Precautions to Prevent Emissions of Unconfined Particulate Matter

PRECAUTIONS TO PREVENT EMISSIONS OF UNCONFINED PARTICULATE MATTER

Precautions include the following:

a. Roads and parking areas are paved.

b. A street sweeper equipped with a vacuum system is used to remove particulate matter from roads and other paved areas.

c. The unpaved areas of the facility are maintained and either sodded or landscaped.

d. Hoods, fans, filters, or similar equipment is used to contain, capture, and/or vent particulate matter.

e. The conveyor systems of the facility are enclosed.

f. The ash is wetted before being stored in the ash handling building.

Fugitive Emissions Identification

FUGITIVE EMISSIONS IDENTIFICATION

The following processes have been identified as contributing to fugitive emissions:

a. Mobile operating equipment including the front-end loaders, street sweeper and forklift.

b. The cooling tower.

c. Yard waste composting on site.

d. Ash handling building.

List of Proposed Exempt Activities

LIST OF PROPOSED EXEMPT ACTIVITIES

The following activities are proposed to be exempt (Chapter 62-210.300 F.A.C):

1. Fire and safety equipment
2. Paint usage is less than 6 gal./day
3. Vehicular traffic
4. Emergency Generator
5. Refuse pit (insignificant source, below reporting thresholds for any of the criteria pollutants)
6. Mineral spirit drums (grouped with the paint, below reporting thresholds)
7. Cooling water treatment bulk drum (container is sealed)
8. Flanges and valves (insignificant source, below reporting thresholds for any of the criteria pollutants)
9. Eight 55-gallon oil storage drums in boiler building (sealed, closed system)
10. Fuel storage tanks (1100-gallon and 300-gallon) (estimated emissions from the TANKS model are less than 1.4 lb/yr.)
11. Laboratory vent
12. Yard waste mulching operation on site (estimated fugitive emissions are below reporting limits)
13. Mobile equipment on site
14. Emergency generator at Falkenburg Wastewater Treatment Plant (operated <400 hrs/yr)
15. Falkenburg Wastewater Treatment Plant (estimated VOC emissions <10 tpy)
16. Sulfuric acid tank and chlorine cylinders

Active Permits

Prevention of Significant Deterioration (PSD-FL-121)

Power Plant Site Certification (PA 83-19)

HILLSBOROUGH

PERMIT NO.: PSD-FL-121

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

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

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

PERMITTEE:
Hillsborough County
Hillsborough County Courthouse
419 Pierce Street
Tampa, Florida 33602

Permit Number: PSD-FL-121
Expiration Date: March 31, 1988
County: Hillsborough
Latitude/Longitude: 27° 57' 00" N
82° 40' 22" W
Project: Hillsborough County Resourc
Recovery Modification

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the modification of a 1,200 ton per day resource recovery facilit to be located at the permitted existing municipal solid waste resourc recovery facility in Hillsborough County approximately two miles east of Tampa on the county's Faulkenburg Road site. The UTM coordinates the proposed plant are 368.2 km E and 3092.7 km N.

This permit solely pertains to the pollutant increases (nitrogen oxides, sulfuric acid mist, and particulates) which result from this modification. Only specific conditions 1.a.(3), 1.b., and 1.c.(1) ha been modified and/or added to reflect the changes requested in this modification. For clarity purposes, the remaining specific condition which pertain to the pollutants addressed in this modification have been repeated as they appeared in the original PSD permit (PSD-FL-104).The other pollutants emitted from this facility are addressed in the original PSD permit.

Construction shall be in accordance with the attached permit application, plan, documents, and drawings except as noted in the Specific Conditions.

Attachments:

1. May 1, 1987, letter by Richard W. Seelinger.
2. June 8, 1987, letter by Bruce P. Miller, EPA Region IV.
3. June 12, 1987, letter by J. R. Treshler.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. 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. This permit does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

GENERAL CONDITIONS:

6. The permittee shall at all times 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, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring 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 notify and provide the Department with the following information:

a. a description of and cause of non-compliance; 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 noncompliance.

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 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 arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)
( ) Determination of Prevention of Significant Deterioration (PSD)
( ) Compliance with New Source Performance Standards.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Emission Limitations

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: 0.021 grains per dry standard cubic foot corrected to 12% CO2 (gr/dscf-12%) or 7.0 pounds per hour per unit, whichever is more restrictive.

SPECIFIC CONDITIONS:

(2) Visible Emissions: Opacity of stack emissions shall not be greater than 15% opacity except that 20% opacity may be allowed for one six-minute period (average of 24 consecutive observations recorded at 15-second intervals) in any one hour. Excess opacity resulting from startup or shutdown shall be permitted providing (1) best operational practices to minimize emissions are adhered to and (2) the duration of excess opacity shall be minimized but in no case exceed two hours in any 24 hour period unless specifically authorized by EPA for longer duration.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up or shutdown shall be prohibited. Opacity of other emission points at the plant shall not exceed 5%.

(3) Nitrogen Oxides: 0.34 gr/dscf-12%, or 6.4 lb/ton, whichever is more restrictive

(4) Each of the emission limits in conditions (1) through (3) is to be expressed as a 3-hour average. This averaging time, which is applicable to the emission limits for all pollutants, is based on the expected length of time for a particulate compliance test. The concentration standards in conditions (2) and (3) are included as the primary compliance limit to facilitate simpler compliance testing, since the process weight, in tons per hour, is not easily measured. The concentration limit is intended to be equivalent to the lb/ton limit. The concentration limits were derived by dividing the lb/ton limits by the calculated volume of flue gas produced when one ton of refuse is combusted. If actual process conditions, i.e. dscf per ton of refuse fired, are different than projected by the applicant, EPA may, at its discretion, determine compliance based upon the lb/ton limits.

(5) The potential for dust generation by ash handling activities will be mitigated by quenching the ash prior to loading in ash transport trucks.

SPECIFIC CONDITIONS:

Additionally, all portions of the proposed facility including the ash handling facility which have the potential for fugitive emissions will be enclosed. Also those areas which have to be open for operational purposes, e.g., tipping floor of the refuse bunker while trunks are entering and leaving, will be under negative air pressure.

(6) Each of the three units is subject to 40 CFR Part 60, Subpart E, New Source Performance Standards (NSPS), except that where requirements in this permit are more restrictive, the requirements in this permit shall apply.

b. Ash handling facility emissions shall not exceed 1.63 pounds per hour.

c. Compliance Tests

(1) Compliance tests for particulate matter, and, nitrogen oxides shall be conducted in accordance with 40 CFR 60.8 (a), (b), (d), (e), and (f), except that an annual test will be conducted for particulate matter. Compliance tests for opacity will be conducted simultaneously with compliance tests for particulate matter. The compliance test requirements for the ash handling facility shall be waived in accordance with Rule 17-2.700(3)(d), FAC.

Compliance tests shall be conducted for such time and under such conditions as specified by EPA prior to the compliance test. These conditions will be specified by EPA upon notification of performance tests as required by General Condition 1. The permittee shall make available to EPA such records as may be necessary to determine the conditions of the performance tests.

(2) The following test methods and procedures from 40 CFR Parts 60 and 61 shall be used for compliance testing:

a. Method 1 for selection of sample site and sample traverses

SPECIFIC CONDITIONS:

b. Method 2 for determining stack gas flow rate when converting concentrations to or from mass emission limits.

c. Method 3 for gas analysis when needed for calculation of molecular weight or percent CO2.

d. Method 4 for determining 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.

e. Method 5 for concentration of particulate matter and associated moisture content. One sample shall constitute one test run.

f. Method 9 for visible determination of the opacity of emissions.

g. Method 7 for concentration of nitrogen oxides. Four samples, taken at approximately 15 minute intervals, shall constitute one test run.

(3) The stack tests shall be performed at +10% of the heat input rate of 150 million Btu per hour per boiler; however, compliance with the particulate matter emission limit shall be at design capacity.

2. The height of the boiler exhaust stack shall not be less than 220 feet above ground level at the base of the stack.

3. The incinerator boilers shall not be loaded in excess of their rated capacity of 36,666 pounds per hour each.

4. The incinerator boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

5. The permittee must submit to EPA and DER within fifteen (15) days after it becomes available to the County, copies of technical data pertaining to the incinerator boiler design,

SPECIFIC CONDITIONS:

to the electrostatic precipitator design, and to the fuel mix that can be used to evaluate compliance of the facility with the preceeding emission limitations.

6. Grease, scum, grit screenings or sewage sludge shall not be charged into the solid waste to energy facility boilers.

7. Electrostatic Precipitator

The electrostatic precipitator shall be designed and constructed to limit particulate emissions to no more than 0.021 grains per dscf corrected to 12% CO2.

8. Stack Monitoring Program

The permittee shall install and operate continuous monitoring devices for stack oxygen and opacity. The monitoring devices shall meet the applicable requirements of Rule 17- 2.710, FAC, 40 CFR Part 60, Subparts A and D, Sections 60.13 and 60.45 respectively, except that emission rates shall be calculated in units consistent with emission limits in this permit. The conversion procedure shall be approved by EPA.

9. Reporting

   a. A copy of the results of the stack tests shall be submitted within forty-five days of testing to the DER Southwest Florida District Office, the Hillsborough County Environmental Protection Commission (HCEPC) and EPA Region IV.

   b. Stack monitoring shall be reported to HCEPC, the DER Southwest District Office and EPA Region IV on a quarterly basis in accordance with Section 17-2.710, FAC, and 40 CFR, Part 60, Subsection 60.7.:e

10. Fuel

The Resource Recovery Facility shall utilize refuse such as garbage and trash (as defined in Chapter 17-7, FAC) but not sludge from sewage treatment plants as its fuel. Use of alternate fuels would necessitate application for a modification to this permit.

PERMITTEE:
Hillsborough County

Permit Number: PSD-FL-121
Expiration Date: March 31, 1988

SPECIFIC CONDITIONS:

Issued this_____day of_____, 19___

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION

____
Dale Twachtmann, Secretary

Condition of Certificati

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

RECEIVED
JUL - 3 1986
CAMP DRESSER & McKEE INC-TAMPA

June 23, 1986

Mr. David S. Dee, Esquire
Carlton, Fields, Ward, Emmanuel,
    Smith and Cutler, P.A.
Post Office Drawer 190
Tallahassee, FL 32301

Dear Mr. Dee:

Attached please find a revised copy of the Conditions of Certification for the Hillsborough County Energy Recovery Facility as approved by the Governor and Cabinet on June 17, 1986.

Sincerely,

Hamilton S. Oven, Jr.

Hamilton S. Oven, Jr., P.E.
Administrator
Siting Coordination Section

HSOjr/sb

cc: All Parties

RECEIVED JUN 2 6 1986

State of Florida Department of Environmental Regulation
Hillsborough County
Energy Recovery Facility
Case No. 83-19
CONDITIONS OF CERTIFICATION Revised 6/17/86

Table of Contents

State of Florida
Hillsborough County
Energy Recovery Facility
Case No. PA 83-19
CONDITIONS OF CERTIFICATION

I. CONSTRUCTION

The facility shall be constructed, as a minimum, pursuant to the design standards presented in the application.

A. Control Measures

1. Stormwater Runoff

To control runoff 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 stormwater to insure against spillage or discharge of excavated material that may cause turbidity in excess of 50 Jackson Turbidity Units above background in Waters of the State and to comply with Hillsborough County and Southwest Florida Water Management District stormwater regulations. 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 runoff. The pH shall be kept within the range of 6.0 to 8.5.

2. Burning

Open burning in connection with land clearing shall be in accordance with Chapter 17-5, FAC, and applicable County regulations. No additional permits shall be required, but prior to each act of burning, the Division of Forestry shall be contacted to determine if satisfactory conditions exist for burning. Open burning shall not occur if the Division of Forestry has issued a ban on burning due to fire hazard conditions.

3. Sanitary Wastes

Disposal of sanitary wastes from construction toilet facilities shall be in accorance with applicable regulations of the appropriate local health agency.

4. Solid Wastes

Solid wastes resulting from construction shall be disposed of in accordance with the applicable regulations of Chapter 17-7, FAC.

5. Noise

Construction noise shall not exceed local noise ordinance specifications, nor those noise standards imposed by zoning.

6. Dust

The County shall employ proper dust-control techniques to minimize fugitive dust emissions.

7. Transmission Lines

The directly associated transmission lines from the Resource Recovery Facility electric generators to the existing Tampa Electric Company (TECO) substation shall be along the existing TECO right-of-way.

B. Environmental Control Program

An environmental control program shall be established under the supervision of a qualified person to assure that all construction activities conform to good environmental practices and the applicable conditions of certification.

If unexpected or harmful effects or evidence or irreversible environmental damage are detected during construction, the permittee shall notify the DER Southwest Florida District Office, 7601 Highway 301 North, Tampa, Florida, 33610, by telephone during the working day that the effect or damage occurs and shall confirm this in writing within seventy-two (72) hours of becoming aware of such conditions, and shall provide in writing an analysis of the problem land a plan to eliminate or significantly reduce the harmful effects of damage.

C. Reporting

1. Starting three (3) months after certification, a quarterly construction status report shall be submitted to the Southwest Florida District Office of the Department of Environmental Regulation. The report shall be a short narrative describing the progress of construction.

2. Upon completion of construction the DER Southwest Florida District Office will be notified in order that a pre-operational inspection can be performed.

II. OPERATION

A. Air

The operation of the Resource Recovery Facility shall be in accordance with all applicable provisions of Chapter 17-2, 17-4, and 17-7, Florida Administrative Code. In addition to the foregoing, the permittee shall comply with the following specific conditions of certification:

1. Emission Limitations

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: 0.021 grains per standard cubic foot dry gas corrected to 12% CO_2 with a maximum cap of 7.0 pounds per hour per unit

(3) TOT. UNITS
.0175 lb/Hr

(2) SO_2: 3.2 lbs/ton of solid waste-fired, maximum 24 hour average .17 gr/dscf (more restrictive) .45 dscf or 8.5 lb/ton 3hr Ave

(3) Nitrogen Oxides: 3 lbs/ton .16 gr/dscf

(4) Carbon Monoxide: 1.8 lbs/ton .093 gr/dscf

Lead - .00104 gr or .02 lb/ton
Florides .0031 gr or .06 lb/ton
Sulfuric Acid Mist .0040 gr or .077 lbs/ton

(5) VOC: 0.2 lbs/ton or .01 gr/dscf (more restrictive)

(6) Mercury: 2200 grams/day = 4.84 lbs./DAY

(7) Odor: there shall be no objectionable odor

(8) Visible emissions: opacity shall not be greater than 15% except that visible emissions with no more than 20% opacity may be allowed for up to three minutes in any one hour except during start up or upsets when the provisions of 17-2.250, FAC, shall apply. Opacity compliance shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)., DER Method 9.

(9) Beryllium: 13.1 x $\underline{10^{-6}}$ lbs/ton or 6.8×10^{-7} gr/dscf

b. The height of the boiler exhaust stack shall not be less than 220 feet above grade.

c. The incinerator boilers shall not be loaded in excess of their rated capacity of 36,666 pounds per hour each.

d. The incinerator boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

e. Compliance with the limitations for particulates, sulfur oxides, nitrogen oxides, carbon monoxide and lead shall be determined in accordance with Florida Administrative Code Rule 17-2.700, DER Methods 1, 2, 3, 5, 6, and 40 CFR 60, Appendix A, Method 7. Compliance with the opacity of stack emissions shall be demonstrated in accordance with Florida Administrative Code Rule 17-2.700(6)(a)9., DER Method 9. The stack test shall be performed at +10% of the heat input rate of 150 million Btu per hour; however, compliance with the particulate matter emission limit shall be at design capacity.

f. The permittee must submit to the Department within thirty (30) days after it becomes available, copies of technical data pertaining to the incinerator boiler design, to the electrostatic precipitator design, and to the fuel mix that can be used to evaluate compliance of the facility with the preceeding emission limitations.

g. Grease, scum, grit screenings or sewage sludge will not be charged into the solid waste to energy facility boilers.

2. Electrostatic Precipitator

The electrostatic precipitator shall be designed and constructed to achieve a maximum emission rate of 0.021 grains per dscf.

3. Air Monitoring Program

a. The permittee shall install and operate continuously monitoring devices for stack oxygen and opacity. The monitoring devices shall meet the applicable requirements of Chapter 17-2.710, FAC, and 40 CFR 60.45, and 40 CFR 60.13, including certification of each device.

b. The permittee shall provide sampling ports into the stack and shall provide access to the sampling ports in accordance with Section 17-2.700(4), FAC.

c. The permittee shall have a sampling test of the stack emissions performed by a commercial testing firm within 90 days of the start of operation of the boilers and annually from the date of testing thereafter.

4. Reporting

a. Two copies of the results of the stack tests shall be submitted within forty-five days of testing to the DER Southwest Florida District Office.

b. Stack monitoring shall be reported to the DER Southwest District Office on a quarterly basis in accordance with Section 17-2.710, FAC, and 40 CFR, Part 60, Subsection 60.7.

B. Fuel

The Resource Recovery Facility shall utilize refuse such as garbage and trash (as defined in Chapter 17-7, FAC) but not sludge from sewage treatment plants as its fuel. Use of alternate fuels would necessitate modification of these Conditions of Certification.

C. Cooling Tower

1. Make-up Water Constituency

a. The Resource Recovery Facility shall utilize only treated sewage effluent or stormwater runoff from the stormwater holding pond as cooling tower makeup water. The effluent shall have received prior to use in the tower, as a minimum, secondary treatment, as well as treatment described in Condition II.C.2 below. Use of waters other than treated sewage effluent or site stormwater, i.e., higher quality potable waters or lower quality less-than-secondarily treated sewage effluent will require a modification of conditions agreed to by the Southwest Florida Water Management District and the Department and must be approved by the Governor and Cabinet.

b. Notwithstanding the provisions of condition II.C.1.(a), Hillsborough County may use potable water as cooling tower makeup water: (i) on an interim basis for 24 months; (ii) on an emergency basis, after the Northwest Brandon Subregional Wastewater Treatment Plant is operational, whenever the wastewater treatment plant is unable to produce treated wastewater of suitable quality or quantities, if the County determines and the SWFWMD agrees that it is not feasible to use other sources of water; and (iii) under such other circumstances as may arise, if such use is approved in writing by the DER and SWFWMD.

c. Hillsborough County may use treated effluent or potable water at any time as boiler makeup water.

d. Hillsborough County will report to the SWFWMD the daily quantities of potable or fresh water utilized as makeup water for the cooling tower. This data will be supplied on a monthly basis, with reports due by the 10th day of the month following data collection.

e. To implement condition II.C.1.(b)(ii), above, Hillsborough County shall submit reports to the SWFWMD concerning the feasibility of using other sources of water for emergency purposes. A progress report shall be submitted to SWFWMD on June 1, 1987 and a final report shall be submitted on June 1, 1988.

2. Chlorination

Chlorine levels in the cooling tower makeup water shall continuously be monitored, prior to insertion in the cooling towers. Sewage effluent from the Brandon Subregional Wastewater Treatment Plant or alternate used as makeup shall be treated if necessary to maintain a 1.0 mg/liter total chlorine residual after fifteen minutes contact time at average daily flow, whichever provides a higher level of public health protection.

D. Water Discharges

1. Any discharges from the site stormwater treatment system via the emergency overflow structure shall meet State Water Quality Standards, Chapter 17-3, FAC, shall comply with Hillsborough County and Southwest Florida Water Management District regulations, and shall comply with Chapter 17-25, FAC.

2. Cooling tower blowdown shall not be discharged to surface waters.

E. Operational Safeguards

The overall design and layout of the facilities shall be such as to minimize hazards to humans and the environment. Security control measures shall be utilized to prevent exposure of the public to hazardous conditions. The Federal Occupational Safety and Health Standards will be complied with during construction and operation. The safety standards specified under Section 440.56, Florida Statutes, by the Industrial Safety Section of the Florida Department of Commerce will be complied with during operation.

F. Transmission Lines

The directly associated transmission lines from the Resource Recovery Facility electric generator to the TECO Substation shall be kept cleared without the use of herbicides.

G. Noise

Operational noises shall not exceed local noise ordinance limitations nor those noise standards imposed by zoning.-

III. 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, production increases,or process modifications which may result in new, different, or increased discharges or pollutants, change in fuel, or expansion in steam generating capacity must be reported by submission of a new or supplemental application pursuant to Chapter 403, Florida Statutes.

IV. NON-COMPLIANCE NOTIFICATION

If, for any reason, the permittee does not comply with or will be unable to comply with any limitation specified in this certification, the permittee shall notify the Southwest Florida District Manager of the Department by telephone during the working day that said non-compliance 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 on non-compliance; and

B. The period of non-compliance, including exact 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-complying event.

V. FACILITIES OPERATION

The permittee shall at all times maintain in good working order and operate as efficiently as possible any treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this certification. Such systems are not to be bypassed without prior Department approval.

VI. ADVERSE IMPACT

The permittee shall take all reasonable steps to minimize any adverse impact resulting from non-compliance with any limitation specified in this certification, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

VII. RIGHT OF ENTRY

The permittee shall allow the Secretary of the Florida Department of Environmental Regulation and/or authorized representatives, upon the presentation of credentials:

A. To enter upon the permittee's premises where an effluent source is located or in which records are required to be kept under the terms and conditions of this permit, and

B. To have access to and copy any records required to be kept under the conditions of this certification, 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.

VIII. REVOCATION OR SUSPENSION

This certification may be suspended or revoked pursuant to Section 403.512, Florida Statutes, or for violations of any of its conditions.

IX. CIVIL AND CRIMINAL LIABILITY

This certification does not relieve the permittee from civil or criminal penalties for non-compliance 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.

X. 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.

XI. 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 provision to other circumstances and the remainder of the certification shall not be affected thereby.

XII. DEFINITIONS

The meaning of terms used herein shall be governed by the definitions contained in Chapter 403, Florida Statutes, and any regulations adopted pursuant thereto. In the event of any dispute over the meaning of a term in these general or special conditions which is not defined in such statutes or regulations, such dispute shall be resolved by reference to the most relevant definitions contained in any other state or federal statute or regulation or, in the alternative, by the use of the commonly accepted meaning as determined by the Department.

XIII. REVIEW OF SITE CERTIFICATION

The certification shall be final unless revised, revoked or suspended pursuant to law. At least every five years from the date of issuance of certification the Department shall review all monitoring data that has been submitted to it during the preceding five-year period for the purpose of determining the extent of the permittee's compliance with the conditions of this certification and the environmental impact of this facility. The Department shall submit the results of its review and recommendations to the permittee. Such review will be repeated at least every five years thereafter.

XIV. MODIFICATION OF CONDITIONS

Pursuant to Subsection 403.516(1), F.S., the Board hereby delegates the authority to the Secretary to modify any condition of this certification dealing with sampling, monitoring, reporting, specification of control equipment, related time schedules, SO_2 emission limitations subject to notice and opportunity for hearing, or any special studies conducted, as necessary to attain the objectives of Chapter 403, Florida Statutes.

All other modifications shall be made in accordance with Section 403.516, Florida Statutes.

Compliance Report and Plan

COMPLIANCE REPORT AND PLAN

The Hillsborough County Resource Recovery Facility located in Tampa, Florida burns municipal waste emanating from unincorporated Hillsborough County, and generates approximately 30 megawatts of electricity which is provided to the Tampa Electric Company. Effluent from an adjacent waste water treatment plant is used for all cooling water needs. Emissions to the atmosphere are controlled by electrostatic precipitators (ESPs). All three stacks are located within a common annulus, together with the Unit No. 4 stack which was not yet in service during the test program.

Stationary source sampling was performed for Ogden Martin Systems, Inc. at the Hillsborough County Resource Recovery Facility (RRF) in Tampa, Florida. The testing was performed on April 16-18, 1996 at the Unit Nos. 1, 2, and 3 municipal solid waste-fired boiler stacks to determine the particulate emissions and plume opacity. The results of the stack testing were submitted to FDEP on May 30, 1996. The results demonstrated the facility is in compliance with FDEP regulation permit number PSD-FL-121.

After a review of all applicable regulations for the facility, the facility was determined to be in compliance. In order to demonstrate continued compliance, stack testing and continuous monitoring will be done as stated below.

To demonstrate continued compliance, the facility will complete annual stack tests of the MWCs for particulates, opacity, and nitrogen oxide as specified in the PSD permit (PSD-FL-121 Specific Condition 1.c). In addition continuous monitors shall be utilized.

Compliance Certification

COMPLIANCE CERTIFICATION

Compliance statements will be submitted to DEP on an annual basis, or as required throughout the permit term.

> *I, the undersigned, am the responsible official as defined in Chapter 62-210.200 F.A.C., of the Title V source for which this report is being submitted. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made and data contained in this report are true, accurate, and complete.*

Daniel A. K

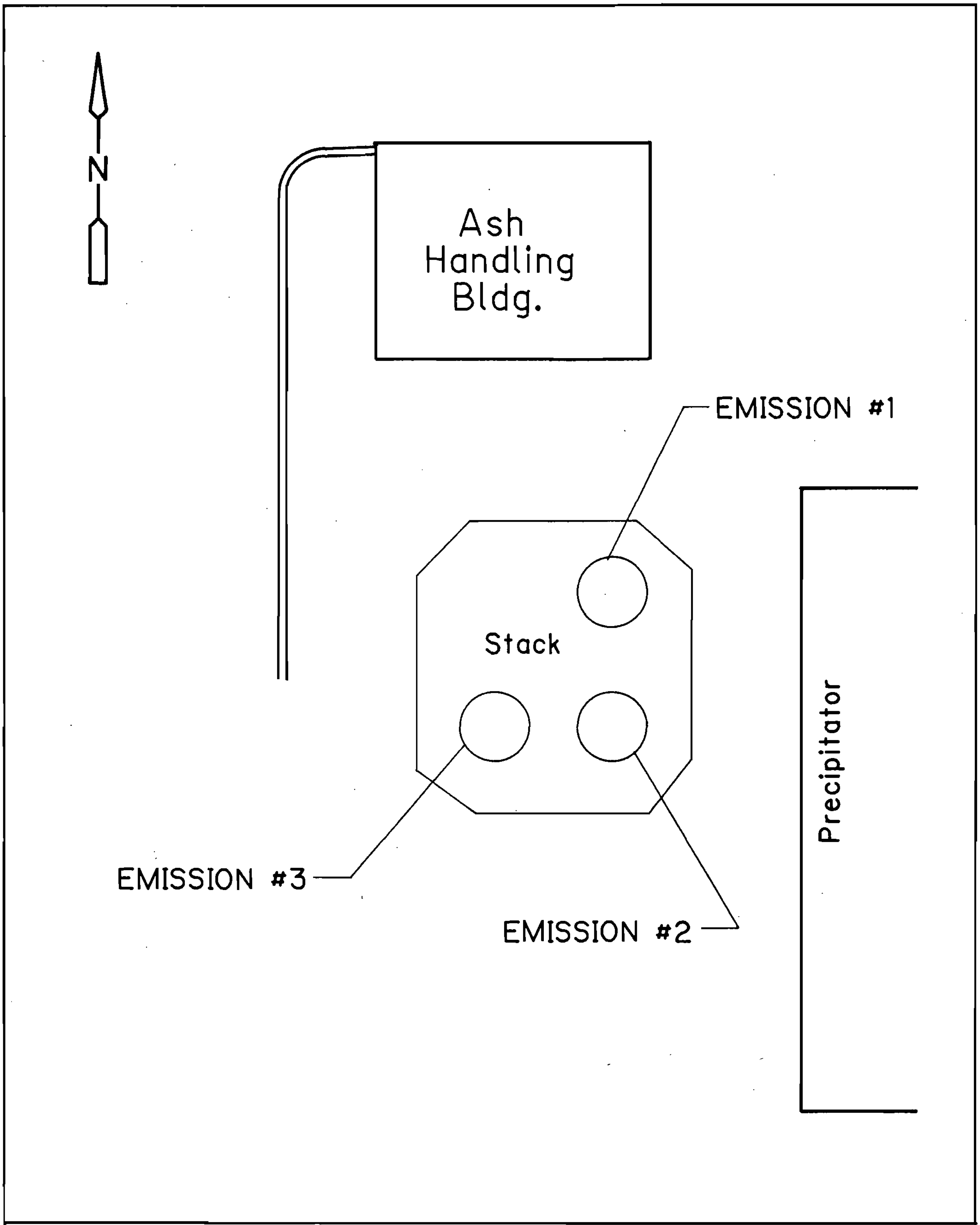
Responsible Official

June 14, 1996

Date

Municipal Solid Waste Combustors Supplementary Information

Point Identification



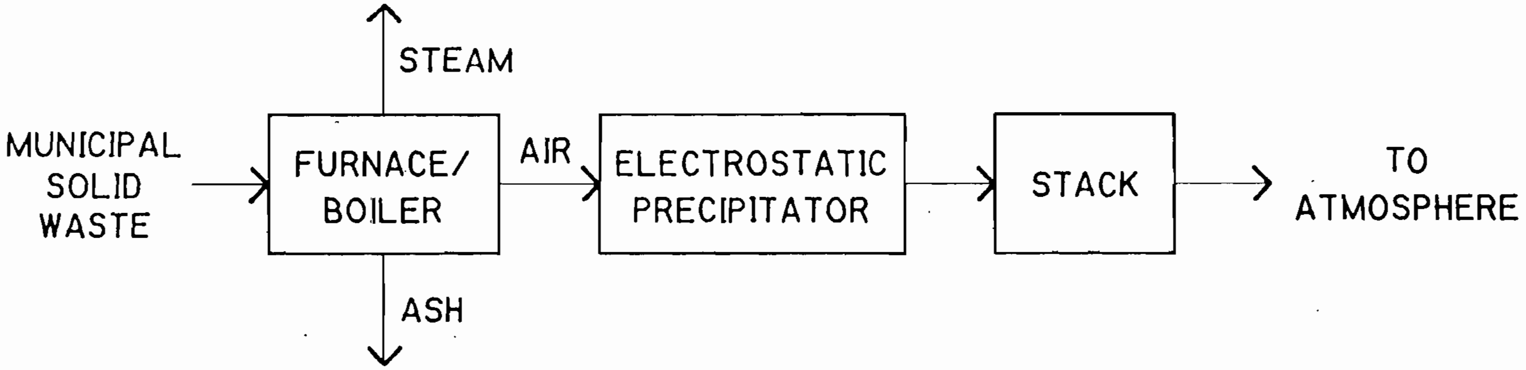
HILLSBOROUGH COUNTY RESOURCE RECOVERY FACILITY

EMISSIONS UNITS

CDM
environmental engineers, scientists, planners, & management consultants

A:\ C200111 06/13/96 14:22:46 1:30:07 Darwish El-Hajji

Process Flow Design



CDM
environmental engineers, scientists, planners, & management consultants

HILLSBOROUGH COUNTY

PROCESS FLOW DIAGRAM

Detailed Description of Control Equipment

AAF PRODUCT CODE NO. 697

Page 4 of 13
Date 2 May 1985
Project No. 83-1379

Type System Municipal Incinerator/Heat Recovery Unit

Gas Volume 92,300 (A)(S)CFM @ 505 °F entering

Type Performance Guarantee Particulate Emissions, Opacity, Pressure Drop and Power Consumption

Operating Pressure ______ " W.G. Dust Loading @ Inlet 2.5 gr/SCF

Outlet 0.017 gr/SCF corrected to 12% CO_2

Other Information Particulate emissions guaranteed for continuous operation and design conditions.

ENGINEERING NOTES

Design Engineering 2444 Man-Hours

Project Engineering $27,135.00 Man-Hours

Start-Up $6300.00 Man-Hours

Estimate Project Engineer Site Visits Three

Due Date May 24, 1985 AAF Drawings for Customer Approval (Est'd)

Due Date Per Erec. Requirements Final Shipment all Materials (Est'd)

Due Date Feb. 21, 1986 Start Sept. 15, 1986 Finish Erection (Est'd)

Due Date 4086/1087 Start-Up of System (Est'd)

Performance Test Required Yes - by others

List Critical Delivery Items T/R's and TRC's. These will be European supply.

SECTION I - DESCRIPTION

General System Description: The system covered by this manual consists of three individual electrostatic precipitator systems. Process gas is routed through an inlet nozzle with perforated plates, through the precipitator, through an outlet nozzle with baffles to a fan, from the fan through a duct to a common stack.

A. Precipitator:

Each precipitator is divided into three electrical fields. Transformer-rectifiers located on the precipitator roof supply high voltage DC power to the precipitator discharge electrodes. Located on the roof are heated insulator housings containing the support insulators and rapping linkages to the rapping mechanisms for cleaning the discharge electrodes.

Each precipitator contains a series of collecting plates and overhead framework which suspends rigid, high voltage discharge electrodes between the collecting plates. The electrodes are stabilized and held plumb by weights attached to the bottom of each electrode and a grid system connecting all of the weights in each field. Stabilizers are employed to prevent oscillation. Rotating hammer and anvil style rappers are provided to dislodge dust from both the discharge electrodes and the collecting plates.

Dust particles in the gas stream are electrically charged by a high voltage, direct current field generated from the electrodes suspended between the collector plates. Current applied directly to the electrodes manifests a highly active and visible glow on the electrodes known as "corona". In the strong electrical field region near the electrode's emitting surface, large numbers of both positive and negative ions are formed. As the electrodes are at negative polarity, the positive ions are attracted to the electrodes. Both negative and positive ions are formed in equal amounts directly in the corona region near the electrodes; but over 99 percent of the gas space between the electrodes and the collector plates contains only negative ions. As the particles entrained in the gas stream pass through the corona field, they are bombarded by the negative ions and become charged. They are then attracted to the grounded collector plates where they impact upon either the plate or the surface of the previously collected material on the plate.

Particulate matter on the collecting plates and electrodes is removed by the impact of "rapper" mechanisms. Particles thus dislodged fall into the hoppers directly below each precipitator.

A mechanical system of key interlocks prevents access to the high voltage areas of the precipitator when it is energized. The precipitator chamber contains its own separate safety key interlock system.

Access doors are provided on the precipitator components for inspection and maintenance.

B. Collector Plates:

Trailing edges (relative to gas flow) of the individual collector plates are a "channel" configuration serving to create an eddy or static air space when exposed to normal system gas velocities. Particulate matter collected on the plate surfaces is inhibited from re-entrainment into the gas stream, because the plate configuration forms a "trough" in which it is trapped and through which it can reach the hopper area. Because any re-entrained particles must pass through the following fields (collector plate/electrode groups), extremely high collection efficiency is achieved.

The collecting plates are cleaned by means of individually rotating hammers. Though the intensity is fixed, the frequency can be adjusted. The hammers, located transversely, are indexed on a rotatig shaft to assure that only one plate assembly is rapped at one time. When a hammer strikes the anvil (mounted on the end of plate row), the force is transmitted into each collector plate module through the lower support bar. A rapper drive access door provides access to the rotating hammers and the drive shaft mechanism.

This method of introducing energy into the collecting plate system minimizes the rapping force required by preventing transmission of rapping forces into the shell. It also allows transmission of a precise amount of energy to each individual plate.

Each system is sequentially timed to assure no two rappers are energized simultaneously. The rapping frequently can be adjusted to assure the highest attainable efficiencies and the elimination of stack puffing.

The rapper drives are Winsmith 8 MCTTW units driven by 1/3 HP motors.

Particulate matter collected on the collector plates is dislodged into the hoppers by the action of the rapping mechanism.

C. R/S Discharge Electrodes:

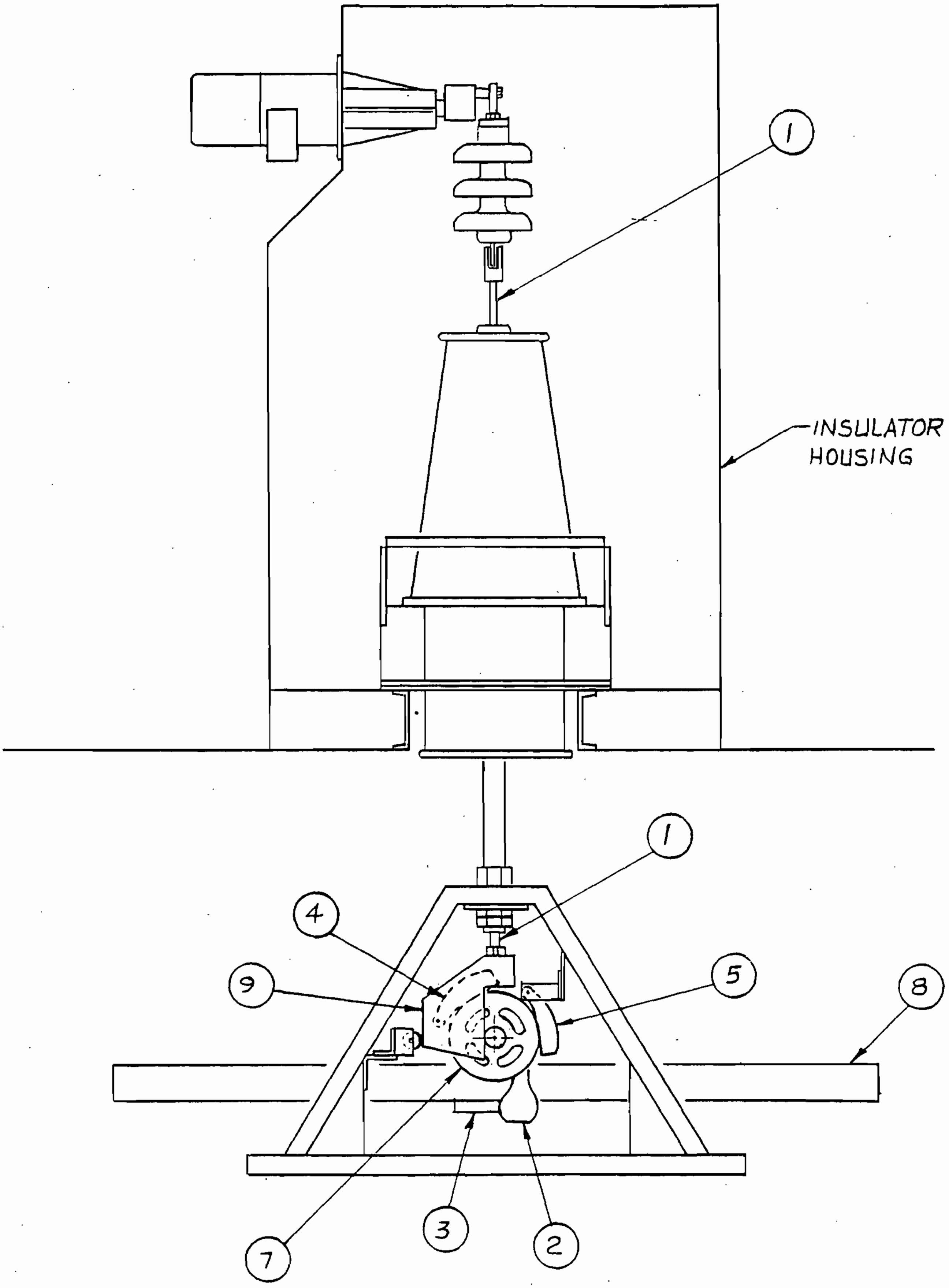
The discharge electrodes are suspended from a grid-like framework above the collector plates so that they are equally spaced between the rows of collector plates within the gas passages. Since the collector plate/discharge electrode relationship is very critical to the electrostatic precipitation process, each electrode is stabilized and held plumb by a 16-pound weight attached to the bottom. Anti-sway devices suspended from support frame and a connecting gridwork at the bottom of the weights prevent oscillation.

The electrode rapper mechanism features a pin wheel escapement assembly. Refer to the Electrode Rapper Illustration, Page 5: ratchet assembly (9) is alternately raised and lowered by drive shaft (1), causing the pin wheel (7), to be advanced one position by pawl (4), as the ratchet is raised. As the shaft reaches the top of its stroke, pawl (5), engages the pin wheel to prevent pin wheel movement during the downward stroke of the ratchet assembly. On the downstroke, pawl (4), is lowered to engage the next pin, and the cycle is repeated. Each such cycle moves the pin wheel one position and causes one rapper hammer (2), to fall over center, striking an anvil (3), on the electrode support assembly (8).

The electrode rapper drives are Eurodrive RUF 70 DT 71D8 driven by 0.2 HP motors.

D. Inlet Perforated Distribution Plates:

Immediately forward of the precipitator, within the precipitator inlet nozzle, are two perforated gas distribution plates through which the gas stream must flow prior to entering the treatment area. The



ELECTRODE RAPPER ILLUSTRATION

nature of the perforations is such that gas flow is equalized across the entire cross section of the precipitator.

Because of the manner in which the perforated gas distribution plates equalize gas distribution, the gas stream and entrained particles pass evenly among all collector plate/discharge electrodes "gas passages" across the precipitator.

Direct vibration is used to dislodge collected particles from the gas distribution plates to prevent any dust buildup which might alter the distribution pattern. This is achieved by a physical connection from the collecting plates to the distribution plates.

E. Hoppers:

Three hoppers are located below the precipitator and each contains one access door, two poke tubes, two electro-mechanical vibrators, one striking anvil and 14 heater modules.

F. Precipitator Power:

Three high voltage transformer/rectifier (T/R) systems provide each precipitator with a high voltage DC power source. The transformer steps-up the AC supply voltage to the desired value before it is rectified by the silicon rectifier. The T/R's are "J" type with a primary reactor (choke) in the enclosure.

A signal from the spark detector in the T/R and from the primary current sensor in the T/R control cabinet automatically regulates the silicon controlled rectifiers (SCR's), affecting the AC voltage applied to the transformer/rectifier, thus the tranformer/rectifier controller (TRC) compensates for changes in the prevailing conditions and maintains the voltage level at the varying threshold of sparking.

Additionally, the TRC regulates the input power to maintain a high level of average voltage with no decrease in precipitator operating efficiency. If there is a sustained short within the T/R power circuit, the TRC limits current to a safe level until the short is cleared.

CAUTION

A suitable temperature environment must be maintained to assure proper performance of the T/R control cabinets. Do not allow the T/R control cabinet to be subjected to an ambient temperature of less than 32° F. or more than 105° F. To do so may affect performance characteristics of the TRC.

Optimum electrostatic precipitator efficiency is realized when the electrodes are operating just below "threshold voltage" (that voltage value which causes arcing between the electrodes and the collector plates). A transformer/rectifier control cabinet houses control equipment which automatically maintains voltage on the electrodes just below the arc-over point. This equipment drives the precipitator voltage up at an adjustable restoration time rate until the threshold of sparking is exceeded and sparking occurs. The spark acts as a fault, collapsing the transformer secondary and primary voltage. As this occurs, nearly the entire line voltage is applied across the SCR elements. Because the electrostatic field is reduced and the transformer primary voltage is low, the spark cannot be sustained. As this action occurs, the regulator reduces the reference level of the applied voltage an adjustable "step back" percentage to prevent immediate restriking of the arc. As the arc is extinguished and the voltage level is reduced to just below the threshold level, the control again drives the voltage up until sparking occurs. By repeating this cycle continuously, the average voltage is maintained at a level just below the threshold of sparking.

Adjustments for restoration time, step back percentage, voltage limit and current limit are provided. Manual operation below the sparking level is possible by manually reducing the voltage or current limit settings. In the manual mode of operation, voltage level remains constant and sparking in the precipitator is controlled by manual readjustment.

Alarm/shutdown of the T/R control panel occurs at T/R high pressure, T/R oil temp >90° C., SCR temperature >90° C., and primary current >110% of full load. Alarm only occurs at T/R oil low level, T/R oil temp >80° C., SCR temp >80° C., and low secondary KV. Alarm test and reset pushbuttons are provided on the T/R control cabinet.

G. Access Doors:

A mechanical system of key interlocks prevents access to the high voltage area of the precipitator while it is operating. Before any access door to the high voltage area can be opened, it is necessary to perform the key interlock sequence.

1. Precipitator Housing: An access door located at each of the collector plate rapper drives provides access to the plate rappers.

Three access doors, located on the roof, provide access to each precipitator "field" for inspection and maintenance.

2. Hoppers: One door is provided for each hopper for inspection and maintenance.
3. Insulator Housings: One bolted access cover is provided for each insulator housing for inspection and maintenance.

H. Hopper Vibrators:

An Eriez 55P vibrator is provided on each hopper. These vibrators are controlled by the hopper level/vibrator panel so that when the hopper ash conveyor is running these vibrators operate periodically. A vibrator will also be on whenever its hopper level is high or when manually set ON at the panel.

J. Electrical Systems:

1. One common control room is provided to house the precipitator power distribution panels (PDP), transformer/rectifier controllers (TRC), rapper panels, level/vibrator panels, room lighting/HVAC equipment and interface terminal box (ITB, for interconnection of control wiring between AAF equipment and remote equipment by others).
2. Transformer/Rectifier: The transformer/rectifier (T/R) units are roof mounted on the precipitator and include oil immersed silicon diodes, transformer reactor choke coil, and high voltage ground switch - all mounted in a single, waterproof tank. Each transformer/rectifier is controlled from an individual T/R control cabinet. One transformer/rectifier is provided for each respective electrical "field" (A, B and C).

3. Insulator Heaters: Each of the roof mounted insulator housings is provided with a 1500 W. electric, thermostatically controlled heater to help maintain a temperature above the dew point.

4. Hopper Heaters: Each hopper is provided with 14 Bylin heater modules, 7.6 KW total, thermostatically controlled by a hopper mounted panel to be on whenever the skin temp is <300° F.

Description of Stack Sampling Facilities

3.0 PROCESS DESCRIPTION AND OPERATION

3.1 General

The Hillsborough County Resource Recovery Facility located in Tampa, Florida burns municipal solid waste emanating from unincorporated Hillsborough County. The facility is rated at 1,320 tons per day and generates approximately 27 megawatts of electricity which is provided to the Tampa Electric Company. Effluent from an adjacent waste water treatment plant is used for all cooling water needs. Emissions to the atmosphere are controlled by electrostatic precipitators (ESPs). All three stacks are located within a common annulus. The testing covered in this report was conducted at the Unit Nos. 1, 2, and 3 stacks.

3.2 Source Air Flow

Figure 3-1 is an air flow schematic which shows the passage of flue gases exhausted from the boilers.

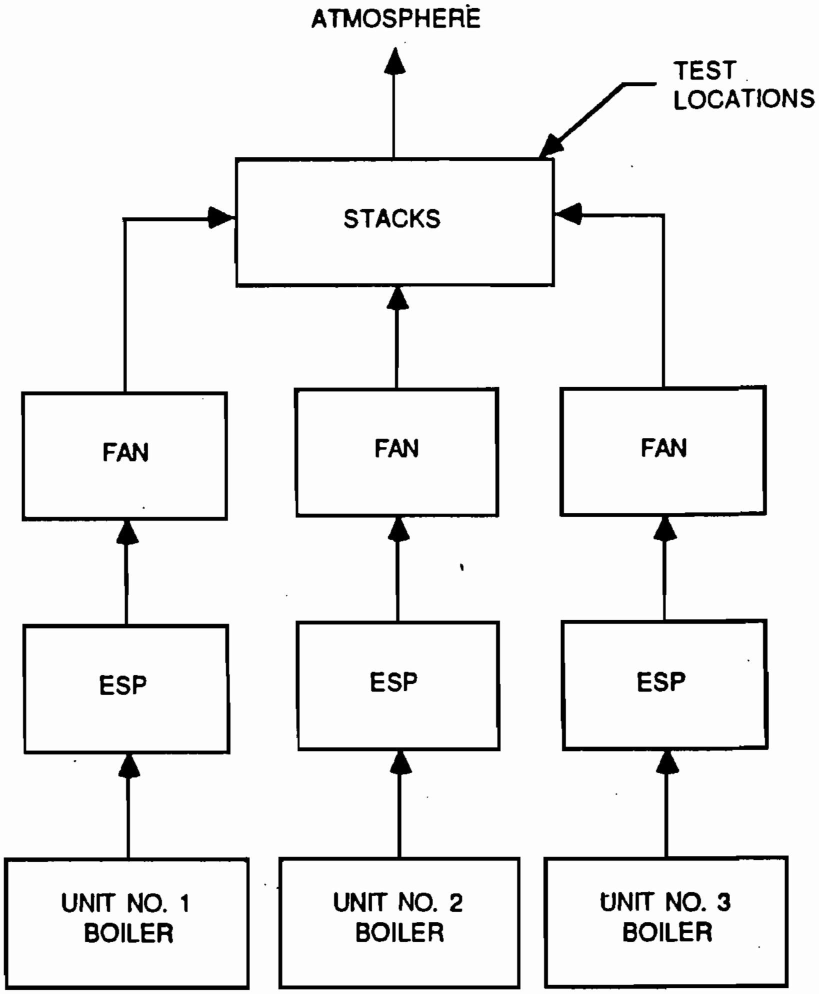


FIGURE 3-1. UNIT NOS. 1, 2, AND 3 AIR FLOW SCHEMATIC

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 General

All sampling and analytical procedures were those recommended by the United States Environmental Protection Agency and the Florida Department of Environmental Regulation. This section provides brief descriptions of the sampling and analytical procedures.

4.2 Sampling Points

The number and location of the sampling points were determined according to the procedures outlined in EPA Method 1. As shown in **Figure 4-1**, the stack cross sections were divided into 12 equal areas with six sampling points on each of two axes.

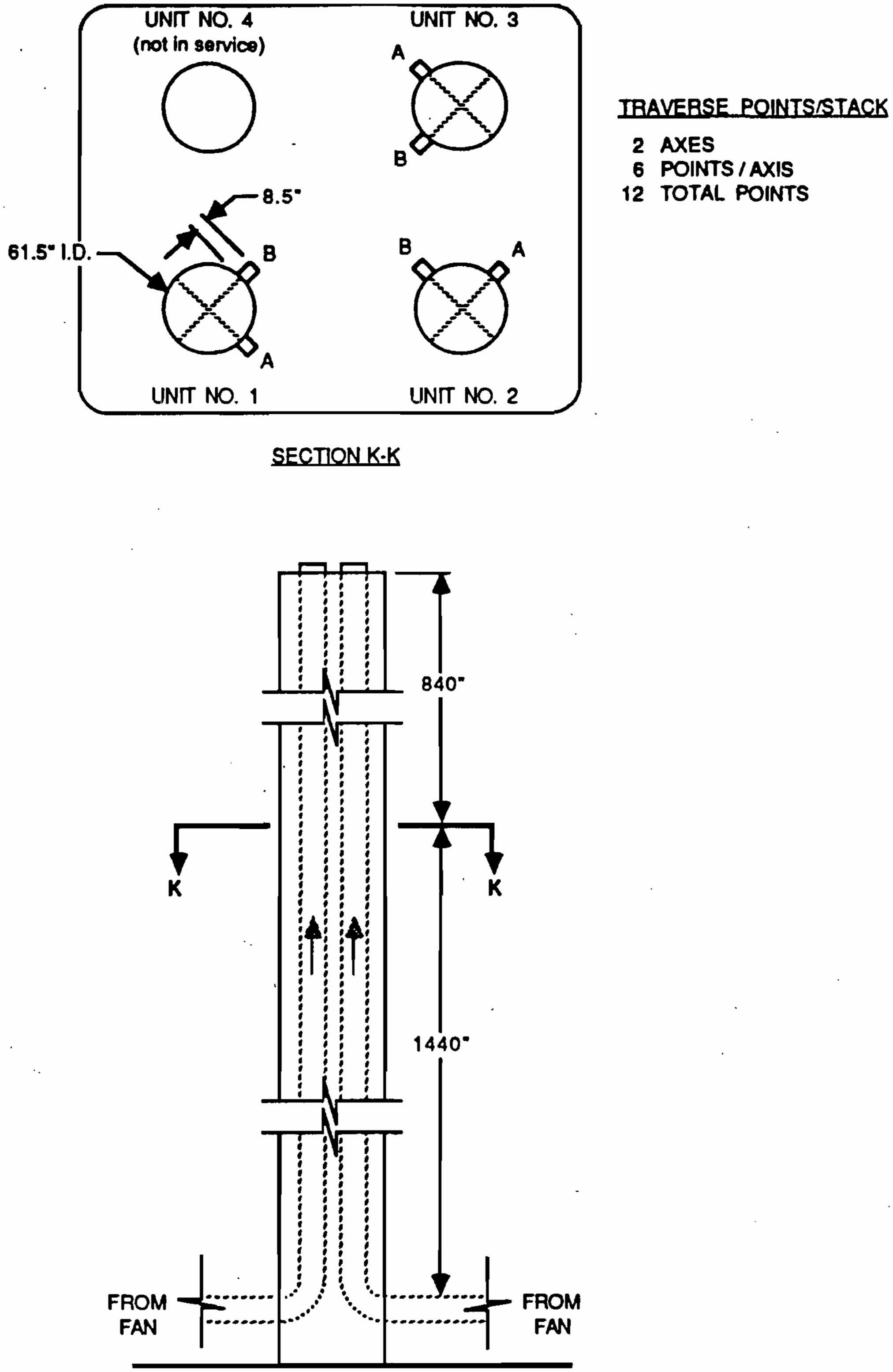


FIGURE 4-1. UNIT NOS. 1, 2, AND 3 STACK TEST LOCATIONS

Compliance Test Report

OGDEN

Ogden Projects, Inc.
40 Lane Road, CN 2615
Fairfield, NJ 07007-2615 USA
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Environmental Engineering Department

VOLUME 2

ENTROPY, INC. REPORT ON COMPLIANCE TESTING

ENVIRONMENTAL TEST REPORT

PREPARED FOR: Ogden Martin Systems of Hillsborough, Inc.
350 N. Falkenberg Road
Tampa, Florida 33619

REGULATORY AGENCY: State of Florida Department of Environmental Protection, Bureau of Air Quality Management, Permit No. PSD-FL-121 and Rule 62-296.416(4)(e).

PURPOSE: Determination of Compliance with Permitted Emission Limits.

TEST DATES: April 16-18, 1996

May 30, 1996
OPI Report No. 2016

MERCURY, PARTICULATE MATTER, AND VISIBLE EMISSIONS TEST REPORT
FOR THE
HILLSBOUROUGH COUNTY SOLID WASTE RESOURCE RECOVERY FACILITY
TAMPA, FLORIDA
FDEP PERMIT #PSD-FL-121

Prepared for:

OGDEN PROJECTS, INC.
40 LANE ROAD CN 2615
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ESE NO. 3196662-0100-3100

APRIL 1996

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1.0 INTRODUCTION

1.0 INTRODUCTION

Under contract to Ogden Projects, Inc. (OPI), Environmental Science & Engineering, Inc. (ESE) conducted a series of emissions tests for Units #1, 2 and 3 at the Hillsbourough County Solid Waste Energy Facility (HCSWEF) located in Tampa, Florida. The testing was conducted during April 16-18, 1996. Units #1, 2 and 3 are identical mass burn solid waste-to-energy waterwall boilers. The purpose of the test program was to demonstrate compliance with particulate matter (PM) and visible emissions (opacity) with the Florida Department of Environmental Protection (FDEP) Permit No. PSD-FL-121. Mercury testing was also conducted in accordance with the FDEP Rule 62-296-416(4)(e). PM and visible emissions are permitted at 0.021 grains/dry standard cubic feet corrected to 12% carbon dioxide (gr/dscf @ 12% CO_2) or 7.0 pounds/hour (lb/hr), whichever is more restrictive; and, 15% opacity, respectively. The current mercury standard used for the facility is 2200g/day. The facility utilizes an electrostatic precipitator to control PM emissions from the flue gas stream of each boiler.

PM emissions were collected under isokinetic sampling conditions and analyzed by ESE in accordance with EPA Reference Method 5. Opacity was measured by a certified visible emissions observer by EPA Reference Method 9. Traverse point layout, velocity, dry gas molecular weight, and moisture content were determined by ESE in accordance with EPA Reference Methods 1-4, respectively. EPA Reference Methods 1-4, 5, and 9 are contained in Appendix A, Title 40, Part 60 of the Code of Federal Regulations (40 CFR 60).

Mercury emissions were collected under isokinetic sampling conditions and analyzed by ESE in accordance with EPA Reference Method 101A, outlined in Appendix B, Title 40, Part 61 of the Code of Federal Regulations (40 CFR 61).

Three (3) test runs were conducted for each boiler. Mercury and PM sample collection were collected over a test run duration of 120 minutes. Visible emission observation of the flue gas

Three (3) test runs were conducted for each boiler. Mercury and PM sample collection were collected over a test run duration of 120 minutes. Visible emission observation of the flue gas opacity were performed over a test run duration of 60 minutes. Mercury, PM, and opacity emission testing was performed concurrently during each test run. The emission tests were coordinated by Ms. Michelle Herman of OPI and Mr. John Burbridge of Ogden Martin Systems of Hillsbourough. The ESE Project Manager was Mr. Bill Mayhew. The test crew was composed of Mr. Lee Garcia, Mr. Tom Macdonald and Mr. Hugh Thomas of ESE.

Section 2.0 of this report provides a brief process description and identification of the sampling locations. Section 3.0 presents the emissions test results. Section 4.0 outlines the procedures and methods that were used by ESE during the emission test series. Section 5.0 discusses the quality assurance/quality control measures followed during sampling and analysis.

2.0 PROCESS DESCRIPTION AND SAMPLING LOCATION

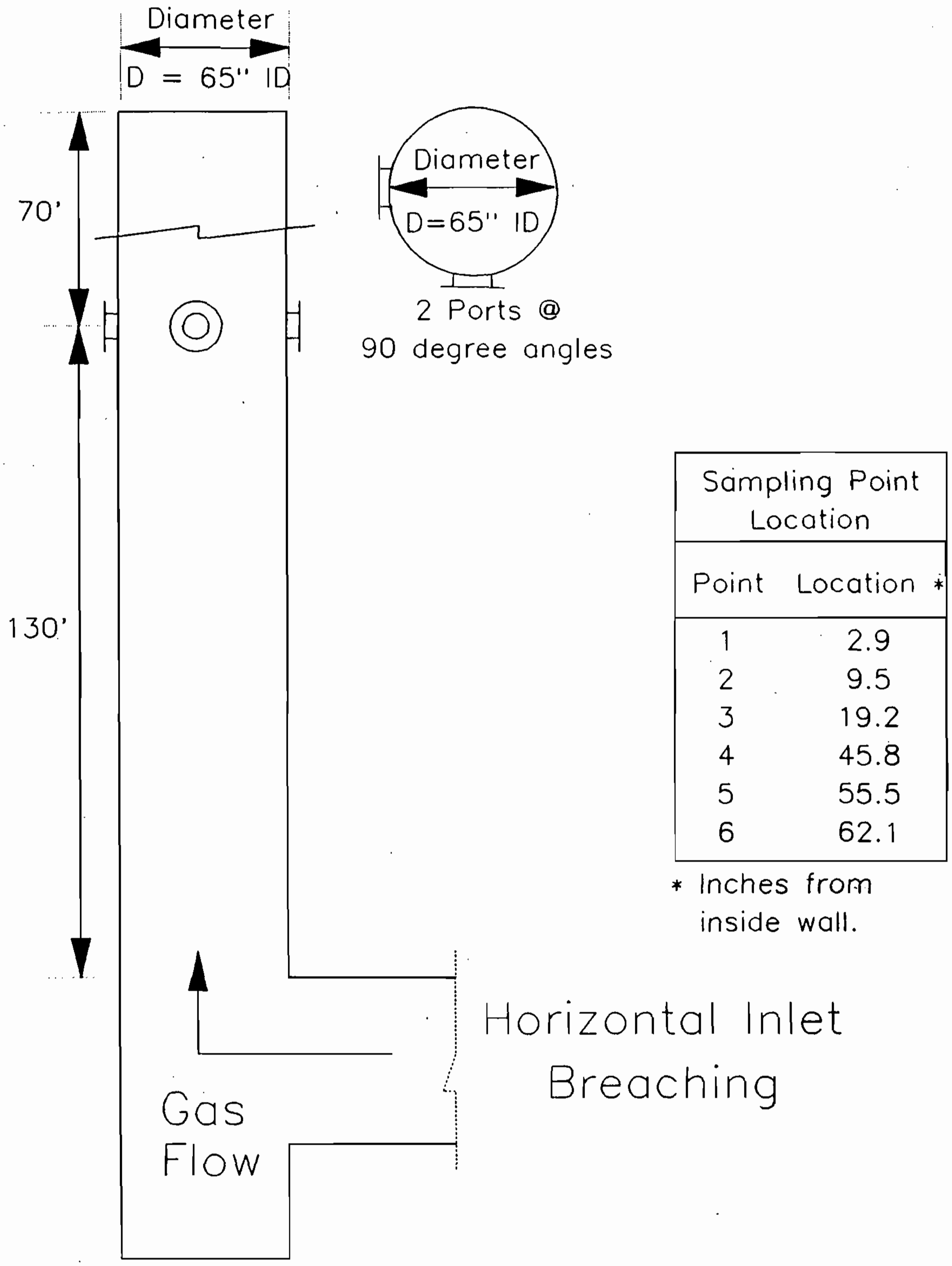
2.0 PROCESS DESCRIPTION AND SAMPLING POINT LOCATIONS

The HCSWEF is located at 350 N. Falkenberg Road in Tampa, Florida. The facility consists of three (3) identical solid waste-to-energy units. The units were designed, built, and operated by Ogden Martin Systems of Hillsbourough (OMSH). German Martin GmbH mass burn technology is the basis for the combustion systems. Municipal solid waste (MSW) is combusted in the units at temperatures exceeding 1800 °F and the heat generated is recovered as steam in the boiler which drives a steam turbine to generate electricity. The boilers are of the waterwall design. Influent MSW is reduced to ash in the combustion process which constitutes a volume reduction of approximately 90%. The ash generated is then disposed of at an adjacent county landfill.

The combined capacity of the three (3) units is a combustion throughput of 1320 tons of MSW per day. The facility is capable of generating up to 27 megawatts (MW) of electrical power. The facility began commercial operation in October 1987.

Emissions from the combustion of MSW are controlled with electrostatic precipitators. The purpose of this test program was to demonstrate compliance of PM and opacity emissions with FDEP Permit No. PSD-FL-121. OPI personnel collected process operating data during the emission test series. This information will be submitted under a separate cover letter.

The exhaust stack consisted of a stack shell housing four (4) circular stacks. At present, three (3) of the stack liners are in use, the fourth is available for future expansion. The stack liners are identical, each stack outfitted with two (2) 8-inch sampling ports positioned 90 degrees apart on the same plane of the stack circumference. The inside diameter of the circular stacks is 65 inches. The stack sampling locations are considered ideal, meeting the "8 and 2" criteria established by EPA Method 1, hence, a total of 12 sampling points were used (6 traverse points across each diameter) for the isokinetic sampling of PM and mercury emissions. The nearest upstream flow disturbance from the sampling ports is the breeching to the stack where the scrubbed flue gas enters the duct. This distance is greater than 8 duct diameters from the sampling ports. The nearest flow disturbance downstream from the sampling ports is the atmospheric exhaust which is greater than 10 duct diameters from the sampling ports in the direction of the flow. Figure 2-1 presents a schematic diagram typical of circular stack sources and shows the exhaust stack and sample port locations.



Sampling Point Location

Point	Location *
1	2.9
2	9.5
3	19.2
4	45.8
5	55.5
6	62.1

* Inches from inside wall.

Figure 2-1. Hillsborough Co. SWEF – Typical Source Sampling Point Location.

3.0 EMISSIONS TEST RESULTS

3.0 EMISSIONS TEST RESULTS

Emission testing of Units #1, #2, and #3 were conducted for the HCWERRF in Tampa, Florida on April 16-18, 1996. Tables 3-1 and 3-2 present the PM and mercury emission test results determined by ESE, respectively.

PM concentration for the three (3) test runs conducted on Unit #1 were determined to be 0.0012, 0.0027 and 0.0022 gr/dscf @ 12% CO_2, respectively. PM mass emission rates for the three (3) test runs were determined to be 0.391, 0.894, and 0.805 lb/hr, respectively. Visible emissions during the three (3) test runs of Unit #1 were found to be 0% opacity. Mercury concentration for the three (3) test runs were found to be 295.5, 152.5, and 209.7 ug/dscm @ 7% O_2, respectively. The average mass emission rate for mercury was 360.1 g/day for the three tests. Isokinetic sampling conditions for all test runs were determined to be within the 100 ± 10 percent criteria of EPA Method 5 and EPA Method 101A.

PM concentration for the three (3) test runs conducted on Unit #2 were determined to be 0.0026, 0.0022, and 0.0023 gr/dscf @ 12% CO_2, respectively. PM mass emission rates for the three (3) test runs were determined to be 0.834, 0.727, and 0.810 lb/hr, respectively. Visible emissions during the three (3) test runs of Unit #2 were found to be 1.0% opacity. Mercury concentration for the three (3) test runs were found to be 270.1, 201.5, and 223.4 ug/dscm @ 7% O_2, respectively. The mean mercury mass emission rate for the three runs was 374.8 g/day. Isokinetic sampling conditions for all test runs were determined to be within the 100 ± 10 percent criteria of EPA Method 5 and EPA Method 101A.

PM concentration for the three (3) test runs conducted on Unit #3 were determined to be 0.0023, 0.0022, and 0.0025 gr/dscf @ 12% CO_2, respectively. PM mass emission rates for the three (3) test runs were determined to be 0.788, 0.794, and 0.867 lb/hr, respectively. Visible emissions during the three (3) test runs of Unit #1 were found to be 0% opacity. Mercury concentration for the three (3) test runs were found to be 298.8, 247.4, and 150.8 ug/dscm @ 7% O_2, respectively.

The average mercury mass emission rate was 394.2 g/day. Isokinetic sampling conditions for all test runs were determined to be within the 100 ± 10 percent criteria of EPA Method 5 and EPA Method 101A.

Sample calculations and run summaries including quality assurance indicators are given in Appendix B. Field data sheets for all sampling are included in Appendix C. Calibration and Quality Assurance data are given in Appendix D.

Table 3-1. Emissions Test Results - Ogden Martin. Hillsborough City Solid Waste Energy Facility
Units #1-3. Particulate Matter and Visible Emissions Results.
Date: April 16, 17 & 18 1996

Unit	Run #	O2 %V,d	CO2 %V,d	Opacity %	PARTICULATE MATTER			
					grains/dscf	grains/dscf @ 12% CO2	grains/dscf @ 7% O2	lb/hr
1	1	9.3	10.1	0	0.00098	0.0012	0.0012	0.391
	2	10.2	9.5	0	0.00215	0.0027	0.0028	0.894
	3	9.3	10.4	0	0.00190	0.0022	0.0023	0.805
	Average	**9.6**	**10.0**	**0.0**	**0.00168**	**0.0020**	**0.0021**	**0.697**
2	1	10.07	9.4	2.9	0.00201	0.0026	0.0026	0.834
	2	10.1	9.6	0	0.00172	0.0022	0.0022	0.727
	3	10.1	9.8	0	0.00186	0.0023	0.0024	0.810
	Average	**10.1**	**9.6**	**1.0**	**0.00186**	**0.0023**	**0.0024**	**0.790**
3	1	9.3	10.2	0	0.00192	0.0023	0.0023	0.788
	2	9.1	10.2	0	0.00189	0.0022	0.0022	0.794
	3	9.3	10.4	0.1	0.00212	0.0025	0.0025	0.867
	Average	**9.2**	**10.3**	**0.0**	**0.00198**	**0.00233**	**0.00236**	**0.816**

Source: ESE 96

Table 3-2. Emissions Test Results - Ogden Martin. Hillsborough City Solid Waste Energy Facility Units #1-3. Mercury Results.
Date: April 16, 17 & 18 1996

Unit	Run #	MERCURY EMISSIONS				
		ug/dscm	ug/dscm @ 12% CO2	ug/dscm @ 7% O2	g/day	lb/hr
1	1	246.6	293.0	295.5	481.6	0.044
	2	117.4	148.3	152.5	240.0	0.022
	3	175.0	202.0	209.7	358.7	0.033
	Average	**179.7**	**214.4**	**219.2**	**360.1**	**0.033**
2	1	210.4	268.6	270.1	426.5	0.039
	2	156.6	195.7	201.5	326.8	0.030
	3	173.6	212.5	223.4	371.1	0.034
	Average	**180.2**	**225.6**	**231.7**	**374.8**	**0.034**
3	1	249.4	293.4	298.8	499.7	0.046
	2	210.0	247.0	247.4	432.8	0.040
	3	125.8	145.2	150.8	250.0	0.023
	Average	**195.1**	**228.5**	**232.3**	**394.2**	**0.036**

Source: ESE 96

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.0 PROCEDURES AND EPA TEST METHODS

ESE conducted compliance emission testing at the HCWERRF facility in Tampa, Florida using the most recent U.S. EPA Reference Test Methods for stationary source emissions testing outlined in Appendix A, Title 40, Part 60 (40 CFR 60) and Appendix B, Title 40, Part 61 (40 CFR 61) of the Code of Federal Regulations.

EPA Method 1:	Determination of sampling point locations for particulate and velocity traverses.
EPA Method 2:	Stack gas velocity and volumetric flow rate determination using calibrated type "S" pitot tubes and type "K" thermocouples.
EPA Method 3:	Stack gas molecular weight and composition.
EPA Method 4:	Determination of sample gas moisture content in stack gases.
EPA Method 5:	Determination of particulate matter under isokinetic sampling conditions.
EPA Method 9:	Opacity measurement by a certified visible emissions observer.
EPA Method 101A:	Determination of mercury emissions.

EPA Methods 1 through 4 were used to determine volumetric flow rate and moisture composition in order to determine mass emission rates from stack gas concentrations, and to verify isokinetic sampling conditions. All procedures and quality control guidelines specified in the appropriate methods were strictly followed during the test program, in addition to ESE's more stringent internal quality control standards.

4.1 EPA METHOD 1: VELOCITY AND SAMPLE TRAVERSE

The location of the traverse points used to perform isokinetic sampling and determine the velocity of the stack gas stream was based on the relation of the sample port location to the upstream and downstream distances of the next obstruction or disturbance. The minimum number of traverse points and the locations on each diameter area was determined from Figure 1-1 and Table 1-1 of EPA Method 1, Appendix A, 40 CFR 60. The stack dimensions, equivalent diameters, equivalent duct diameters, upstream and downstream distances were discussed in Section 2.0 of this report.

4.2 EPA METHOD 2: VELOCITY DETERMINATION

The stack gas velocity was determined from measurement of the velocity head with a calibrated type "S" pitot tube connected to an inclined manometer; measurement of the stack gas temperature with a calibrated type "K" thermocouple; and, measurement of the stack gas composition (EPA Method 3). The pitot tubes were calibrated by the visual examination procedures outlined in EPA Method 2. Verification of these measurements were recorded onto a pitot tube calibration work sheet contained in Appendix D.

The velocity of the gas stream was calculated from the arithmetic average of all traverse velocity measurements made during each test run. Stack gas temperature, velocity head, sampling rate, volume of dry gas metered, and various test train measurements were recorded at each traverse point during each test run. Field data work sheets and computer printouts of all calculations are included in Appendix B and C.

4.3 EPA METHOD 3: STACK GAS MOLECULAR WEIGHT

The molecular weight of the stack gas stream was calculated from measurement of carbon monoxide, oxygen, and carbon dioxide concentrations with an orsat analyzer. An integrated gaseous sample from the stack source was collected in a leak-free tedlar bag. The contents of the tedlar bag were analyzed three (3) times with the orsat analyzer. The balance of the gas composition was assumed to be nitrogen. The tedlar bag was evacuated, purged with nitrogen, evacuated again, and reused for the next test run.

4.4 EPA METHOD 4: MOISTURE CONTENT

The moisture content of the sample gas stream was determined by extracting the gas sample at a known and regulated rate through a glass condenser train consisting of four (4) glass impingers connected in series with leak free glass u-tube connectors. The gas sample was extracted through the impinger train (maintained below 68 °F in an ice bath) with a vacuum pump and the volume of gas sampled was measured with a calibrated dry gas meter. The sampling rate was regulated with a critical orifice mounted on the outlet of the dry gas meter. The volume of moisture collected was measured gravimetrically with an analytical balance with a tolerance of 0.1 g and the volume of gas drawn, corrected to dry standard conditions (528 °R, 29.92 in Hg.) was determined. The dry gas meter and thermocouple calibration forms are contained in Appendix D.

4.5 EPA METHOD 5: PARTICULATE MATTER

Collection of particulate matter under isokinetic sampling conditions was conducted in accordance with the procedures outlined in EPA Method 5, revised as of July 1, 1995. The sample train equipment consisted of the following components and measurement devices:

1. Probe Assembly

a. Probe--Stainless steel sheath containing stack gas thermocouple, pitot tube, nozzle, and sample liner for transportation of stack gas through the probe assembly.

b. Nozzle--Borosilicate glass nozzle with a sharp, tapered, leading edge calibrated with a micrometer according to specifications of EPA Method 5. The nozzle was connected to the sample liner with a teflon union.

c. Sample Liner--5/8 inch diameter borosilicate glass liner connected to the heated filter box assembly with glass connectors. Temperature maintained throughout the test duration at 248 ± 25 °F with a calibrated type "K" thermocouple.

d. Pitot--Calibrated reverse type "S" pitot attached to the probe according to the specifications outlined in EPA Method 2.

e. Stack Thermocouple--Calibrated type "K" thermocouple attached to the probe assembly such that the tip has no contact with metal and does not interfere with the pitot tube face openings and nozzle sample area as outlined in EPA Method 2.

2. **Filter Box Assembly**

Enclosed housing containing the borosilicate filter bell assembly and maintained at a temperature of 248 ± 25 °F throughout the test duration with a calibrated type "K" thermocouple. The filter bell assembly was connected to the probe liner and impinger train with glass connectors. The glass filter paper was supported with a teflon frit inside the filter bell assembly.

3. **Impinger Train**

Four (4) impingers connected in series with glass ball/socket joint fittings and placed in an ice bath. The first, third, and fourth impingers are the modified Greenburg-Smith design. The second impinger is the Greenburg-Smith design with a standard orifice tip. Sample gas exit temperature from the fourth impinger was measured with a calibrated type "K" thermocouple immersed in the gas stream and maintained below 68 °F.

4. **Control Box**

Module containing vacuum gauge, timer, dual inclined manometers, external leak-free pump, calibrated type "K" thermocouples for measurement of temperature across the dry gas meter, thermocouple sensors, calibrated dry gas meter with a minimum of 2 percent accuracy, valves, and related equipment to determine sample volume and provide isokinetic operation of the sample test train.

a. Umbilical Cable--Harness containing thermocouple, electrical, gas sample lines for connection of the sample train to the console control box module.

A diagram of the EPA Method 5 sample train is contained in Figure 4-1.

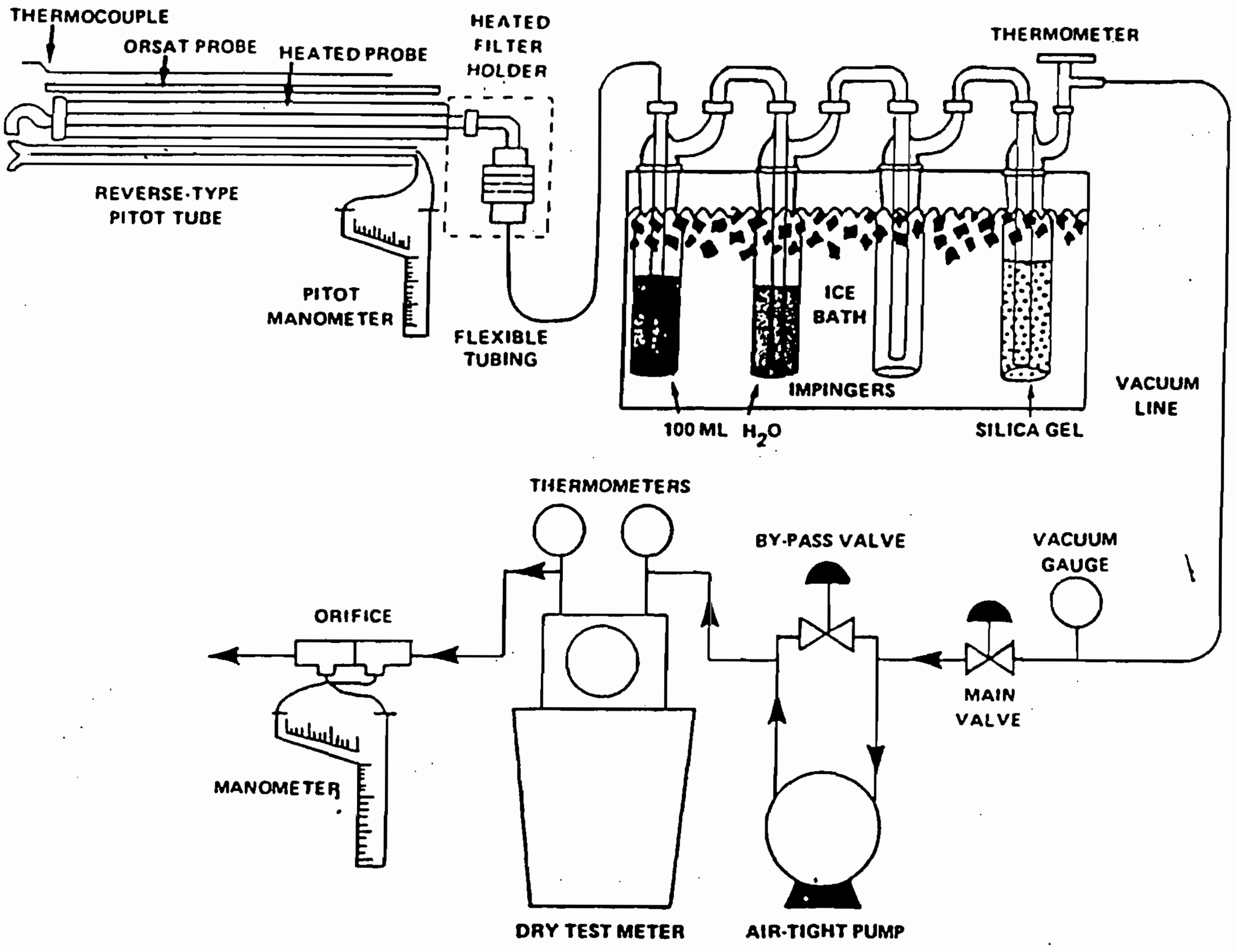


Figure 4-1

EPA METHOD 5 SAMPLING TRAIN

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.,

SAMPLE TRAIN COMPONENT PREPARATION

The pitot tube, dry gas meter, and thermocouple measurement devices were calibrated by ESE in accordance with Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA-600/4-77-27b.

All glass and teflon components of the sample train before the outlet of the last impinger were prepared before mobilization to the facility. At a minimum, these components were washed in hot soapy water, rinsed three (3) times with Type II deionized water (ASTM D-1193-77), rinsed with reagent grade acetone, air dried, and packaged in appropriately designed shipping containers.

SAMPLE TRAIN PREPARATION

Upon arrival at the sampling site, a cyclonic check of the stack gas flow stream was performed with the pitot and manometer. The stack gas was found to be noncyclonic. A preliminary sample run was performed to select an appropriately sized nozzle in order to sample under isokinetic conditions. Stack gas temperature, moisture content, and velocity head were utilized in selection of the nozzle. The selected nozzle was calibrated with a micrometer and attached to the sample probe with a teflon union.

The moisture sample train was prepared in the following manner: 200 ml of H_2O was added to the first and second impingers. The third impinger was left empty and approximately 200 g of silica gel (indicating type, 6-16 Mesh) was added to the forth impinger. Each impinger was then weighed on an analytical balance with a tolerance of 0.1 g, transferred to the cold box and assembled in series with glass u-tube connectors. The cold box was packed full with crushed ice and assembled to the sampling train. A preweighed glass filter was placed inside the filter holder onto a teflon support frit. The filter holder was positioned into the filter assembly unit and connected to the sample probe and impinger train with interconnecting glassware as depicted in Figure 4-1.

The entire assembled sample system was leak-checked by plugging the inlet to the probe nozzle and pulling a vacuum of at least 10 in. Hg. A leak rate less than 0.02 cfm was determined and considered acceptable as outlined in EPA Method 4. The pitot tube system was also vacuum leak-checked at 2 to 3 inches of water column.

The traverse points were marked on the probe for easy visibility. Temperature controllers for the heated filter box and the probe were set to maintain a temperature of 248 ± 25 °F. The nozzle was placed at the first traverse point with the tip pointing 180 degrees away from the gas stream. Upon achieving operating temperature of the sample train and equilibration of the probe to the stack gas temperature, the nozzle tip was positioned directly facing the stack gas stream. The sample pump was started and the flow adjusted to a suitable pressure drop over the dry gas meter in order to sample under isokinetic conditions during the test run. After the required time interval had elapsed, the probe tip was repositioned to the next traverse point. This was done for each point on the traverse until the test run was completed. Pressure head, stack gas temperature, and sample train measurements were taken at equal spaced intervals. At the conclusion of the traverse of the first port, the nozzle was turned 180 degrees away from the stack gas stream, the pump stopped, and the sample train was repositioned to the subsequent sample port(s). This technique was followed throughout the entire sampling until all traverse samples were completed.

At the conclusion of each test run, the sample pump was turned off, and the final sample train measurements were recorded. The integrity of the EPA Method 5 sample train was not disturbed, except when positioning the train to the next sample port(s) during each test run, thus, intermediate leak checks were not necessary to perform. A final leak-check of the system was performed at the conclusion of every test run as previously described at the highest vacuum encountered during testing. A leak-check of the pitot system was performed as previously described. The final leak checks were determined to be within the guidelines outlined in EPA Method 5. All velocity measurements, sample train measurements, moisture data, and leak check measurement were recorded onto the field data work sheets contained in Appendix C.

SAMPLE RECOVERY

At the conclusion of each test run, the probe was removed from the stack sample port and a rubber cap was placed onto the nozzle tip to prevent loss of sample during the recovery of the sample train. The impinger train was disconnected, the inlet and outlet openings sealed with parafilm. The particulate filter holder and the interconnecting glassware were removed from the filter box and the openings sealed with parafilm. Likewise, the sample probe was disconnected and the openings were sealed with parafilm. The impinger train, sample probe, particulate filter holder, and interconnecting glassware were relocated to the sample collection area.

Each impinger was weighed on an analytical balance with a tolerance of ± 0.5 g. The silica gel contents in the fourth impinger was removed and fresh silica gel was added. The contents of the first and second impingers were emptied and refilled to the appropriate volumes. The impingers and interconnecting u-tubes were reassembled, the inlet and outlets of the sample train sealed with parafilm, and prepared for the next test run.

The glass fiber filter was removed from the filter holder with tweezers and placed into the original petri dish. A nylon brush was used to loosen and collect any excess particulate matter or filter fiber material from the filter holder gasket into the sample container. The circumference of the lid was sealed with teflon tape and prepared for shipment. The probe liner, nozzle, interconnecting glassware, and the front half of the filter holder were rinsed with acetone and collected into a glass collection container. A nylon brush was used to loosen any adhering particulate material and subsequent rinses of these devices were collected into the container. Acetone was also used to rinse any particulate matter adhering to the nylon brush into the sample collection container. The liquid level of the sample solution was indicated, the container sealed with teflon tape, and prepared for shipment.

A chain of custody form detailing the persons immediately responsible for the recovery of the particulate sample trains, the analytical requirements, and the unique sample identification number were recorded.

Upon completion of the sample recovery of the EPA Method 5 sample train, the probe liner was reinserted into the probe sheath, the nozzle recalibrated with a micrometer, attached onto the probe, and the nozzle tip and liner end sealed with parafilm. Likewise, the remaining sample train glassware openings were sealed with parafilm and prepared for the subsequent test run. An acetone blank sample was collected at the sample cleanup area for each test day at the facility. Acetone used in the particulate recovery and sample train collection during the compliance test period was from the same stock container.

4.6 EPA METHOD 101A: MERCURY

Collection of mercury under isokinetic sampling conditions was conducted in accordance with the procedures outlined in EPA Method 101A. The sample train equipment consisted of the following components and measurement devices.

1. **Sample Probe Assembly**
   a. Nozzle--Glass buttonhook design with a sharp, tapered leading edge.
   b. Probe--Stainless steel sheath with a 5/8 inch diameter glass probe liner. The probe was maintained at 248 ± 25 °F during sampling.
   c. Pitot--Type "S" constructed and attached to probe sheath according to specifications outlined in EPA Method 2.
   d. Thermocouple--Type "K" attached to the pitot tube to measure stack gas temperature such that the tip has no contact with metal and does not interfere with the pitot tube face openings.
2. **Filter Bypass**
   Interconnecting glassware utilized to connect the probe to the first impinger.

3. **Impingers**
   Four (4) impingers connected in series with glass ball/socket joint fittings and placed in an ice bath. A Greenburg-Smith impinger standard tip configuration was used for the second impinger. The first, third, and fourth impingers were the modified Greenburg-Smith design. Final sample train gas exit temperature was measured within ± 2 °F with a type "K"

thermocouple immersed in the gas stream. The final impinger exit temperature was maintained below 68 °F.

4. **Sampling Console**

   Assembly containing vacuum gauge, external leak-free vane pump, thermocouples capable of measuring temperature to within ± 2 °F, dry gas meter with a minimum of 2 percent accuracy, valves and related equipment as required to maintain an isokinetic sampling rate, and to determine sample volume. The gas meter and thermocouples are calibrated prior to and after use in the field. Documentation of these calibrations are included in the Appendices to this document.

Figure 4-2 presents a schematic diagram of the EPA Method 101A sampling train.

Prior to leaving the laboratory, all sampling glassware was cleaned by washing with hot soapy water (Alconox), followed by three hot water rinses, followed by three rinses with double distilled/deionized water. Final rinsing was with 0.1 N nitric acid. In the field, the impingers were rinsed with sample recovery solution prior to charging.

The sample pump oiler was checked for adequate oil upon arrival at the site. Subsequently, the pump, gas meter and associated sampling equipment were leak-checked at approximately 20 inches of mercury vacuum to ensure the oiler was replaced properly and that no other leakage had been introduced during transport. The meter was also run at the Delta H@ value for 5 minutes and the sampling rate timed to ensure that the rate was at or near specifications at 0.75 cfm.

The sample train was prepared in the following manner: 50 mL of the acidic permanganate solution was added to the first impinger and 100 ml was added to the second and third impingers. Approximately 300 g of fresh indicating silica gel was added to the fourth impinger for final moisture removal.

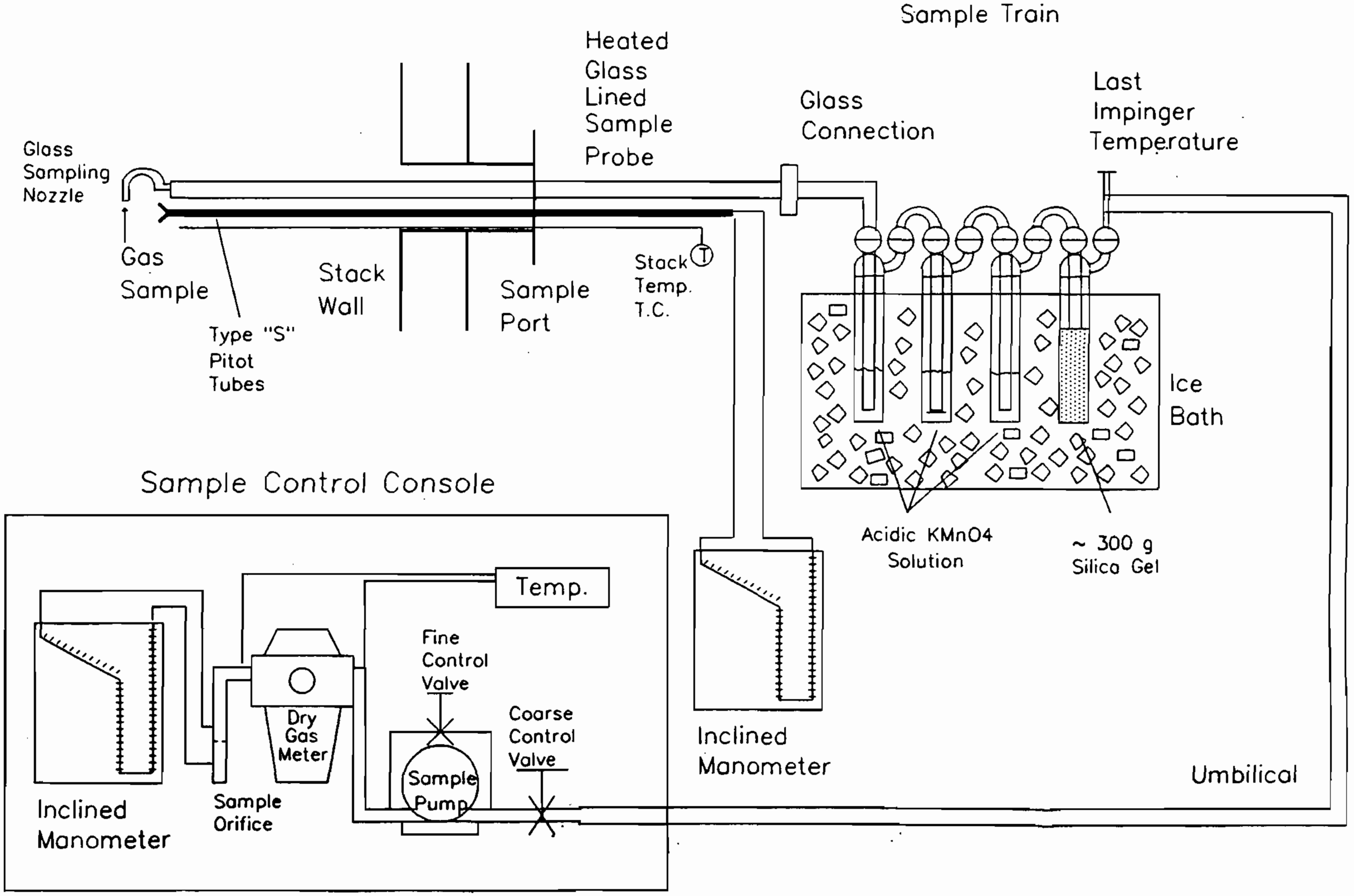


Figure 4-2. EPA Method 101A Sampling Train - Mercury Determination

After assembling the train with the probe as shown in the schematic, the system was leak-checked by plugging the inlet to the probe nozzle and pulling a vacuum of at least 5 in. Hg. A leakage rate of less than or equal to 0.02 cfm is considered acceptable. The pitot tube system was also leak-checked at 2 to 3 inches of water, and any leaks found were corrected.

The inside dimensions of the stack were measured and recorded. The number of sampling points and the location of these points on a traverse were determined by EPA Method 1. The traverse points were marked on the probe sheath for easy visibility.

A preliminary traverse was conducted to determine the range of velocity heads and the pressure of the stack. An approximate stack temperature was obtained during the same traverse, and an approximate moisture content was estimated based on experience and previous test data. Based on this preliminary data, an appropriately sized nozzle for isokinetic sampling was selected.

Crushed ice was placed around the impingers prior to beginning the test run. The sampling nozzle was placed at the first traverse point with the tip pointing directly into the gas stream. The initial meter volume was recorded prior to beginning the run. The pump was started and the sampling rate was adjusted to isokinetic conditions. After the required time interval had elapsed, the probe was repositioned to the next traverse point, and isokinetic sampling was re-established. This procedure was followed for each point on the traverse until the run was completed. Readings were taken at equal spaced intervals during the test run. At the conclusion of each run, the pump was turned off and the final readings were recorded. A final leak-check of the system was performed as previously described at the highest vacuum encountered during testing, and a leak-check of the pitot system was repeated.

The collection train was carefully moved to a convenient and clean sample recovery area in order to minimize the loss of collected sample and to prevent sample contamination. The condensate gain in the impingers was determined gravimetrically. The contents of the first three impingers were poured into an appropriately labeled sample bottle. The probe, nozzle, and all sample-exposed surfaces were then rinsed with an aliquot of the acidic permanganate solution followed by rinsing with 8 N hydrochloric acid (HCl). The rinsate was combined with the impinger solution in the sample bottle. During recovery, the probe and nozzle were brushed three times with a precleaned Teflon brush to dislodge any residual particulate matter or residue. The brush was also rinsed into the sample bottle. The silica gel was removed from the fourth impinger after weighing and kept for recycling. A sample of the solution used for sample recovery was saved for a blank laboratory analysis.

4.7 EPA METHOD 9: VISIBLE EMISSIONS

Visible emission (opacity) measurement from the exhaust stack was determined by a qualified and certified visible emission observer in accordance with EPA Method 9. The certification towards qualification as a visible emission observer is based on successful completion of a Visible Emission Evaluation Course, given biannually by Eastern Technical Associates of Raleigh, North Carolina. The certification test was comprised of evaluating opacity readings of a plume from a smoke generator. Opacity readings were assigned to 25 different black smoke plumes and 25 different white smoke plumes with an error not to exceed 15 percent opacity on any one reading and an average error not to exceed 7.5 percent opacity in each category.

The opacity test observations were recorded on an appropriate field data work sheet, rounded to the nearest 5 percent, at 15-second intervals for the duration of the test period. The opacity for each test run was determined from the maximum averaged six-minute observations during the test period (24 consecutive readings). Appendix C contains the visible emission raw data work sheets recorded during the compliance test series. Photocopies of ESE's visible emission observer certifications are contained in Appendix E.

4.8 CHAIN OF CUSTODY

Chain of custody work sheets were prepared daily at the test location detailing the person(s) immediately responsible for the recovery of every sample. The chain of custody forms were prepared with detailed identifications of each sample, the analysis requirements, and the persons immediately responsible for the recovery. Signatures of every person in contact with the filter and probe wash samples from the test location to the laboratory were recorded. Test date, sample identification, and the laboratory performing the analyses were identified on the chain of custody work sheet.

4.9 LABORATORY ANALYSIS

PARTICULATE MATTER

Analysis of the glass fiber filters and probe wash samples were performed by ESE in accordance with EPA Method 5. Each glass fiber filter sample was placed into an oven and dried at 225 °F over a two-hour period. The filters were cooled in a desiccator at ambient temperature and pressure. The filters were weighed on an analytical balance with a tolerance of ± 0.1 mg. Subsequent desiccations and weighings were performed until the gravimetric measurement of the filter sample agreed within 0.5 mg.

The contents of each probe rinse sample were measured volumetrically to a tolerance of ± 0.1 ml and transferred to tarred, precleaned beakers. The liquid was evaporated at ambient temperature and pressure in a desiccator. The beakers were weighed on an analytical balance with a tolerance of 0.1 mg. Subsequent desiccations and weighings were performed until the gravimetric measurements of each beaker agreed within 0.5 mg.

MERCURY

Analysis of the field blank and impinger samples for mercury were performed by ESE in accordance with EPA Method 101A. The blank and impinger samples were stored on ice and transported to the laboratory in a cooler. During log-in, each sample identification label was verified against the chain of custody work sheets and then immediately refrigerated. The samples and blanks were analyzed for mercury by cold vapor atomic absorption spectroscopy.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.0 QUALITY ASSURANCE/QUALITY CONTROL

Strict Quality Assurance/Quality Control (QA/QC) measures were closely observed for all sampling and analysis performed for the HCWERRF test program. The QA/QC program is designed to provide the highest quality data in terms of the accuracy and precision of the measurements as well as the representativeness and comparability of the results.

The internal QA program includes the activities planned by routine operators and analysts to provide an assessment of test data precision. The following items were included in the internal QA program for this compliance test program:

The quality assurance/quality control measures for sampling and analysis included in the following documents were strictly followed during the emissions test program. The procedures are incorporated by reference into the quality assurance program for this effort as they apply to the collection, analysis, and calculation of mercury concentrations and mass emission rates from the exhaust stack of the electrostatic precipitator control devices.

> The Code of Federal Regulations, Title 40, Part 60, Appendix A., EPA Methods 1, 2, 3, 4, and 5.
>
> The Code of Federal Regulations, Title 40, Part 61, Appendix B., EPA Method 101A.
>
> The Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III - Stationary Source Specific Methods (EPA-600/4-77-027b) Sections 3.0-3.4.

The remainder of the items listed below provide a brief synopsis of critical elements of the internal QA program.

Experienced sampling personnel conducted the emissions testing. The sampling crew was led by Mr. Lee Garcia, a Chief Technician with over 15 years experience in emissions testing. Mr. Mayhew was assisted by two (2) additional chief technicians. The average experience level of the test crew is approximately 9 years.

Primary components of the QA program for the sampling equipment and procedures are listed below:

- Equipment Calibrations - including pre-test and post-test calibrations of meter boxes, thermocouples, and pitot tubes. Sampling nozzles were also calibrated on site. Appendix D contains the calibration data sheets.
- Equipment Leak Checks - including pre- and post-test sample train leak checks, meter and pump leak checks, and pitot leak checks. All sampling train leak rates were less than the maximum acceptable leak rate of 0.02 cubic feet per minute. Sample train leak checks are performed at a vacuum of at least the highest observed vacuum observed during sampling. Leak checks are documented on the field data sheets in Appendix C.
- Careful monitoring and documentation of sample train critical parameters including temperatures, velocity pressure, meter pressure, and sample vacuum. Final impinger temperature was maintained below 68 °F. Data sheets verifying these parameters are included in Appendix C.
- Preliminary measurements to aid in calculating the sampling K-factor used to determine isokinetic sampling rate of the PM and mercury test trains.
- Maintaining an isokinetic sampling rate so that the velocity though the sampling nozzle matches the surrounding flue gas steam velocity to within ± 10%. Isokinetic sampling rates are documented on the data summaries in Appendix B of this document. Sample calculations are also provided with the data.

Specific measures that were observed to ensure the integrity of collection of the mercury samples include but are not limited to:

- Pre-test cleaning for sampling glassware consisting of washing with hot soapy water (Alconox), followed by three hot water rinses, followed by three rinses with double distilled/deionized water and three (3) rinses with nitric acid. In the field, the impingers were rinsed with recovery solution prior to charging.

- All reagents used for sampling and recovery were trace metals grade purity or better.

- Collection of a reagent/trip blank in the field.

- All sample exposed surfaces of the sampling train were constructed of glass or Teflon.

- The sampling time for each test run was 2 hours in order to ensure that detection limits were satisfied.

- Moisture content was determined gravimetrically rather than volumetrically in order to minimize the possibility for contamination.

- Sample bottles were EPA Class B precleaned ICHEM amber borosilicate glass jars. The jars were 1000 ml in capacity and had Teflon lined screw caps.

- Samples were issued a unique identification number in the field and logged on an appropriate chain of custody form. The form included the date and time of collection; the site, unit, and sample location; and, test condition. The liquid level in the bottle was clearly marked on the container. Teflon tape was used to seal the sample jar lids. Copies of the sample log and chain of custody work sheets are included in Appendix E of this document.

- Samples were stored in a cooler and kept cool from the time of recovery until they arrived in the lab, where they were refrigerated until analysis. The temperature of the samples was audited by the laboratory upon receipt.

Specific measures that were observed for the Mercury analysis include:

- Samples were analyzed within the required holding time.

- All reagents used for sample preparation were trace metals grade or better purity.

- Cold vapor atomic absorption spectroscopy (CVAAS) was used for the analysis in order to ensure the best detection limits.

- All samples were analyzed in duplicate and the analytical results for duplicate samples were required to be within 5%.

- A method blank and a reagent/trip blank were both analyzed.

Specific measures that were conducted to ensure the integrity of collection of the particulate matter samples include but are not limited to:

- All sample train components that contacted the sample were precleaned before mobilization to the facility.
- All reagents used for sampling and recovery were trace metals grade purity or better.
- Collection of an acetone reagent/trip blank in the field.
- The glass fiber filter was stored in a sealed petri dish during transportation to/from the facility.
- All sample exposed surfaces of the sampling train were constructed of glass or Teflon.
- Sample bottles were EPA Class B precleaned ICHEM amber borosilicate glass jars. The jars were 1000 ml in capacity and had Teflon lined screw caps.
- Samples were issued a unique identification number in the field and logged onto a chain of custody form. The form included the date and time of collection; site, unit, and sample location; and, test condition. The liquid level in the bottle was clearly marked on the container. Teflon tape was used to seal the sample jar lids and petri dish top.
- Probe wash samples were stored in a cooler and kept cool from the time of recovery until they arrived in the lab, where they were refrigerated until analysis. The temperature of the samples was audited by the laboratory upon receipt.

Specific measures that were observed for the particulate matter analysis include:

- Gravimetric analysis was used for the analysis as specified in EPA Method 5.
- All samples were analyzed in duplicate and the analytical results for duplicate samples were determined to be within 0.5 mg.
- An acetone reagent blank was analyzed.

Laboratory data including QA documentation is included in Appendix E of this document.

APPENDIX A--FDEP FACILITY PERMIT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

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

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

PERMITTEE:
Hillsborough County
Hillsborough County Courthouse
419 Pierce Street
Tampa, Florida 33602

Permit Number: PSD-FL-121
Expiration Date: March 31, 1988
County: Hillsborough
Latitude/Longitude: 27° 57' 00" N
82° 40' 22" W
Project: Hillsborough County
Resource Recovery Modification

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the modification of a 1,200 ton per day resource recovery facility located at the permitted existing municipal solid waste resource recovery facility in Hillsborough County approximately two miles east of Tampa on the county's Faulkenburg Road site. The UTM coordinates of the plant are 368.2 km E and 3092.7 km N.

This permit solely pertains to the pollutant increases (nitrogen oxides, sulfuric acid mist, and particulates) which result from this modification. Only Specific Condition No. 1 has been modified to reflect the changes requested in this modification. For clarity purposes, the remaining specific conditions which pertain to the pollutants addressed in this modification have been repeated as they appeared in the original PSD permit (PSD-FL-104) and also Specific Condition No. 11 has been added. The other pollutants emitted from this facility are addressed in the original PSD permit. This facility is not subject to any emission limitations or testing requirements for sulfuric acid mist. Except as expressly provided in the Specific Conditions contained herein, all of the other provisions of permit No. PSD-FL-104 remain in effect.

Attachments:

1. May 1, 1987, letter by Richard W. Seelinger.
2. June 8, 1987, letter by Bruce P. Miller, EPA Region IV.
3. June 12, 1987, letter by J. R. Treshler.
4. Letter from David Dee, attorney for Hillsborough County dated August 10, 1987.
5. Letter from Ogden Projects, dated August 14, 1987.

6. Letter from U.S. EPA dated September 11, 1987.
7. Letter from U.S. Department of the Interior, dated September 22, 1987.
8. Letter from Hillsborough County Environmental Protection Commission, dated October 2, 1987.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. 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. This permit does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

GENERAL CONDITIONS:

6. The permittee shall at all times properly operate an maintain the facility and systems of treatment and control (an related appurtenances) that are installed or used by th permittee to achieve compliance with the conditions of thi permit, as required by Department rules. This provision include the operation of backup or auxiliary facilities or simila systems when necessary to achieve compliance with the conditio of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agree to allow authorized Department personnel, upon presentation credentials or other documents as may be required by law, acce to the premises, at reasonable times, where the permitt activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; an

c. Sampling or monitoring 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 conce being investigated.

8. If, for any reason, the permittee does not comply with will be unable to comply with any condition or limitati specified in this permit, the permittee shall immediately noti and provide the Department with the following information:

a. a description of and cause of non-compliance; 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 noncompliance.

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 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 arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

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.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Emission Limitations

a. Stack emissions from each unit shall not exceed the following:

(1) Particulate matter: 0.021 grains per dry standard cubic foot corrected to 12% CO_2 (gr/dscf-12%) or 7.0 pounds per hour per unit, whichever is more restrictive.

SPECIFIC CONDITIONS:

(2) Visible Emissions: Opacity of stack emissions shall not be greater than 15% opacity except that 20% opacity may be allowed for one six-minute period (average of 24 consecutive observations recorded at 15-second intervals) in any one hour. Excess opacity resulting from startup or shutdown shall be permitted providing (1) best operational practices to minimize emissions are adhered to and (2) the duration of excess opacity shall be minimized but in no case exceed two hours in any 24 hour period unless specifically authorized by DER for longer duration.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up or shutdown shall be prohibited. Opacity of other emission points at the plant shall not exceed 5%.

(3) Nitrogen Oxides: 0.34 gr/dscf-12%, or 6.4 lb/ton, whichever is more restrictive

(4) Each of the emission limits in conditions (1) and (3) is to be expressed as a 3-hour average. This averaging time, which is applicable to the emission limits for all pollutants, is based on the expected length of time for a particulate compliance test. The concentration standards in conditions (1) and (3) are included as the primary compliance limit to facilitate simpler compliance testing, since the process weight, in tons per hour, is not easily measured. The concentration limit is intended to be equivalent to the lb/ton limit. The concentration limits were derived by dividing the lb/ton limits by the calculated volume of flue gas produced when one ton of refuse is combusted. If actual process conditions, i.e. dscf per ton of refuse fired, are different than projected by the applicant, DER may, at its discretion, determine compliance based upon the lb/ton limits.

(5) The potential for dust generation by ash handling activities will be mitigated by quenching the ash prior to loading in ash transport trucks.

SPECIFIC CONDITIONS:

Additionally, all portions of the proposed facility including the ash handling facility which have the potential for fugitive emissions will be enclosed. Also those areas which have to be open for operational purposes, e.g., tipping floor of the refuse bunker while trunks are entering and leaving, will be under negative air pressure.

(6) Each of the three units is subject to 40 CFR Part 60, Subpart E, New Source Performance Standards (NSPS), except that where requirements in this permit are more restrictive, the requirements in this permit shall apply.

b. Ash handling facility emissions shall not exceed 1.63 pounds per hour.

c. Compliance Tests

(1) Compliance tests for particulate matter, and, nitrogen oxides shall be conducted in accordance with 40 CFR 60.8 (a), (b), (d), (e), and (f), except that an annual test will be conducted for particulate matter. Compliance tests for opacity will be conducted simultaneously with compliance tests for particulate matter. The compliance test requirements for the ash handling facility shall be waived in accordance with Rule 17-2.700(3)(d), FAC.

Compliance tests shall be conducted for such time and under such conditions as specified by EPA prior to the compliance test. These conditions will be specified by DER upon notification of performance tests as required by General Condition 1. The permittee shall make available to DER such records as may be necessary to determine the conditions of the performance tests.

(2) The following test methods and procedures from 40 CFR Parts 60 and 61 shall be used for compliance testing:

a. Method 1 for selection of sample site and sample traverses.

SPECIFIC CONDITIONS:

b. Method 2 for determining stack gas flow rate when converting concentrations to or from mass emission limits.

c. Method 3 for gas analysis when needed for calculation of molecular weight or percent CO_2.

d. Method 4 for determining 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.

e. Method 5 for concentration of particulate matter and associated moisture content. One sample shall constitute one test run.

f. Method 9 for visible determination of the opacity of emissions.

g. Method 7E for concentration of nitrogen oxides.

(3) The stack tests shall be performed at +10% of the heat input rate of 150 million Btu per hour per boiler; however, compliance with the particulate matter emission limit shall be at design capacity.

2. The height of the boiler exhaust stack shall not be less than 220 feet above ground level at the base of the stack.

3. The boilers shall not be loaded in excess of their rated capacity of 36,666 pounds per hour each.

4. The boilers shall have a metal name plate affixed in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number.

SPECIFIC CONDITIONS:

5. Grease, scum, grit screenings or sewage sludge shall not be charged into the solid waste to energy facility boilers.

6. Electrostatic Precipitator

The electrostatic precipitator shall be designed and constructed to limit particulate emissions to no more than 0.021 grains per dscf corrected to 12% CO_2.

7. Stack Monitoring Program

The permittee shall install and operate continuous monitoring devices for stack oxygen and opacity. The monitoring devices shall meet the applicable requirements of Rule 17- 2.710, FAC, 40 CFR Part 60, Subparts A and D, Sections 60.13 and 60.45 respectively, except that emission rates shall be calculated in units consistent with emission limits in this permit. The conversion procedure shall be approved by DER.

8. Reporting

   a. A copy of the results of the stack tests shall be submitted within forty-five days of testing to the DER Southwest Florida District Office, the Hillsborough County Environmental Protection Commission (HCEPC) and EPA Region IV.

   b. Stack monitoring shall be reported to HCEPC, the DER Southwest District Office and EPA Region IV on a quarterly basis in accordance with Section 17-2.710, FAC, and 40 CFR, Part 60, Subsection 60.7.

9. Fuel

The Resource Recovery Facility shall utilize refuse such as garbage and trash (as defined in Chapter 17-7, FAC) but not sludge from sewage treatment plants as its fuel. Use of alternate fuels would necessitate application for a modification to this permit.

PERMITTEE: Hillsborough County

Permit Number: PSD-FL-121
Expiration Date: March 31, 1988

SPECIFIC CONDITIONS:

10. This permit shall supercede the NOx and acid mist emission limitations and testing requirements as contained in permit PSD-FL-104.

Issued this 14 day of Oct., 1987

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION

Dale Twachtmann

Dale Twachtmann, Secretary

APPENDIX B--DATA SUMMARIES AND EXAMPLE CALCULATIONS

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M5 Unit 1

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.15
Average Stack Temperature (F)	429.3
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	83.225
Average Meter Pressure (in.H2O)	1.44
Average Meter Temperature (F)	86.3
Moisture Collected (g)	276.4
Carbon Dioxide Concentration (%V)	10.1
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.6
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0051

Average Sampling Rate (dscfm)	0.6705
Standard Metered Volume,Vm(std) (dscf)	80.4582
Standard Metered Volume,Vm(std) (dscm)	2.27858
Standard Volume Water Vapor,Vw (scf)	13.0323
Standard Volume Water Vapor,Vw (scm)	0.36907
Stack Moisture (%V)	13.94%
Mole Fraction Dry Stack Gas	0.8606
Dry Molecular Weight	29.988
Wet Molecular Weight	28.3169
Average Square Root of Delta P (in H2O)^0.5	0.8933
Stack Gas Velocity,Vs (fps)	65.418
Stack Gas Velocity,Vs (mps)	19.9394
Volumetric Flow Rate (acfm)	90448.7
Volumetric Flow Rate (acmm)	2561.51
Volumetric Flow Rate (dscfm)	46646.8
Volumetric Flow Rate (dscmm)	1321.04
Percent Isokinetic (%)	102.063

Concentration of Particulate (grains/dscf)	0.00098
Concentration of Particulate (grains/dscf @12% CO2)	0.00116
Concentration of Particulate (grains/dscf @ 7% O2)	0.00117
Particulate Mass Emission Rate (lb/hr)	0.39106

```
================================================================================
Ogden Martin      Hillsborough              M5 Unit 1         Unit:    #1
================================================================================
                             MOISTURE CONTENT DETERMINATION
                               EPA METHOD 4 CALCULATIONS
Parameter       Definition                                       Units
================================================================================
Pm      -  Absolute Meter Pressure                               in. Hg
Po      -  Average Meter Differential Pressure                   in. H20
Ps      -  Absolute Stack Gas Pressure                           in. Hg
Pstd    -  Absolute Standard Barometric Pressure (29.92)         in. Hg
Pb      -  Absolute Barometric Pressure                          in. Hg
K       -  Standard Volume H20 Vapor/Unit Weight Liquid          ft3/g
           Constant = 0.04715 cu.ft/g
Tm      -  Average Meter Temperature                             degrees R
Tstd    -  Absolute Standard Temperature (528|R)                 degrees R
DGMC    -  Dry Gas Meter Correction Factor (gamma)               Dimensionless
Vlcg    -  Total Condensate Collected                            grams H20
Vm      -  Metered Dry Sample Gas Volume                         dcf
Vmstd   -  Metered Volume at Standard Conditions(528|R, 1atm)    dscf
Vwstd   -  Volume of Water Vapor Collected, at Standard          scf
           Conditions (528|R, 1atm)
W(sat)- Vapor Pressure of H20 at Stack Temperature               in. Hg
Bws     -  Moisture Content                                      mole fraction
 wd     -  Moisture Content                                      % Volume
================================================================================
                        TEST DATA RUN #Run 1
           Pb =        30.21           Tm =         546.3
           Vm =       83.225           Po =          1.44
           Vlcg=       276.4           DGMC =      0.9872
           W(sat)=      1000           Ps =      30.19897
================================================================================
                        MEASURED MOISTURE CALCULATIONS

Pm     =     Pb +(Po/13.6)        =      30.21 + (1.44/13.6)      =  30.316 in. Hg

          (Vm)(DGMC)(Pm)(Tstd)         83.225*0.9872*30.32*528
Vmstd =  --------------------    =    ----------------------- =  80.4582 ft3
              (Pstd)(Tm)                   29.92*546.3

Vwstd =        (K)(Vlcg)          =        (0.04715)*(276.4)      =13.03226 ft3

Bws    =  (Vwstd)/((Vwstd)+(Vmstd))  = 13.032/(13.032+80.458)  =  0.1394 mol frac

Bwd    =      (Bws)*100 %         =           0.1394*100%       =    13.94%V

================================================================================
```

Ogden Martin Hillsborough M5 Unit 1 Unit: #1

MOLECULAR WEIGHT DETERMINATION

EPA METHOD 3 CALCULATIONS

Parameter	Definition	Units
Md	- Sample Gas Molecular Weight, Dry Basis	lb/lb-mole
Ms	- Sample Gas Molecular Weight, Wet Basis	lb/lb-mole
Bws	- Moisture Content	mole fraction
%CO2	- Carbon Dioxide Concentration, Dry Basis	% Volume
%CO	- Carbon Monoxide Concentration, Dry Basis	% Volume
%O2	- Oxygen Concentration, Dry Basis	% Volume
%N2	- Nitrogen Concentration, Dry Basis (gas balance)	% Volume
0.32	- Molecular Weight of Oxygen (O2), divided by 100%	lb/lb-mole
0.28	- Molecular Weight of Carbon Monoxide, divided by 100%	lb/lb-mole
0.28	- Molecular Weight of Nitrogen (N2), divided by 100%	lb/lb-mole
0.44	- Molecular Weight of Carbon Dioxide, divided by 100%	lb/lb-mole
18.0	- Molecular Weight of Water	lb/lb-mole

TEST DATA RUN #Run 1

Bws = 0.1394 %CO = 0.00

%N2 = 80.60 %CO2 = 10.10

%O2 = 9.30

Md = (0.44)(%CO2) + (0.32)(%O2) + (0.28)(%N2 + %CO)

= (0.44)*10.10 + (0.32)*9.30 + (0.28)*(80.60 + 0.00)

= 29.988 lb/lb-mol

Ms = (Md)(1 - Bws) + (18.0)(Bws)

= 29.988*(1 - 0.1394) + 18.0*0.1394

= 28.31691 lb/lb-mol

```
================================================================================
Ogden Martin      Hillsborough              M5 Unit 1         Unit:    #1
================================================================================
                  VELOCITY AND VOLUMETRIC FLOWRATE DETERMINATION
                             EPA METHOD 2 CALCULATIONS
Parameter       Definition                                       Units
================================================================================
Cp    -  Pitot Tube Coefficient                                  Dimensionless
Vs    -  Gas Stream Velocity                                     ft/sec
Qsd   -  Volumetric Flow Rate at Standard Conditions,Dry Basis   dscfm
Qact  -  Actual Volumetric Flow Rate, Wet Basis                  acfm
Bws   -  Moisture Content                                        mole fraction
Dp    -  Avg. Sq. Root of Velocity Head                          (in. H20)^0.5
Pb    -  Absolute Barometric Pressure                            in. Hg
Kp    -  Constant =   89.49  (ft)(lb/lb-mol)(in.Hg^0.5)/(s)(|R)(in.H20)
Ts    -  Absolute Gas Stream Temperature                         degrees R
Ms    -  Sample Gas Molecular Weight, Wet Basis                  lb/lb-mole
Sp    -  Static Pressure of Gas Stream                           in. H20
528   -  Absolute Standard Temperature                           degrees R
CSA   -  Stack Cross-Sectional Area                              ft2
Ps    -  Absolute Stack Gas Pressure                             in. Hg
60    -  Conversion Factor                                       sec/min.
Pi    -  Constant Ratio ¯ 3.1416                                 Dimensionless
D     -  Duct Diameter                                           inches
================================================================================
                     TEST DATA RUN #Run 1

         Ms  =      28.317          Cp  =        0.84
         Bws =      0.1394          Pb  =       30.21
         Sp  =       -0.15          Ts  =       889.3
         D   =       65.00          Dp  =      0.8933
================================================================================
Circular Duct

Ps    =     Pb + (Sp/13.6)     =       30.21 + (-0.15/13.6)   =   30.20 in.Hg


Vs    =  (85.49)(Cp)(Dp)*[(Ts)/(Ms*Ps)]^0.5

      =  85.49*0.84*0.8933*[889.3/(28.317*30.20)]^0.5

      =   65.418 ft/s                                         65.418 ft/s

CSA   =  (Pi)[(D)^2]/[(4)(144)]  =  3.1416*(65.00^0.5)/(4*144)=  23.044 ft2


Qact  =      (Vs)*CSA*60  =      65.418*23.044*60     =        90448.72 acfm


Qsd   =  (Qact)(1-Bws)(528)(Ps)     90448.7*(1 - 0.1394)*528*30.20
         ---------------------   = ----------------------------
              (Ts)(29.92)                   889.3*29.92

      =  46646.77 dscfm                                       46646.77 dscfm

================================================================================
```

```
=================================================================================
Ogden Martin      Hillsborough               M5 Unit 1         Unit:    #1
=================================================================================
                             ISOKINETIC SAMPLING RATE
                             EPA METHOD 5 CALCULATIONS
Parameter       Definition                                     Units
=================================================================================

K4     -  Constant = 0.09450
Ts     -  Average Stack Temperature                            degrees R
Vmstd  -  Metered Volume at Standard Conditions(528|R, 1atm)   dscf
Ps     -  Absolute Stack Gas Pressure                          in. Hg
Vs     -  Gas Stream Velocity                                  ft/sec
Bws    -  Moisture Content                                     mole fraction
t      -  Sampling Time Duration                               minutes
Dn     -  Sample Nozzle Diameter                               inches
An     -  Area of Nozzle                                       ft2
%I     -  Percent of Isokinetic Sampling                       %
=================================================================================
                     TEST DATA RUN #Run 1

         Ts =        889.3         Vs =     65.41797
         Vmstd =   80.4582         Bws =    0.139397
         Ps =     30.19897         Dn =        0.244
         t =           120
=================================================================================


An     =  (Pi)[(Dn)^2]/[(4)(144)]

       =  3.1416*(0.244^0.5)/(4*144)

       =  3.25E-04 ft2                                         3.25E-04 ft2


              K4(Ts)(Vmstd)
%I     =   ----------------------
           (Ps)(Vs)(An)(t)(1-Bws)


                 0.09450*889.3*80.458
       =  --------------------------------------
          30.20*65.42*0.0003247*120.0(1 - 0.139)


       =    102.06 % Isokinetic                                102.0634 %

=================================================================================
```

```
================================================================================
Ogden Martin      Hillsborough               M5 Unit 1          Unit:     #1
================================================================================
                              PARTICULATE MATTER EMISSIONS
                                EPA METHOD 5 CALCULATIONS
Parameter        Definition                                        Units
================================================================================
Mn     -  Total Mass of Particulate Matter Collected             grams
Vmstd -  Metered Volume at Standard Conditions(528|R, 1atm)     dscf
Qsd    -  Volumetric Flow Rate at Standard Conditions,Dry Basis dscfm
Cs     -  Concentration of Particulate Matter in Gas             gr/dscf
ER     -  Particulate Matter Emission Rate                       lb/hr
15.43 -  Conversion Factor (grains/gram)                        gr/g
7000   -  Conversion Factor (grains/lb)                          gr/lb
60     -  Conversion Factor (minutes/hour)                       min/hr
================================================================================
                        TEST DATA RUN #Run 1

                              Mn =        0.0051
                              Vmstd =   80.4582
                              Qsd =    46646.77
================================================================================

               (Mn)*15.43              0.00510*15.43
Cs     =      ------------      =      -------------  =  0.000978 gr/dscf
                (Vmstd)                    80.458


ER     =  (Cs)(Qsd)(60)/7000    =      0.0010*46646.8*60/7000

       =  0.391058 lb/hr                              0.391058 lb/hr

================================================================================
```

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M5 Unit 1

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.18
Average Stack Temperature (F)	429.3
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	86.399
Average Meter Pressure (in.H2O)	1.5442
Average Meter Temperature (F)	92.9
Moisture Collected (g)	274.1
Carbon Dioxide Concentration (%V)	9.5
Oxygen Concentration (%V)	10.2
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0115

Average Sampling Rate (dscfm)	0.6879
Standard Metered Volume,Vm(std) (dscf)	82.5505
Standard Metered Volume,Vm(std) (dscm)	2.33783
Standard Volume Water Vapor,Vw (scf)	12.9238
Standard Volume Water Vapor,Vw (scm)	0.366
Stack Moisture (%V)	13.54%
Mole Fraction Dry Stack Gas	0.86464
Dry Molecular Weight	29.928
Wet Molecular Weight	28.3134
Average Square Root of Delta P (in H2O)^0.5	0.9246
Stack Gas Velocity,Vs (fps)	67.7168
Stack Gas Velocity,Vs (mps)	20.6401
Volumetric Flow Rate (acfm)	93627.2
Volumetric Flow Rate (acmm)	2651.52
Volumetric Flow Rate (dscfm)	48508.7
Volumetric Flow Rate (dscmm)	1373.77
Percent Isokinetic (%)	100.698

Concentration of Particulate (grains/dscf)	0.00215
Concentration of Particulate (grains/dscf @12% CO2)	0.00272
Concentration of Particulate (grains/dscf @ 7% O2)	0.00279
Particulate Mass Emission Rate (lb/hr)	0.89375

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M5 Unit 1

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.19
Average Stack Temperature (F)	429.6
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	88.715
Average Meter Pressure (in.H2O)	1.5992
Average Meter Temperature (F)	97.8
Moisture Collected (g)	256.8
Carbon Dioxide Concentration (%V)	10.4
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0103

Average Sampling Rate (dscfm)	0.7002
Standard Metered Volume,Vm(std) (dscf)	84.0299
Standard Metered Volume,Vm(std) (dscm)	2.37973
Standard Volume Water Vapor,Vw (scf)	12.1081
Standard Volume Water Vapor,Vw (scm)	0.3429
Stack Moisture (%V)	12.59%
Mole Fraction Dry Stack Gas	0.87405
Dry Molecular Weight	30.036
Wet Molecular Weight	28.5201
Average Square Root of Delta P (in H2O)^0.5	0.9396
Stack Gas Velocity,Vs (fps)	68.5779
Stack Gas Velocity,Vs (mps)	20.9026
Volumetric Flow Rate (acfm)	94817.8
Volumetric Flow Rate (acmm)	2685.24
Volumetric Flow Rate (dscfm)	49642.7
Volumetric Flow Rate (dscmm)	1405.88
Percent Isokinetic (%)	100.161

Concentration of Particulate (grains/dscf)	0.00189
Concentration of Particulate (grains/dscf @12% CO2)	0.00218
Concentration of Particulate (grains/dscf @ 7% O2)	0.00227
Particulate Mass Emission Rate (lb/hr)	0.80478

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M5 Unit 2

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	439.8
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	83.765
Average Meter Pressure (in.H2O)	1.5629
Average Meter Temperature (F)	86.8
Moisture Collected (g)	265.2
Carbon Dioxide Concentration (%V)	9.4
Oxygen Concentration (%V)	10.07
Nitrogen Concentration (%V)	80.53
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0105
Average Sampling Rate (dscfm)	0.6733
Standard Metered Volume,Vm(std) (dscf)	80.7969
Standard Metered Volume,Vm(std) (dscm)	2.28817
Standard Volume Water Vapor,Vw (scf)	12.5042
Standard Volume Water Vapor,Vw (scm)	0.35412
Stack Moisture (%V)	13.40%
Mole Fraction Dry Stack Gas	0.86598
Dry Molecular Weight	29.9068
Wet Molecular Weight	28.3111
Average Square Root of Delta P (in H2O)^0.5	0.9301
Stack Gas Velocity,Vs (fps)	68.6363
Stack Gas Velocity,Vs (mps)	20.9204
Volumetric Flow Rate (acfm)	94898.5
Volumetric Flow Rate (acmm)	2687.53
Volumetric Flow Rate (dscfm)	48509.2
Volumetric Flow Rate (dscmm)	1373.78
Percent Isokinetic (%)	98.5579
Concentration of Particulate (grains/dscf)	0.00201
Concentration of Particulate (grains/dscf @12% CO2)	0.00256
Concentration of Particulate (grains/dscf @ 7% O2)	0.00257
Particulate Mass Emission Rate (lb/hr)	0.83375

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M5 Unit 2

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	439.9
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	84.186
Average Meter Pressure (in.H2O)	1.6125
Average Meter Temperature (F)	91.4
Moisture Collected (g)	270.9
Carbon Dioxide Concentration (%V)	9.57
Oxygen Concentration (%V)	10.1
Nitrogen Concentration (%V)	80.33
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.009

Average Sampling Rate (dscfm)	0.6711
Standard Metered Volume,Vm(std) (dscf)	80.5352
Standard Metered Volume,Vm(std) (dscm)	2.28076
Standard Volume Water Vapor,Vw (scf)	12.7729
Standard Volume Water Vapor,Vw (scm)	0.36173
Stack Moisture (%V)	13.69%
Mole Fraction Dry Stack Gas	0.86311
Dry Molecular Weight	29.9352
Wet Molecular Weight	28.3014
Average Square Root of Delta P (in H2O)^0.5	0.9457
Stack Gas Velocity,Vs (fps)	69.8033
Stack Gas Velocity,Vs (mps)	21.276
Volumetric Flow Rate (acfm)	96512
Volumetric Flow Rate (acmm)	2733.22
Volumetric Flow Rate (dscfm)	49165
Volumetric Flow Rate (dscmm)	1392.35
Percent Isokinetic (%)	96.9284

Concentration of Particulate (grains/dscf)	0.00172
Concentration of Particulate (grains/dscf @12% CO2)	0.00216
Concentration of Particulate (grains/dscf @ 7% O2)	0.00222
Particulate Mass Emission Rate (lb/hr)	0.72666

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M5 Unit 2

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	446.1
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	88.016
Average Meter Pressure (in.H2O)	1.7371
Average Meter Temperature (F)	93.9
Moisture Collected (g)	281.4
Carbon Dioxide Concentration (%V)	9.8
Oxygen Concentration (%V)	10.1
Nitrogen Concentration (%V)	80.1
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0101

Average Sampling Rate (dscfm)	0.6987
Standard Metered Volume,Vm(std) (dscf)	83.8445
Standard Metered Volume,Vm(std) (dscm)	2.37448
Standard Volume Water Vapor,Vw (scf)	13.268
Standard Volume Water Vapor,Vw (scm)	0.37575
Stack Moisture (%V)	13.66%
Mole Fraction Dry Stack Gas	0.86337
Dry Molecular Weight	29.972
Wet Molecular Weight	28.3363
Average Square Root of Delta P (in H2O)^0.5	0.9819
Stack Gas Velocity,Vs (fps)	72.6797
Stack Gas Velocity,Vs (mps)	22.1528
Volumetric Flow Rate (acfm)	100489
Volumetric Flow Rate (acmm)	2845.85
Volumetric Flow Rate (dscfm)	50856.2
Volumetric Flow Rate (dscmm)	1440.25
Percent Isokinetic (%)	97.5554

Concentration of Particulate (grains/dscf)	0.00186
Concentration of Particulate (grains/dscf @12% CO2)	0.00228
Concentration of Particulate (grains/dscf @ 7% O2)	0.00239
Particulate Mass Emission Rate (lb/hr)	0.81023

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M5 Unit 3

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.25
Average Stack Temperature (F)	439.9
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	84.249
Average Meter Pressure (in.H2O)	1.4958
Average Meter Temperature (F)	78.7
Moisture Collected (g)	253
Carbon Dioxide Concentration (%V)	10.2
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.5
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0103

Average Sampling Rate (dscfm)	0.6886
Standard Metered Volume,Vm(std) (dscf)	82.6357
Standard Metered Volume,Vm(std) (dscm)	2.34024
Standard Volume Water Vapor,Vw (scf)	11.929
Standard Volume Water Vapor,Vw (scm)	0.33783
Stack Moisture (%V)	12.61%
Mole Fraction Dry Stack Gas	0.87385
Dry Molecular Weight	30.004
Wet Molecular Weight	28.4897
Average Square Root of Delta P (in H2O)^0.5	0.91
Stack Gas Velocity,Vs (fps)	66.8304
Stack Gas Velocity,Vs (mps)	20.3699
Volumetric Flow Rate (acfm)	92401.5
Volumetric Flow Rate (acmm)	2616.81
Volumetric Flow Rate (dscfm)	47821.8
Volumetric Flow Rate (dscmm)	1354.31
Percent Isokinetic (%)	102.25

Concentration of Particulate (grains/dscf)	0.00192
Concentration of Particulate (grains/dscf @12% CO2)	0.00226
Concentration of Particulate (grains/dscf @ 7% O2)	0.0023
Particulate Mass Emission Rate (lb/hr)	0.78834

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M5 Unit 3

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.28
Average Stack Temperature (F)	440.6
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	87.353
Average Meter Pressure (in.H2O)	1.612
Average Meter Temperature (F)	88
Moisture Collected (g)	285.9
Carbon Dioxide Concentration (%V)	10.2
Oxygen Concentration (%V)	9.1
Nitrogen Concentration (%V)	80.7
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0103

Average Sampling Rate (dscfm)	0.7021
Standard Metered Volume,Vm(std) (dscf)	84.2499
Standard Metered Volume,Vm(std) (dscm)	2.38596
Standard Volume Water Vapor,Vw (scf)	13.4802
Standard Volume Water Vapor,Vw (scm)	0.38176
Stack Moisture (%V)	13.79%
Mole Fraction Dry Stack Gas	0.86207
Dry Molecular Weight	29.996
Wet Molecular Weight	28.3414
Average Square Root of Delta P (in H2O)^0.5	0.9451
Stack Gas Velocity,Vs (fps)	69.6192
Stack Gas Velocity,Vs (mps)	21.2199
Volumetric Flow Rate (acfm)	96257.4
Volumetric Flow Rate (acmm)	2726.01
Volumetric Flow Rate (dscfm)	49103.7
Volumetric Flow Rate (dscmm)	1390.62
Percent Isokinetic (%)	101.526

Concentration of Particulate (grains/dscf)	0.00189
Concentration of Particulate (grains/dscf @12% CO2)	0.00222
Concentration of Particulate (grains/dscf @ 7% O2)	0.00222
Particulate Mass Emission Rate (lb/hr)	0.79396

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M5 Unit 3

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.28
Average Stack Temperature (F)	440
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	84.193
Average Meter Pressure (in.H2O)	1.5
Average Meter Temperature (F)	91.1
Moisture Collected (g)	256.8
Carbon Dioxide Concentration (%V)	10.4
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98720
Pitot Constant	0.84
Particulate Catch (g)	0.0111

Average Sampling Rate (dscfm)	0.6727
Standard Metered Volume,Vm(std) (dscf)	80.7234
Standard Metered Volume,Vm(std) (dscm)	2.28609
Standard Volume Water Vapor,Vw (scf)	12.1081
Standard Volume Water Vapor,Vw (scm)	0.3429
Stack Moisture (%V)	13.04%
Mole Fraction Dry Stack Gas	0.86957
Dry Molecular Weight	30.036
Wet Molecular Weight	28.4661
Average Square Root of Delta P (in H2O)^0.5	0.9116
Stack Gas Velocity,Vs (fps)	66.9818
Stack Gas Velocity,Vs (mps)	20.416
Volumetric Flow Rate (acfm)	92610.9
Volumetric Flow Rate (acmm)	2622.74
Volumetric Flow Rate (dscfm)	47686.4
Volumetric Flow Rate (dscmm)	1350.48
Percent Isokinetic (%)	100.167

Concentration of Particulate (grains/dscf)	0.00212
Concentration of Particulate (grains/dscf @12% CO2)	0.00245
Concentration of Particulate (grains/dscf @ 7% O2)	0.00254
Particulate Mass Emission Rate (lb/hr)	0.86724

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M101A Unit 1

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.15
Average Stack Temperature (F)	429.3
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	65.866
Average Meter Pressure (in.H2O)	0.811
Average Meter Temperature (F)	91.2
Moisture Collected (g)	227
Carbon Dioxide Concentration (%V)	10.1
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.6
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	440

Average Sampling Rate (dscfm)	0.5250
Standard Metered Volume,Vm(std) (dscf)	63.0012
Standard Metered Volume,Vm(std) (dscm)	1.78419
Standard Volume Water Vapor,Vw (scf)	10.7031
Standard Volume Water Vapor,Vw (scm)	0.30311
Stack Moisture (%V)	14.52%
Mole Fraction Dry Stack Gas	0.85478
Dry Molecular Weight	29.988
Wet Molecular Weight	28.2471
Average Square Root of Delta P (in H2O)^0.5	0.9221
Stack Gas Velocity,Vs (fps)	67.6104
Stack Gas Velocity,Vs (mps)	20.6076
Volumetric Flow Rate (acfm)	93480
Volumetric Flow Rate (acmm)	2647.35
Volumetric Flow Rate (dscfm)	47884.1
Volumetric Flow Rate (dscmm)	1356.08
Percent Isokinetic (%)	103.13

Mercury Concentration (ug/dscm)	246.61
Mercury Concentration (ug/dscm @12% CO2)	293.002
Mercury Concentration (ug/dscm @ 7% O2)	295.507
Hg Mass Emission Rate (lb/hr)	0.04424
Hg Mass Emission Rate (g/day)	481.568

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M101A Unit 1

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.18
Average Stack Temperature (F)	429.2
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	69.51
Average Meter Pressure (in.H2O)	0.8771
Average Meter Temperature (F)	98.8
Moisture Collected (g)	222.1
Carbon Dioxide Concentration (%V)	9.5
Oxygen Concentration (%V)	10.2
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	218

Average Sampling Rate (dscfm)	0.5466
Standard Metered Volume,Vm(std) (dscf)	65.593
Standard Metered Volume,Vm(std) (dscm)	1.85759
Standard Volume Water Vapor,Vw (scf)	10.472
Standard Volume Water Vapor,Vw (scm)	0.29657
Stack Moisture (%V)	13.77%
Mole Fraction Dry Stack Gas	0.86233
Dry Molecular Weight	29.928
Wet Molecular Weight	28.2858
Average Square Root of Delta P (in H2O)^0.5	0.9578
Stack Gas Velocity,Vs (fps)	70.1785
Stack Gas Velocity,Vs (mps)	21.3904
Volumetric Flow Rate (acfm)	97030.8
Volumetric Flow Rate (acmm)	2747.91
Volumetric Flow Rate (dscfm)	50143.6
Volumetric Flow Rate (dscmm)	1420.07
Percent Isokinetic (%)	102.535

Mercury Concentration (ug/dscm)	117.356
Mercury Concentration (ug/dscm @12% CO2)	148.239
Mercury Concentration (ug/dscm @ 7% O2)	152.453
Hg Mass Emission Rate (lb/hr)	0.02204
Hg Mass Emission Rate (g/day)	239.981

FACILITY : Ogden Martin

DATE: 4/18/96
LOCATION: Hillsborough
CONDITION: M101A Unit 1

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.21
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.19
Average Stack Temperature (F)	429.1
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	69.739
Average Meter Pressure (in.H2O)	0.873
Average Meter Temperature (F)	102.6
Moisture Collected (g)	209.2
Carbon Dioxide Concentration (%V)	10.4
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	324

Average Sampling Rate (dscfm)	0.5447
Standard Metered Volume,Vm(std) (dscf)	65.3639
Standard Metered Volume,Vm(std) (dscm)	1.85111
Standard Volume Water Vapor,Vw (scf)	9.86378
Standard Volume Water Vapor,Vw (scm)	0.27934
Stack Moisture (%V)	13.11%
Mole Fraction Dry Stack Gas	0.86888
Dry Molecular Weight	30.036
Wet Molecular Weight	28.4579
Average Square Root of Delta P (in H2O)^0.5	0.9555
Stack Gas Velocity,Vs (fps)	69.7951
Stack Gas Velocity,Vs (mps)	21.2735
Volumetric Flow Rate (acfm)	96500.6
Volumetric Flow Rate (acmm)	2732.9
Volumetric Flow Rate (dscfm)	50253
Volumetric Flow Rate (dscmm)	1423.16
Percent Isokinetic (%)	101.954

Mercury Concentration (ug/dscm)	175.031
Mercury Concentration (ug/dscm @12% CO2)	201.958
Mercury Concentration (ug/dscm @ 7% O2)	209.735
Hg Mass Emission Rate (lb/hr)	0.03295
Hg Mass Emission Rate (g/day)	358.7

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M101A Unit 2

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	439
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	71.017
Average Meter Pressure (in.H2O)	0.9117
Average Meter Temperature (F)	92.9
Moisture Collected (g)	223.4
Carbon Dioxide Concentration (%V)	9.4
Oxygen Concentration (%V)	10.07
Nitrogen Concentration (%V)	80.53
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	403

Average Sampling Rate (dscfm)	0.5635
Standard Metered Volume,Vm(std) (dscf)	67.624
Standard Metered Volume,Vm(std) (dscm)	1.91511
Standard Volume Water Vapor,Vw (scf)	10.5333
Standard Volume Water Vapor,Vw (scm)	0.2983
Stack Moisture (%V)	13.48%
Mole Fraction Dry Stack Gas	0.86523
Dry Molecular Weight	29.9068
Wet Molecular Weight	28.3021
Average Square Root of Delta P (in H2O)^0.5	0.9531
Stack Gas Velocity,Vs (fps)	70.3134
Stack Gas Velocity,Vs (mps)	21.4315
Volumetric Flow Rate (acfm)	97217.3
Volumetric Flow Rate (acmm)	2753.19
Volumetric Flow Rate (dscfm)	49695.6
Volumetric Flow Rate (dscmm)	1407.38
Percent Isokinetic (%)	106.663

Mercury Concentration (ug/dscm)	210.432
Mercury Concentration (ug/dscm @12% CO2)	268.636
Mercury Concentration (ug/dscm @ 7% O2)	270.083
Hg Mass Emission Rate (lb/hr)	0.03917
Hg Mass Emission Rate (g/day)	426.466

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M101A Unit 2

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	439.8
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	72.882
Average Meter Pressure (in.H2O)	0.9783
Average Meter Temperature (F)	97.9
Moisture Collected (g)	237.4
Carbon Dioxide Concentration (%V)	9.6
Oxygen Concentration (%V)	10.1
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	305

Average Sampling Rate (dscfm)	0.5732
Standard Metered Volume,Vm(std) (dscf)	68.7891
Standard Metered Volume,Vm(std) (dscm)	1.94811
Standard Volume Water Vapor,Vw (scf)	11.1934
Standard Volume Water Vapor,Vw (scm)	0.317
Stack Moisture (%V)	13.99%
Mole Fraction Dry Stack Gas	0.86005
Dry Molecular Weight	29.94
Wet Molecular Weight	28.269
Average Square Root of Delta P (in H2O)^0.5	0.9875
Stack Gas Velocity,Vs (fps)	72.9263
Stack Gas Velocity,Vs (mps)	22.2279
Volumetric Flow Rate (acfm)	100830
Volumetric Flow Rate (acmm)	2855.5
Volumetric Flow Rate (dscfm)	51188.3
Volumetric Flow Rate (dscmm)	1449.65
Percent Isokinetic (%)	105.336

Mercury Concentration (ug/dscm)	156.562
Mercury Concentration (ug/dscm @12% CO2)	195.703
Mercury Concentration (ug/dscm @ 7% O2)	201.502
Hg Mass Emission Rate (lb/hr)	0.03002
Hg Mass Emission Rate (g/day)	326.824

FACILITY : Ogden Martin

DATE: 4/16/96
LOCATION: Hillsborough
CONDITION: M101A Unit 2

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.16
Absolute Stack Pressure,Ps(in. Hg)	30.10
Stack Static Pressure (in. H2O)	-0.85
Average Stack Temperature (F)	446
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	75.403
Average Meter Pressure (in.H2O)	1.03
Average Meter Temperature (F)	100.9
Moisture Collected (g)	240.3
Carbon Dioxide Concentration (%V)	9.8
Oxygen Concentration (%V)	10.1
Nitrogen Concentration (%V)	80.1
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	348

Average Sampling Rate (dscfm)	0.5900
Standard Metered Volume,Vm(std) (dscf)	70.7967
Standard Metered Volume,Vm(std) (dscm)	2.00496
Standard Volume Water Vapor,Vw (scf)	11.3301
Standard Volume Water Vapor,Vw (scm)	0.32087
Stack Moisture (%V)	13.80%
Mole Fraction Dry Stack Gas	0.86204
Dry Molecular Weight	29.972
Wet Molecular Weight	28.3204
Average Square Root of Delta P (in H2O)^0.5	1.0136
Stack Gas Velocity,Vs (fps)	75.0431
Stack Gas Velocity,Vs (mps)	22.8731
Volumetric Flow Rate (acfm)	103757
Volumetric Flow Rate (acmm)	2938.39
Volumetric Flow Rate (dscfm)	52434.7
Volumetric Flow Rate (dscmm)	1484.95
Percent Isokinetic (%)	105.834

Mercury Concentration (ug/dscm)	173.569
Mercury Concentration (ug/dscm @12% CO2)	212.534
Mercury Concentration (ug/dscm @ 7% O2)	223.39
Hg Mass Emission Rate (lb/hr)	0.03409
Hg Mass Emission Rate (g/day)	371.148

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M101A Unit 3

RUN NUMBER: Run 1

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.25
Average Stack Temperature (F)	440
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	67.269
Average Meter Pressure (in.H2O)	0.848
Average Meter Temperature (F)	83.6
Moisture Collected (g)	218.9
Carbon Dioxide Concentration (%V)	10.2
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.5
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	461

Average Sampling Rate (dscfm)	0.5439
Standard Metered Volume,Vm(std) (dscf)	65.2702
Standard Metered Volume,Vm(std) (dscm)	1.84845
Standard Volume Water Vapor,Vw (scf)	10.3211
Standard Volume Water Vapor,Vw (scm)	0.29229
Stack Moisture (%V)	13.65%
Mole Fraction Dry Stack Gas	0.86346
Dry Molecular Weight	30.004
Wet Molecular Weight	28.365
Average Square Root of Delta P (in H2O)^0.5	0.9441
Stack Gas Velocity,Vs (fps)	69.4908
Stack Gas Velocity,Vs (mps)	21.1808
Volumetric Flow Rate (acfm)	96080
Volumetric Flow Rate (acmm)	2720.98
Volumetric Flow Rate (dscfm)	49128.7
Volumetric Flow Rate (dscmm)	1391.33
Percent Isokinetic (%)	104.138

Mercury Concentration (ug/dscm)	249.398
Mercury Concentration (ug/dscm @12% CO2)	293.409
Mercury Concentration (ug/dscm @ 7% O2)	298.848
Hg Mass Emission Rate (lb/hr)	0.0459
Hg Mass Emission Rate (g/day)	499.671

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M101A Unit 3

RUN NUMBER: Run 2

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.28
Average Stack Temperature (F)	440.5
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	70.268
Average Meter Pressure (in.H2O)	0.905
Average Meter Temperature (F)	91.1
Moisture Collected (g)	231.9
Carbon Dioxide Concentration (%V)	10.2
Oxygen Concentration (%V)	9.1
Nitrogen Concentration (%V)	80.7
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	400

Average Sampling Rate (dscfm)	0.5605
Standard Metered Volume,Vm(std) (dscf)	67.2615
Standard Metered Volume,Vm(std) (dscm)	1.90484
Standard Volume Water Vapor,Vw (scf)	10.9341
Standard Volume Water Vapor,Vw (scm)	0.30965
Stack Moisture (%V)	13.98%
Mole Fraction Dry Stack Gas	0.86017
Dry Molecular Weight	29.996
Wet Molecular Weight	28.3186
Average Square Root of Delta P (in H2O)^0.5	0.9744
Stack Gas Velocity,Vs (fps)	71.8023
Stack Gas Velocity,Vs (mps)	21.8854
Volumetric Flow Rate (acfm)	99275.9
Volumetric Flow Rate (acmm)	2811.49
Volumetric Flow Rate (dscfm)	50537.7
Volumetric Flow Rate (dscmm)	1431.23
Percent Isokinetic (%)	104.323

Mercury Concentration (ug/dscm)	209.991
Mercury Concentration (ug/dscm @12% CO2)	247.048
Mercury Concentration (ug/dscm @ 7% O2)	247.362
Hg Mass Emission Rate (lb/hr)	0.03976
Hg Mass Emission Rate (g/day)	432.784

FACILITY : Ogden Martin

DATE: 4/17/96
LOCATION: Hillsborough
CONDITION: M101A Unit 3

RUN NUMBER: Run 3

Total Sampling Time (min.)	120
Corrected Barometric Pressure (in. Hg)	30.22
Absolute Stack Pressure,Ps(in. Hg)	30.20
Stack Static Pressure (in. H2O)	-0.28
Average Stack Temperature (F)	439.9
Stack Area (sq.ft.)	23.0438
Metered Volume,Vm (cu.ft.)	67.553
Average Meter Pressure (in.H2O)	0.833
Average Meter Temperature (F)	96.8
Moisture Collected (g)	211.7
Carbon Dioxide Concentration (%V)	10.4
Oxygen Concentration (%V)	9.3
Nitrogen Concentration (%V)	80.3
Dry Gas Meter Factor	0.98700
Pitot Constant	0.84
Mercury Catch (ug)	228

Average Sampling Rate (dscfm)	0.5332
Standard Metered Volume,Vm(std) (dscf)	63.9895
Standard Metered Volume,Vm(std) (dscm)	1.81218
Standard Volume Water Vapor,Vw (scf)	9.98166
Standard Volume Water Vapor,Vw (scm)	0.28268
Stack Moisture (%V)	13.49%
Mole Fraction Dry Stack Gas	0.86506
Dry Molecular Weight	30.036
Wet Molecular Weight	28.4119
Average Square Root of Delta P (in H2O)^0.5	0.9354
Stack Gas Velocity,Vs (fps)	68.7923
Stack Gas Velocity,Vs (mps)	20.9679
Volumetric Flow Rate (acfm)	95114.2
Volumetric Flow Rate (acmm)	2693.63
Volumetric Flow Rate (dscfm)	48726.8
Volumetric Flow Rate (dscmm)	1379.94
Percent Isokinetic (%)	102.937

Mercury Concentration (ug/dscm)	125.815
Mercury Concentration (ug/dscm @12% CO2)	145.171
Mercury Concentration (ug/dscm @ 7% O2)	150.761
Hg Mass Emission Rate (lb/hr)	0.02297
Hg Mass Emission Rate (g/day)	250.01

APPENDIX C--RAW TEST DATA

MERCURY

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility:	Ogden Martin, Hillsborough	Meter #:	23	Baro. Press.:	30.21
Unit:	1	DH@	1.65	Ambient T:	85
Location:	stack	DGM Factor:	0.9870	Nozzle Dia:	0.212
Test Type:	M101A	Pitot #:	B	Static P:	-0.15
Run #:	1-1	Pitot Coef:	0.84	Stack Dimensions:	65"
Operator(s):	MG / HT	K-Factor:	0.95	Initial Leak Check:	0.007 cfm @ 15 "Hg
Date:	4-18-96	Filter #:	N/A	Final Leak Check:	0.002 cfm @ 6 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	250.324									
0850	B 1	5	282.85	0.70	0.66	428	259	N/A	59	82	82	1
		10	285.00	0.65	0.61	430	255		43	83	83	1
	2	15	287.69	0.95	0.90	429	254		42	84	83	1
		20	290.35	0.85	0.81	430	255		42	86	83	1
	3	25	293.31	1.00	0.95	431	255		43	87	84	1
		30	296.30	1.00	0.95	429	253		43	89	84	1
	4	35	299.37	1.05	1.00	430	254		43	91	85	1
		40	302.18	0.90	0.86	431	255		44	92	85	1
	5	45	305.32	0.95	0.90	430	254		44	93	87	1
		50	307.88	0.90	0.86	430	255		44	95	88	1
	6	55	310.80	0.90	0.86	429	253		44	95	88	1
0950		60	313.465	0.80	0.76	425	255		45	96	89	1
			Post Port	Leak	check	0.002	@ 6"					
			Pre Port	Leak	check	0.002	@ 6"					
		60/0	313.630									
0	A 1	5	316.25	0.75	0.71	430	256		49	92	92	1
		10	318.78	0.72	0.68	429	255		43	94	92	1
	2	15	321.62	0.85	0.81	428	254		42	95	92	1
		20	324.19	0.75	0.71	429	255		42	96	92	1
	3	25	326.84	0.75	0.71	428	253		42	97	92	1
		30	329.70	0.90	0.86	429	254		42	98	93	1
	4	35	332.25	0.72	0.68	428	255		43	98	93	1
		40	335.26	1.00	0.95	431	254		43	98	94	1
	5	45	337.93	0.80	0.76	429	254		43	99	94	1
		50	340.90	0.95	0.90	430	257		43	99	94	1
	6	55	343.47	0.85	0.81	429	253		43	100	94	1
400		120/off 70	346.355	0.80	0.76	427	253	↓	43	99	95	1
										91.2		
			65.866		.911							
				.922		429.3				103.2	%I	
			62.976 std					Vs = 61.53				
					Bws =	.1451						
							Qstd =	47,831				
	Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	586.4	561.5	633.4	660.1		
Final	757.6	597.7	642.4	670.7		
Total						227

Orsat	1	2	3	ave
O2	9.3	9.3	9.3	9.3
CO2	10.1	10.1	10.1	10.1

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N-3	Baro. Press.: 30.21
Unit: 1	DH@ 1.65	Ambient T: 90
Location: Stack	DGM Factor: 0.9870	Nozzle Dia: 0.212
Test Type: M101A	Pitot #: B	Static P: -0.18
Run #: 1-2	Pitot Coef: 0.84	Stack Dimensions: 65-4
Operator(s): TMD / HT	K-Factor: 0.95	Initial Leak Check: 0.005 cfm @ 15 "H
Date: 4-18-96	Filter #: N/A	Final Leak Check: 0.002 cfm @ 7 "H

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuu ("Hg)
		0/0	346.723									
1200	A 1	5	349.55	0.85	0.81	429	247	N/A	59	95	95	1
		10	352.53	0.94	0.90	430	251		43	95	95	1
	2	15	355.20	0.80	0.76	428	253		43	97	95	1
		20	358.14	0.95	0.90	429	251		42	98	96	1
	3	25	361.24	1.05	1.00	430	250		43	99	96	1
		30	364.43	1.15	1.10	431	250		43	100	97	1
	4	35	367.51	1.05	1.00	430	251		44	101	97	1
		40	370.60	1.05	1.00	430	251		44	101	97	1
	5	45	373.59	1.15	1.10	432	253		44	101	96	1
		50	376.87	1.00	0.95	429	252		44	102	96	1
	6	55	379.75	0.90	0.86	428	253		45	102	97	1
1300		60	382.608	0.90	0.86	429	251		45	102	98	1
		Post	Port	LEAK	check	0.002	@ 8"					
		PRE	Port	LEAK	check	0.002	@ 7"					
		60/0	382.800									
1311	B 1	5	385.54	0.80	0.76	429	253		55	98	98	1
		10	388.25	0.80	0.76	428	251		43	99	98	1
	2	15	391.12	0.90	0.86	429	250		43	100	98	1
		20	393.90	0.85	0.81	429	252		43	101	97	2
	3	25	397.03	1.05	1.00	430	251		43	101	97	2
		30	400.08	0.85	0.81	428	252		44	102	98	2
	4	35	402.75	0.85	0.81	430	253		45	102	98	2
		40	405.58	0.90	0.86	429	255		45	102	99	2
	5	45	408.25	0.80	0.76	430	254		45	103	99	2
		50	410.95	0.85	0.81	428	254		45	103	99	2
	6	55	413.63	0.80	0.76	427	253		45	103	99	2
1411		120/off	416.425	0.85	0.81	429	250		45	103	99	2
			(69.510)	[illegible]	.8771					98.8		
				.9578		429.2						
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	592.9	554.5	620.8	669.5			O2	10.2	10.2	10.2	10.2
Final	770.7	580.1	626.2	682.8			CO2	9.5	9.5	9.5	9.5
Total						222.1					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N3	Baro. Press.: 30.21
Unit: 1	DH@ 1.65	Ambient T: 90
Location: stack	DGM Factor: 0.9870	Nozzle Dia: 0.212
Test Type: M101A	Pitot #: B	Static P: -0.19
Run #: 1-3	Pitot Coef: 0.84	Stack Dimensions: 654
Operator(s): TMD / HT	K-Factor: 0.95	Initial Leak Check: 0.003 cfm @ 15 °H
Date: 4-18-96	Filter #: N/A	Final Leak Check: 0.003 cfm @ 7 °H

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuu (Hg)
		0/0	416.605									
1515	B 1	5	419.15	0.72	0.68	429	251	N/A	59	97	97	0
		10	421.95	0.90	0.86	430	251		40	97	97	0
	2	15	424.90	0.95	0.90	430	250		40	98	97	0
		20	427.74	0.90	0.86	428	252		40	100	98	0
	3	25	430.33	0.75	0.71	428	251		41	101	98	0
		30	432.78	0.65	0.62	427	253		41	102	98	0
	4	35	435.79	1.00	0.95	429	253		41	102	98	0
		40	438.80	1.00	0.95	431	254		42	104	98	0
	5	45	441.91	1.05	1.00	431	257		42	105	99	0
		50	444.85	0.95	0.90	429	258		42	106	99	0
	6	55	447.92	0.90	0.86	428	260		42	106	100	0
1615		60	450.577	0.80	0.76	428	257		42	106	100	0
		Post	Port	LEAK	check	0.003	@ 6					
		PRE	Port	LEAK	check	0.002	@ 8					
		60/0	450.655									
1622	A 1	5	453.05	0.65	0.62	429	255		58	102	102	0
		10	455.95	0.90	0.86	430	251		43	104	102	0
	2	15	458.94	0.95	0.90	429	250		43	105	102	0
		20	461.77	0.90	0.86	425	252		43	106	102	0
	3	25	464.76	0.90	0.86	430	251		43	106	102	0
		30	467.72	0.95	0.90	429	252		44	107	103	0
	4	35	470.84	1.00	0.95	428	256		44	108	103	0
		40	474.02	1.10	1.05	430	255		44	108	103	0
	5	45	476.99	0.90	0.86	428	257		44	109	104	0
		50	480.09	1.05	1.00	429	252		45	109	104	0
	6	55	483.10	1.00	0.95	430	251		45	110	105	0
1722		[illegible] 70	486.425	1.15	1.10	431	252		45	110	106	0
			69.739		.873					102.6		
				.4555		409.1						
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	592.8	583.3	625	642.8			O2	9.3	9.3	9.3	9.3
Final	760	608.8	629.8	654.5			CO2	10.4	10.4	10.4	10.4
Total						209.2					

PG. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin Hillsborough	Meter #: N-3	Baro. Press.: 30.16	
Unit: 2	DH@ 1.65	Ambient T: 90	
Location: Stack	DGM Factor: 0.9870	Nozzle Dia: 0.212	
Test Type: M101A	Pitot #: B	Static P: -0.85	
Run #: 2-1	Pitot Coef: 0.84	Stack Dimensions: 65"	
Operator(s): TMcD / JHT	K-Factor: 1.00	Initial Leak Check: 0.005 cfm @ 15 "Hg	
Date: 4-16-96	Filter #: N/A	Final Leak Check: 0.004 cfm @ 6 "Hg	

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
start 0955		0/0	852.818									
	B 1	5	855.31	0.60	0.60	439	251	N/A	59	86	85	1
		10	858.06	0.80	0.80	438	249		60	87	85	1
	2	15	860.92	0.90	0.90	439	240		60	89	85	1
		20	863.87	0.92	0.92	440	248		59	91	86	1
	3	25	866.72	0.86	0.86	440	249		57	92	87	1
		30	869.60	0.86	0.86	439	250		56	93	88	1
	4	35	872.58	0.94	0.94	441	253		56	94	88	1
		40	875.52	0.94	0.94	440	250		57	95	88	1
	5	45	878.38	0.85	0.85	446	256		57	96	88	1
		50	881.50	1.00	1.00	439	255		58	97	89	1
	6	55	884.59	1.05	1.05	438	256		58	98	89	1
055		60	887.705	1.05	1.05	439	252		58	98	91	1 .948
			Post Port	leak	check	0.006	@ 8"					
			Pre Port	leak	check	0.005	@ 8"					
		60/0	887.800									
1110	A 1	5	890.69	0.82	0.82	439	258		59	93	93	1
		10	893.60	0.85	0.85	435	257		46	93	92	1
	2	15	896.30	0.80	0.80	435	259		47	96	93	1
		20	899.07	0.80	0.80	438	252		46	96	93	1
	3	25	902.09	0.92	0.92	439	258		46	97	93	1
		30	905.38	1.10	1.10	439	255		45	98	93	1
	4	35	908.58	1.00	1.00	440	257		46	99	94	1
		40	911.49	0.92	0.92	439	258		45	99	94	1
	5	45	914.57	0.96	0.96	440	255		45	99	94	1
		50	917.72	1.00	1.00	441	253		46	100	95	1
	6	55	920.60	0.96	0.96	440	256		47	100	95	1
1210		120/off	923.930	0.98	0.98	439	252		47	100	95	1
			71.017		.9117					92.9		
				.9531		439						
	Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	588	590.8	626.6	650.9		
Final	757.7	624.2	632.1	665.7		
Total						223.4

Orsat	1	2	3	ave
O2	10.1	10.0	10.1	10.07
CO2	9.4	9.4	9.4	9.4

.9285

pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin Hillsborough	Meter #: N3	Baro. Press.: 30.16	
Unit: 2	DH@ ~~1.63~~ 1.65 gm	Ambient T: 90	
Location: Stack	DGM Factor: 0.9870	Nozzle Dia: 0.212	
Test Type: M101A	Pitot #: B	Static P: -0.85	
Run #: 2-2	Pitot Coef: 0.84	Stack Dimensions: 65"	
Operator(s): TMG/HT	K-Factor: 1.00	Initial Leak Check: 0.004 cfm @ 15 "Hg	
Date: 4-16-96	Filter #: N/A	Final Leak Check: 0.001 cfm @ 8 "Hg	

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp (F)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	924.147									
325	A 1	5	926.95	0.82	0.82	439	249	N/A	59	92	92	1
		10	929.51	0.82	0.82	439	253		49	91	91	1
	2	15	932.76	0.96	0.96	441	256		46	91	91	1
		20/935	935.75	0.96	0.96	440	255		44	94	91	1
	3	25	938.84	1.05	1.05	439	258		45	95	91	1
		30	941.81	0.94	0.94	439	256		45	97	92	1
	4	35	944.96	1.10	1.10	441	255		46	97	92	1
		40	948.26	1.15	1.15	441	253		46	99	93	1
	5	45	951.43	1.05	1.05	440	254		47	100	94	1
		50	954.50	1.00	1.00	440	250		47	100	94	1
	6	55	957.63	1.05	1.05	438	251		48	101	95	1
425		60	960.761	1.05	1.05	439	251		48	101	96	1
			mid	point	leak	check	0.002	@ 6"				
		60/0	960.852									
435	B 1	5	963.63	0.72	0.72	439	255		49	97	97	1
		10	966.26	0.78	0.78	439	250		46	101	97	1
	2	15	969.24	0.96	0.96	440	255		45	102	98	1
		20	972.42	1.05	1.05	441	254		45	103	98	1
	3	25	975.45	0.97	0.97	440	257		46	104	98	1
		30	978.38	0.90	0.90	441	257		45	104	99	1
	4	35	981.42	0.95	0.95	440	254		46	104	99	1
		40	984.70	1.15	1.15	442	253		46	105	99	1
	5	45	987.90	1.10	1.10	440	251		47	105	100	1
		50	991.09	1.00	1.00	440	251		47	105	100	1
535	6	55	994.10	1.00	1.00	439	253		47	106	100	1
		120/off	997.120	0.95	0.95	439	254		48	106	101	1
			72.882	sq.rt.	.9783					97.9		
				.9875		439.8						
	Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	574.4	573.3	616.1	707.1		
Final	760.7	602.2	621.5	724.4		
Total						237.4

Orsat	1	2	3	ave.
O2	10.1	10.1	10.1	10.1
CO2	9.5	9.6	9.6	9.6

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility:	Ogden Martin, Hillsborough	Meter #:	N-3	Baro. Press.:	30.16
Unit:	2	DH@	Ti66 1.65	Ambient T:	93
Location:	Stack	DGM Factor:	0.9872	Nozzle Dia:	0.213
Test Type:	M101A	Pitot #:	B	Static P:	-0.85
Run #:	2-3	Pitot Coef:	0.84	Stack Dimensions:	65-4
Operator(s):	TMG / HT	K-Factor:	1.00	Initial Leak Check:	0.002 cfm @ 15 "Hg
Date:	4-16-96	Filter #:	N/A	Final Leak Check:	0.001 cfm @ 6 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	998.414									
640	B 1	5	1001.50	1.00	1.00	447	259	~~251~~	58	96	96	1
		10	4.31	0.85	0.85	445	258	N/A	49	96	96	1
	2	15	7.17	0.83	0.83	446	258		46	97	96	1
		20	10.42	1.10	1.10	449	253		46	98	96	1
	3	25	13.63	1.10	1.10	447	256		46	99	96	1
		30	16.43	0.80	0.80	448	254		48	101	97	1
	4	35	19.42	0.90	0.90	445	254		48	101	97	1
		40	22.69	1.10	1.10	446	254		48	102	98	1
	5	45	26.05	1.20	1.20	449	253		48	103	98	1
		50	29.33	1.15	1.15	447	253		49	104	98	1
	6	55	32.56	1.10	1.10	445	251		49	104	98	1
740		60	1035.759	1.05	1.05	446	250		49	105	99	1
			Mid point leak check 0.003 @ 6 "									
		60/0	1035.826									
745	A 1	5	38.67	0.87	0.87	445	251		53	100	100	1
		10	41.72	0.95	0.95	447	253		44	103	100	1
	2	15	44.89	1.05	1.05	446	253		44	103	100	1
		20	48.11	1.05	1.05	447	256		44	104	100	1
	3	25	51.34	1.10	1.10	444	255		45	105	101	1
		30	54.44	0.98	0.98	446	253		45	106	101	1
	4	35	57.70	1.10	1.10	444	251		45	106	101	1
		40	61.03	1.05	1.05	446	250		46	106	101	1
	5	45	64.34	1.20	1.20	450	251		46	107	102	1
		50	67.65	1.05	1.05	443	255		47	107	102	1
	6	55	70.70	1.05	1.05	444	255		47	107	102	1
845		120/off	1073.884	1.10	1.10	442	256		47	107	102	1
			75.403		1.030					120.9		
				1.0136		446						
	Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	583.5	592.6	622.8	646.4		
Final	774.7	620.5	628.4	662		
Total						240.3

Orsat	1	2	3	ave
O2	10.1	10.1	10.1	10.1
CO2	9.8	9.8	9.8	9.8

~~88~~ 74

1.0161 447

7557 438

20.69

Pg. ____ of ____

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N3	Baro. Press.: 30.22
Unit: 3	DH@ 1.65	Ambient T: 75
Location: Stack	DGM Factor: 0.9870	Nozzle Dia: 0.212
Test Type: M101A	Pitot #: A	Static P: -0.25
Run #: 3-1	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMG / HT	K-Factor: 0.95	Initial Leak Check: 0.003 cfm @ 15 "Hg
Date: 4-17-96	Filter #: N/A	Final Leak Check: 0.001 cfm @ 5 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp (F)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Dry Gas Meter Temp Inlet (F)	Dry Gas Meter Temp Outlet (F)	Vacuum ("Hg)
		0/0	74.112									
0835	B 1	5	76.60	0.76	0.72	437	261	N/A	53	76	76	1
		10	79.30	0.85	0.81	437	258		43	76	76	1
	2	15	81.81	0.80	0.76	438	251		43	78	74	1
		20	84.44	0.80	0.76	439	250		44	79	76	1
	3	25	87.20	0.85	0.81	440	253		44	80	77	1
		30	90.24	1.00	0.95	440	251		44	82	77	1
	4	35	93.00	0.92	0.87	441	251		44	83	77	1
		40	95.63	0.80	0.76	440	255		44	85	77	1
	5	45	98.62	1.00	0.95	441	253		44	85	79	1
		50	101.43	0.95	0.90	440	253		44	87	79	1
	6	55	104.45	0.95	0.90	440	251		44	87	80	1
0935		60	107.216	0.90	0.85	439	251		44	88	81	1
				~~0.80~~	~~0.76~~	~~440~~	~~253~~		~~44~~	~~85~~	~~81~~	~~1~~
			Post	Port	leak	check			0.003	@8"		
			Pre	Port	leak	check			0.001	@5"		
		60/0	107.355		0.78							
0950	A 1	5	110.01	0.82	~~0.64~~	440	253		45	83	83	1
		10	112.69	0.82	0.75	441	255		41	86	83	1
	2	15	115.80	1.05	1.00	440	256		41	87	84	1
		20	118.80	1.00	0.95	442	255		42	89	85	1
	3	25	121.74	0.95	0.90	440	251		42	89	85	1
		30	124.67	0.95	0.90	440	253		43	90	86	1
	4	35	127.69	1.00	0.95	441	254		43	90	86	1
		40	130.47	0.85	0.81	440	255		43	91	87	1
	5	45	133.07	0.75	0.71	441	256		44	91	87	1
		50	135.91	0.90	0.85	440	259		44	91	87	1
	6	55	138.60	0.82	0.78	441	250		44	91	87	1
1050		120/off	141.550	0.95	0.90	441	251		44	92	88	1
			67.269	.915	.848					83.6		
				.9441		440.0						

Avg/Tot.											
Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	580.6	558.2	644.7	644.1			O2	9.3	9.3	9.3	9.3
Final	753.5	586.7	650.4	655.9			CO2	10.2	10.2	10.2	10.2
Total						218.9					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N-3	Baro. Press.: 30.22
Unit: 3	DH@ ~~1.69~~ 1.65	Ambient T: 75
Location: Stack	DGM Factor: 0.9870	Nozzle Dia: 0.212
Test Type: M101A	Pitot #: B	Static P: -0.28
Run #: 3-2	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMD & HT	K-Factor: 0.95	Initial Leak Check: 0.005 cfm @ 15 "Hg
Date: 4-17-96	Filter #: N/A	Final Leak Check: 0.004 cfm @ 6 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	141.727									
1155	A 1	5	144.68	0.80	0.76	441	249	NA	58	85	85	1
		10	147.13	0.80	0.76	440	248		43	86	85	1
	2	15	150.12	1.00	0.95	441	248		42	87	85	1
		20	153.05	0.95	0.90	440	250		42	88	85	1
	3	25	156.10	1.05	1.00	438	255		43	89	85	1
		30	159.08	0.93	0.88	439	253		43	90	86	1
	4	35	162.03	0.95	0.90	440	251		43	91	87	1
		40	164.90	0.93	0.88	440	251		44	92	87	1
	5	45	167.95	1.05	1.00	442	252		44	93	88	1
		50	170.80	0.90	0.86	440	251		44	94	88	1
	6	55	173.66	0.90	0.86	439	251		45	94	90	1
255		60	176.928	1.15	1.09	441	250		45	94	90	1
		Post	Port	leak	check	0.003	@ 8"					
		Pre	Port	leak	check	0.003	@ 8"					
		60/0	177.119									
305	B 1	5	179.64	0.70	0.66	441	251		49	90	90	1
		10	182.51	0.90	0.86	442	251		43	92	90	1
	2	15	185.37	0.90	0.86	440	252		43	93	90	1
		20	188.46	1.05	1.00	441	252		43	94	91	1
	3	25	191.39	0.95	0.90	440	253		44	95	91	1
		30	194.30	0.95	0.90	442	254		44	96	92	1
	4	35	197.44	1.15	1.09	443	251		44	96	92	1
		40	200.54	1.15	1.09	444	251		45	97	93	1
	5	45	203.47	0.90	0.86	440	253		45	97	93	1
		50	206.42	0.95	0.90	439	252		45	97	93	1
	6	55	209.35	0.95	0.90	440	253		45	98	95	1
405		120/off	212.186	0.90	0.86	439	253		46	98	96	1
			70.268		.905					91.1		
				.9744		440.5						
Avg/Tot.												

Impinger	1	2	3	4	5	Total
Initial	586.5	563.8	621	694.2		
Final	772.9	591.6	624.9	708		
Total						231.9

Orsat	1	2	3	ave
O2	9.1	9.1	9.1	9.1
CO2	10.2	10.2	10.2	10.2

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough
Unit: 3
Location: Stack
Test Type: M 101 A
Run #: 3-3
Operator(s): TM / AT
Date: 4-17-96

Meter #: N-3
DH@ 1.65
DGM Factor: 0.9870
Pitot #: B
Pitot Coef: 0.84
K-Factor: 0.95
Filter #: N/A

Baro. Press.: 30.22
Ambient T: 80
Nozzle Dia: 0.212
Static P: -0.28
Stack Dimensions: 65"
Initial Leak Check: 0.005 cfm @ 15 "Hg
Final Leak Check: 0.003 cfm @ 9 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp (F)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Dry Gas Meter Temp Inlet (F)	Dry Gas Meter Temp Outlet (F)	Vacuum ("Hg)
		0/0	212.357									
500	B 1	5	215.17	0.80	0.76	440	239	n/a	51	91	91	1
		10	217.65	0.74	0.70	439	243		40	91	91	1
	2	15	220.66	1.00	0.95	441	257		41	92	91	1
		20	223.32	0.80	0.76	440	252		41	94	91	1
	3	25	226.25	0.95	0.90	441	251		41	95	92	1
		30	228.93	0.80	0.76	441	253		41	96	93	1
	4	35	231.79	0.90	0.85	440	253		41	97	94	1
		40	234.42	0.80	0.76	440	252		42	98	93	1
	5	45	237.26	0.93	0.88	439	253		42	98	93	1
		50	239.93	0.85	0.81	439	253		43	99	94	1
	6	55	242.80	0.95	0.90	441	254		43	99	95	1
1600		60	245.687	0.95	0.90	440	252		43	100	95	1
			Post	Port	leak	check	0.003@	8"				
			Pre Port	leak	check	0.003	@ 8"					
						-						
		60/0	245.846									
1610	A 1	5	248.70	0.89	0.85	441	253		56	96	96	1
		10	251.29	0.73	0.69	438	254		43	98	96	1
	2	15	254.05	0.80	0.76	439	253		42	99	96	1
		20	256.90	0.85	0.81	440	254		43	100	97	1
	3	25	259.73	0.85	0.81	439	255		43	101	97	1
		30	262.83	1.05	1.00	441	254		43	101	98	1
	4	35	265.80	0.95	0.90	440	254		44	102	98	1
		40	268.73	0.95	0.90	440	253		44	102	99	1
	5	45	271.65	0.90	0.86	441	255		44	102	99	1
		50	274.49	0.90	0.86	440	255		44	102	99	1
	6	55	277.91	0.85	0.81	438	257		44	103	100	1
1710		120 off	280.069	0.85	0.81	439	256		44	103	100	1
			67.553		.833					96.8		
				.9354		439.9						
			63.9639 std									
					Bws = ~~.14~~		.1348					
		Qstd =	48,686			Vs = 68.72			102.98 % I			
	Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	583.7	591.1	629.9	679.1		
Final	750.4	620.1	635.1	689.9		
Total						211.7

Orsat	1	2	3	ave
O2	9.3	9.3	9.3	9.3
CO2	10.4	10.4	10.4	10.4

Pg. 1 of 1 PM

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N 1	Baro. Press.: 30.21
Unit: 1	DH@ 1.68	Ambient T: 85
Location: Stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: M5	Pitot #: 6 F	Static P: -0.15
Run #: 1-1	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): MG / HT	K-Factor: 1.8	Initial Leak Check: 0.003 cfm @ 15 "Hg
Date: 4-18-96	Filter #: A-36	Final Leak Check: 0.002 cfm @ 8 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	884.416									
0851	A 6	5	887.72	0.72	1.30	430	251	248	57	79	78	1
		10	890.93	0.72	1.30	429	256	249	49	80	79	1
	5	15	894.60	0.93	1.67	430	255	247	44	80	79	1
		20	898.09	0.82	1.48	430	254	249	44	82	80	1
	4	25	901.57	0.82	1.48	430	255	249	44	83	80	1
		30	904.87	0.72	1.30	428	255	246	44	84	80	1
	3	35	908.70	0.98	1.76	431	256	249	44	85	81	1
		40	912.30	0.85	1.53	430	257	248	45	86	81	1
	2	45	915.92	0.81	1.46	430	257	246	45	87	83	1
		50	919.29	0.81	1.46	430	258	247	45	88	83	1
	1	55	922.59	0.72	1.30	429	252	249	45	88	84	1
0951		60	925.951	0.72	1.30	427	256	248	45	89	84	1
		Post	Port	Leak	check	0.001	@ 8"					
		PRE	Port	LEAK	check	0.004	@ 8"					
		60/0	926.100									
1001	B 6	5	929.48	0.75	1.35	429	258	249	53	88	88	1
		10	932.76	0.72	1.30	429	252	247	43	88	88	1
	5	15	936.15	0.80	1.44	430	256	248	42	89	88	1
		20	939.60	0.80	1.44	429	256	246	42	90	88	2
	4	25	942.88	0.70	1.26	425	255	248	43	91	89	2
		30	946.53	0.93	1.67	430	255	249	43	91	89	2
	3	35	949.90	0.70	1.26	425	256	245	43	92	89	2
		40	953.72	0.98	1.76	431	256	249	44	92	90	2
	2	45	956.99	0.70	1.26	429	255	243	45	92	90	2
		50	960.70	0.88	1.58	430	252	246	45	93	90	2
	1	55	964.42	0.88	1.58	429	253	243	45	93	90	2
1101		120/off	967.790	0.75	1.35	425	255	245	45	93	90	2
			83.225	ave	1.441					86.3		
				.8933		429.3						
			80.4262 std									
								Qstd = 46,690				
				Vs =	65.47							
								101.93 % I				

Avg/Tot.											
Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	566.6	565.8	529.8	646.6			O2	9.3	9.3	9.3	9.3
Final	745.7	632.2	545.3	662			CO2	10.1	10.1	10.1	10.1
Total						276.4					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N-1	Baro. Press.: 30.21
Unit: 1	DH@ 1.68	Ambient T: 90
Location: stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: m-5	Pitot #: F	Static P: -0.18
Run #: 1-2	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMD / HT	K-Factor: 1.80	Initial Leak Check: 0.009 cfm @ 15 "H
Date: 4-18-96	Filter #: X-3	Final Leak Check: 0.005 cfm @ 7 "H

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head (H2O)	Orifice Press (H2O)	Stack Temp (F)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Dry Gas Meter Temp Inlet (F)	Dry Gas Meter Temp Outlet (F)	Vacuu (Hg)
		0/0	967.941									
1201	B 6	5	971.74	0.91	1.64	429	253	249	59	89	89	1
		10	975.41	0.95	1.71	430	251	246	43	89	88	1
	5	15	978.94	0.80	1.44	429	250	249	43	89	88	1
		20	982.44	0.80	1.44	430	251	251	43	90	88	1
	4	25	986.01	0.85	1.53	429	256	247	43	92	89	1
		30	989.92	1.00	1.80	429	256	248	43	93	90	1
	3	35	993.35	0.93	1.67	430	255	248	44	94	90	1
		40	997.35	0.95	1.71	431	256	245	44	94	90	1
	2	45	1001.37	1.10	1.98	432	254	243	44	94	90	1
		50	5.04	0.85	1.53	429	250	248	45	95	90	1
	1	55	8.69	0.80	1.44	428	253	248	45	95	90	1
1301		60	12.020	0.75	1.35	428	253	247	45	96	91	1
			Post Port	LEAK	check	0.001	@ 6"					
			Pre Port	LEAK	check	0.002	@ 6"					
		60/0	12.200									
1312	A 6	5	15.60	0.75	1.35	429	256	249	53	93	93	1
		10	19.11	0.80	1.44	428	255	247	42	94	93	1
	5	15	22.68	0.85	1.53	430	255	248	42	94	93	1
		20	26.23	0.85	1.53	430	251	249	43	95	93	1
	4	25	30.30	1.15	2.07	428	250	248	43	95	93	2
		30	33.77	0.75	1.35	429	257	250	43	96	93	2
	3	35	37.32	0.85	1.53	428	250	247	44	96	93	2
		40	40.75	0.80	1.44	430	251	248	45	97	94	2
	2	45	44.15	0.75	1.35	429	251	248	45	97	95	2
		50	47.64	0.80	1.44	429	253	249	45	98	95	2
	1	55	51.13	0.80	1.44	430	251	248	45	97	95	2
1412		120/off	1054.520	0.75	1.35	429	253	249	46	97	95	2
				die r								
			86.399	.9246	1.5442	429.3				92.9		
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	609.2	572.3	467.7	628.3			O2	10.2	10.2	10.2	10.2
Final	826.4	608.7	472	644.9			CO2	9.5	9.5	9.5	9.5
Total						274.1					

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough
Unit: 1
Location: stack
Test Type: m5
Run #: ~~2-3~~ 1-3
Operator(s): TMG / HT
Date: 4-18-96

Meter #: N 1
DH@ 1.68
DGM Factor: 0.9872
Pitot #: F
Pitot Coef: 0.84
K-Factor: 1.60
Filter #: X-4

Baro. Press.: 30.21
Ambient T: 90
Nozzle Dia: 0.244
Static P: -0.19
Stack Dimensions: 65"
Initial Leak Check: 0.003 cfm @ 15 "H
Final Leak Check: 0.001 cfm @ 5 "H

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head (H2O)	Orifice Press (H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuu (Hg)
		0/0	55.200									
1516	A 6	5	59.21	0.70	1.26	429	253	259	58	93	93	0
		10	62.44	0.92	1.66	430	256	259	42	92	92	0
	5	15	66.21	0.95	1.71	431	254	260	41	94	92	0
		20	69.84	0.85	1.53	430	250	261	42	96	92	0
	4	25	73.84	1.00	1.89	430	253	262	42	96	92	0
		30	77.46	0.85	1.53	429	253	260	42	98	93	0
	3	35	81.28	0.95	1.71	429	256	255	42	98	94	0
		40	85.17	1.00	1.80	431	255	256	42	99	94	0
	2	45	88.99	0.95	1.71	430	254	258	42	99	95	0
		50	92.60	0.85	1.53	429	254	259	42	100	95	0
	1	55	95.79	0.65	1.17	428	255	260	43	100	95	0
1616		60	99.005	0.65	1.17	427	254	260	43	100	95	0
		Post	Port	LEAK	check	0.002	@ 8					
		PRE	Port	Leak	check	0.003	@ 7					
		60/0	99.100									
1623	B 6	5	102.94	1.00	1.80	429	255	261	59	99	99	1
		10	106.58	0.85	1.53	430	251	260	43	99	99	1
	5	15	110.27	0.85	1.53	428	254	261	42	100	99	1
		20	113.75	0.80	1.44	430	251	259	43	100	99	1
	4	25	117.41	0.85	1.53	431	252	256	44	101	99	1
		30	121.17	0.90	1.62	429	255	259	44	101	99	1
	3	35	124.96	0.95	1.71	430	253	258	44	102	100	1
		40	128.93	1.05	1.89	431	255	259	44	102	100	1
	2	45	132.64	0.90	1.62	429	253	260	44	102	100	1
		50	136.55	1.00	1.80	429	250	261	45	102	100	1
	1	55	140.25	1.00	1.80	430	252	259	45	102	100	1
1723		120/off	144.010	0.80	1.44	431	253	259	45	102	100	1
				ave √								
			88.715	.9291		429.6				97.8		
					1.5992							
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	613.1	580.1	467.5	625			O2	9.3	9.3	9.3	9.3
Final	818	612.1	471.8	640.6			CO2	10.4	10.4	10.4	10.4
Total						256.8					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin Hillsborough	Meter #: ai	Baro. Press.: 30.16
Unit: 2	DH@ 1.68	Ambient T: 90
Location: Stack 0.9872	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: ms	Pitot #: F	Static P: -0.85
Run #: 2-1	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMD / HT	K-Factor: 1.80	Initial Leak Check: 0.006 cfm @ 15 "Hg
Date: 4-16-96	Filter #: ~~218~~ 218-KG	Final Leak Check: 0.003 cfm @ 5 "Hg

Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
	0/0	370.430									
A 6	5	374.10	1.00	1.80	441	~~268~~	268	59	82	82	1
	10	377.62	0.85	1.53	441	265	270	58	83	82	1
5	15	381.35	0.92	1.66	440	267	255	58	84	82	1
	20	384.75	0.87	1.57	439	265	245	57	86	83	1
4	25	388.39	0.85	1.53	440	260	249	58	86	83	1
	30	391.65	0.87	1.57	437	258	240	58	87	83	1
3	35	395.40	1.00	1.80	439	259	243	56	88	84	1
	40	398.85	0.82	1.48	440	255	257	57	89	84	1
2	45	402.30	0.82	1.48	439	249	258	58	89	84	1
	50	405.92	0.90	1.62	439	251	253	58	89	85	1
1	55	409.63	0.96	1.73	440	253	258	58	90	85	1
	60	413.125	0.92	1.66	441	255	256	57	90	86	1
		Post Port	leak	check	0.001	@ 6	"				
		Pre-Port	leak	check	0.003	@ 6	"				
	60/0	413.162									
B 6	5	416.50	0.84	1.51	439	251	242	87	87	87	1
	10	419.82	0.84	1.51	440	249	257	49	87	86	1
5	15	423.60	0.84	1.51	441	253	258	47	88	86	1
	20	426.80	0.88	1.58	440	257	255	46	89	86	1
4	25	430.35	0.92	1.66	439	256	258	47	90	86	1
	30	434.11	1.05	1.89	440	255	260	46	90	86	1
3	35	437.65	0.87	1.57	441	251	260	45	91	87	1
	40	441.13	0.85	1.53	439	250	261	46	91	87	1
2	45	444.25	0.62	1.12	440	253	259	46	92	87	1
	50	447.63	0.70	1.26	440	255	261	46	91	88	1
1	55	450.89	0.86	1.55	441	256	260	46	92	88	1
	120/off	454.232	0.77	1.39	440	255	261	47	92	88	1
		83.765								86.8	
				1.5229							
		80.7596 std			439.8						
			ave √								
			.9301								
					Bws ≈	.1339					
						98.73	% I				
		Qstd = 50,012									
Avg/Tot.											

t
76
256
11
211
.94
.91

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	603.1	581.2	527.5	665.7			O2	10.1	10.0	10.1	10.07
Final	782.8	637.9	537.7	684.3			CO2	9.4	9.4	9.4	9.4
Total						265.2					

99 ~~77.832~~ 7 .9301

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N1	Baro. Press.: 30.16
Unit: 2	DH@ 1.68	Ambient T: 90
Location: stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: m5	Pitot #: F	Static P: -0.85
Run #: 2-2	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMG / HT	K-Factor: 1.80	Initial Leak Check: 0.009 cfm @ 15 "Hg
Date: 4-16-96	Filter #: Z19 KG	Final Leak Check: 0.009 cfm @ 8 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	454.419									
326	B 6	5	457.89	0.75	1.35	440	256	259	51	87	87	1
		10	461.32	0.78	1.40	441	253	261	49	86	86	1
	5	15	464.81	0.84	1.51	440	250	259	46	88	86	1
		20	467.99	0.84	1.51	440	248	255	47	88	86	1
	4	25	471.63	0.90	1.62	441	247	255	45	89	86	1
		30	474.95	0.88	1.58	440	249	256	45	90	86	1
	3	35	478.68	1.05	1.89	440	249	259	46	91	88	1
		40	482.41	1.05	1.89	441	245	257	46	92	88	1
	2	45	485.93	0.87	1.57	439	248	253	48	93	88	1
		50	489.42	0.85	1.53	439	250	253	48	92	89	1
	1	55	492.83	0.84	1.51	440	249	255	47	93	89	1
826		60	496.260	0.84	1.51	440	250	256	48	93	90	1
			Mid	point	leak	check	0.008	@7"				
		60/0	496.313									
1436	A 6	5	499.50	0.80	1.44	439	251	257	51	92	92	1
		10	502.74	0.80	1.44	440	249	255	47	92	92	1
Δ1.73	5	15	506.41	0.96	1.73 ~~0.96~~	441	250	258	46	93	92	1
		20	509.93	0.94	1.69	440	250	261	45	95	93	1
	4	25	513.51	0.96	1.73	439	253	260	46	95	93	1
		30	516.99	0.94	1.69	440	251	261	46	95	93	1
	3	35	520.64	0.94	1.69	439	251	258	47	96	93	1
		40	524.58	1.05	1.89	441	252	259	47	96	93	1
	2	45	528.03	0.98	1.76	440	250	257	48	97	93	1
		50	531.72	0.90	1.62	439	250	258	48	97	93	1
	1	55	534.96	0.85	1.53	439	253	257	48	96	93	1
536		120/off	538.658	0.90	1.62	440	250	257	48	97	93	1
				ave								
			84.186	.9457	1.6125	439.9				91.4		
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	622.5	507.3	465.5	616.8			O2	10.1	10.1	10.1	10.1
Final	838.9	630.4	469.8	633.9			CO2	9.5	9.6	9.6	9.57
Total						270.9					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N-1	Baro. Press.: 30.16
Unit: 2	DH@ 1.68	Ambient T: 93
Location: stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: M5	Pitot #: F	Static P: -0.85
Run #: 2-3	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMJ THT	K-Factor: 1.80	Initial Leak Check: 0.002 cfm @ 15 "Hg
Date: 4-16-96	Filter #: 220	Final Leak Check: 0.006 cfm @ 8 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp (F)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Dry Gas Meter Temp Inlet (F)	Dry Gas Meter Temp Outlet (F)	Vacuum ("Hg)
0		0/0	538.764									
641	A 6	5	542.42	0.91	1.64	443	252	251	58	90	89	1
		10	545.75	0.85	1.53	446	251	253	48	90	89	1
	5	15	549.42	1.00	1.80	445	250	252	46	90	89	1
		20	552.96	1.05	1.89	448	247	253	46	92	90	1
	4	25	556.90	1.05	1.89	449	248	250	46	93	90	1
		30	560.33	0.85	1.53	445	249	251	45	94	90	1
	3	35	563.67	0.80	1.44	443	251	250	46	94	91	1
		40	567.35	0.96	1.73	447	253	247	46	95	51	1
	2	45	571.40	1.15	2.07	449	255	248	47	95	91	1
		50	575.23	1.05	1.89	446	254	249	47	96	91	1
	1	55	579.06	1.05	1.89	447	255	249	47	96	91	1
741		60	582.906	1.05	1.89	444	253	249	48	97	92	1
			mid	point	leak	check 0.001	@5"					
		60/0	582.995									
846	B 6	5	586.53	0.92	1.66	446	256	245	58	95	95	1
		10	590.17	0.95	1.71	448	253	245	46	95	95	1
	5	15	594.31	1.00	1.80	445	255	247	45	96	95	1
		20	597.68	1.00	1.80	447	256	248	44	97	95	1
	4	25	601.34	0.98	1.75	445	253	249	45	97	95	1
		30	605.03	0.95	1.71	443	255	250	45	97	95	1
	3	35	608.67	0.95	1.71	447	253	247	45	97	95	1
		40	612.39	0.98	1.75	449	256	249	46	97	95	2
	2	45	616.06	0.95	1.71	449	255	246	46	97	95	2
		50	619.62	0.90	1.62	447	253	249	47	97	95	2
	1	55	623.16	0.85	1.53	443	251	248	47	97	95	2
846		120/off	626.869	0.98	1.75	445	250	249	47	97	95	2
				ave √								
			88.016	.9819	1.7371	446.1				93.9		
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	ave
Initial	598.1	576.8	529.9	655.5			O2	10.1	10.1	10.1	10.1
Final	813.7	617.7	535.2	675.1			CO2	9.8	9.8	9.8	9.8
Total						281.4					

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: N-1	Baro. Press.: 30.22
Unit: 3	DH@ 1.68	Ambient T: 75
Location: Stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: M5	Pitot #: F	Static P: -0.25
Run #: 3-1	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMG / HT	K-Factor: 4.80	Initial Leak Check: 0.003 cfm @ 15 "Hg
Date: 4-17-96	Filter #: Z 17	Final Leak Check: 0.008 cfm @ 5 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	627.620									
0836	A 6	5	631.35	0.89	1.60	439	249	241	57	73	73	1
		10	635.02	0.93	1.67	439	248	240	43	73	73	1
	5	15	638.47	0.83	1.49	440	249	240	42	73	73	1
		20	641.54	0.65	1.17	440	250	243	42	73	73	1
	4	25	645.02	0.73	1.31	439	249	243	43	73	73	1
		30	648.57	1.00	1.80	440	245	249	43	~~75~~ 77	73	1
	3	35	652.07	0.80	1.44	441	247	250	43	77	74	1
		40	655.38	0.77	1.39	440	250	253	43	78	74	1
	2	45	659.15	0.96	1.73	439	253	253	43	79	75	1
		50	662.72	0.85	1.53	439	251	254	44	80	76	1
	1	55	666.32	0.93	1.67	441	250	255	44	80	76	1
0936		60	669.839	0.85	1.53	439	253	255	44	81	76	1
			Post	Port	leak	check		0.001	@6"			
			Pre	Port	leak	check		0.002	@6"			
		60/0	670.055									
0951	B 6	5	673.69	0.80	1.44	439	255	257	48	80	80	1
		10	677.21	0.80	1.44	440	253	257	42	80	80	1
	5	15	680.82	0.89	1.60	442	251	256	42	82	80	1
		20	684.46	0.96	1.73	441	251	257	42	82	80	1
	4	25	688.07	0.90	1.62	440	250	253	43	83	80	1
		30	691.62	0.85	1.53	439	251	253	43	84	81	1
	3	35	695.27	0.96	1.73	441	250	251	43	84	81	1
		40	698.81	0.80	1.44	440	251	254	43	85	82	1
	2	45	702.19	0.70	1.26	440	250	255	44	85	82	1
		50	705.65	0.80	1.44	439	259	254	44	85	82	1
	1	55	708.83	0.65	1.17	440	255	254	44	85	82	1
1051		120/off	712.085	0.65	1.17	440	256	250	44	85	82	1
			84.249	ave √	1.4438					78.7		
				.9100		439.9						
			82.6026 std									
					Bws = .126		Vs = 66.944					
							Q std = 49,395					
			102.02 %I									
	Avg/Tot.											

Impinger	1	2	3	4	5	Total	Orsat	1	2	3	avg
Initial	598.6	593.9	469.8	631.3			O2	9.3	9.3	9.3	9.3
Final	793.3	630.2	473.9	649.2			CO2	10.2	10.2	10.2	10.2
Total						253					

PG. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough
Unit: 7
Location: Stack
Test Type: MS
Run #: 7-2
Operator(s): TMG TLT
Date: 4-17-96

Meter #: N1
DH@ 1.68
DGM Factor: 0.9872
Pitot #: F
Pitot Coef: 0.84
K-Factor: 1.80
Filter #: 5-2

Baro. Press.: 30.22
Ambient T: 70
Nozzle Dia: 0.244
Static P: -0.28
Stack Dimensions: 65"
Initial Leak Check: 0.001 cfm @ 15 "Hg
Final Leak Check: 0.003 cfm @ 6 "Hg

Traverse Point Number	Time	Gas Meter Reading Vm(ft3)	Velocity Head ("H2O)	Orifice Press. ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
	0/0	712.237									
1156 B 6	5	716.07	0.86	1.55	440	261	263	58	81	80	1
	10	719.25	0.86	1.55	439	260	263	43	81	80	1
5	15	722.94	0.95	1.71	440	258	259	42	82	80	1
	20	726.54	0.95	1.71	441	257	260	42	83	80	1
4	25	730.43	0.98	1.76	440	255	261	44	84	81	1
	30	734.05	0.85	1.53	439	253	260	45	85	82	1
3	35	737.67	0.92	1.66	439	255	259	45	85	83	1
	40	741.20	0.80	1.44	441	255	258	45	87	84	1
2	45	744.73	0.80	1.44	442	253	258	46	87	84	1
	50	748.23	0.78	1.40	441	253	259	46	88	85	1
1	55	751.62	0.74	1.33	440	252	258	46	88	85	1
1256	60	755.284	0.92	1.66	442	251	260	46	89	85	1
		Post Port	leak	check	0.001	@ 5"					
		Pre Port	leak	check	0.002	@ 6"					
	60/0	755.431									
1306 A 6	5	758.90	0.80	1.44	441	253	252	51	87	87	1
	10	762.56	0.95	1.71	442	250	255	41	87	87	1
5	15	766.14	0.95	1.71	441	251	255	40	88	87	1
	20	769.98	1.05	1.89	440	251	257	41	88	87	2
4	25	773.84	0.95	1.71	443	251	257	43	90	88	2
	30	777.63	0.92	1.66	441	253	259	44	90	88	2
3	35	781.55	1.05	1.89	443	250	257	44	90	88	2
	40	785.50	1.05	1.89	442	251	256	45	91	89	2
2	45	789.19	0.90	1.62	440	251	256	45	91	89	2
	50	792.85	0.86	1.55	439	254	258	45	91	89	2
1406 1	55	796.45	0.86	1.55	440	254	259	46	92	90	2
	120/off	799.737	0.74	1.33	439	255	259	46	92	96	2
		87.353	ave √	1.612							
			.9451		440.6				89.0		
		84.2162 std									
						Bws = .1378					
				Qstd = 49,069					Vs = 69.6		
						101.56 %I					
Avg/Tot.											

Impinger	1	2	3	4	5	Total
Initial	572	583.3	529.9	647.2		
Final	791.7	624.1	538.3	664.2		
Total						285.9 ~~285.9~~

Orsat	1	2	3	ave
O2	9.1	9.1	9.1	9.1
CO2	10.2	10.2	10.2	10.2

Pg. 1 of 1

ESE ISOKINETIC SAMPLING FIELD DATA SHEET

Facility: Ogden Martin, Hillsborough	Meter #: 21	Baro. Press.: 30.22
Unit: 3	DH@ 1.68	Ambient T: 80
Location: Stack	DGM Factor: 0.9872	Nozzle Dia: 0.244
Test Type: M5	Pitot #: F	Static P: -0.28
Run #: 3-3	Pitot Coef: 0.84	Stack Dimensions: 65"
Operator(s): TMD / HT	K-Factor: 1.80	Initial Leak Check: 0.003 cfm @ 15 "Hg
Date: 4-17-96	Filter #: A35	Final Leak Check: 0.002 cfm @ 8 "Hg

	Traverse Point Number	Time	Gas Meter Reading Vm (ft3)	Velocity Head ("H2O)	Orifice Press ("H2O)	Stack Temp. (F)	Probe Temp. (F)	Filter Temp. (F)	Impinger Temp. (F)	Dry Gas Meter Temp. Inlet (F)	Dry Gas Meter Temp. Outlet (F)	Vacuum ("Hg)
		0/0	799.950									
1501	A 6	5	803.43	0.88	1.58	439	247	259	53	86	86	1
		10	806.90	0.79	1.42	440	251	261	42	87	86	1
	5	15	810.78	1.05	1.89	441	251	258	42	87	86	1
		20	814.55	0.98	1.76	440	253	257	42	89	87	1
	4	25	818.34	0.98	1.76	440	252	258	42	90	87	1
		30	821.99	0.93	1.67	441	253	258	42	91	88	1
	3	35	825.72	0.93	1.67	441	255	256	42	92	89	1
		40	829.08	0.72	1.30	439	255	257	43	92	89	1
	2	45	832.57	0.83	1.50	439	255	258	43	93	89	1
		50	836.08	0.83	1.50	440	256	259	43	93	89	1
	1	55	839.32	0.69	1.24	439	254	260	43	93	90	1
1601		60	842.545	0.69	1.24	440	255	261	44	93	90	1
			Post	Port	leak	check	0.002	@ 8"				
			Pre	Port	leak	check	0.003	@ 8"				
		60/0	842.662									
	B 6	5	846.19	0.85	1.53	440	256	260	59	92	92	1
		10	849.52	0.75	1.35	439	255	259	43	92	92	1
	5	15	853.02	0.85	1.53	440	254	257	43	93	92	1
		20	856.43	0.80	1.44	442	254	256	43	93	92	1
	4	25	859.84	0.80	1.44	440	251	257	43	94	92	1
		30	863.61	0.99	1.78	442	252	258	43	94	92	1
	3	35	867.25	0.85	1.53	440	251	258	43	94	92	2
		40	870.75	0.80	1.44	441	251	257	43	95	92	2
	2	45	874.72	0.72	1.30	438	253	258	44	95	92	2
		50	877.44	0.75	1.35	439	251	259	45	95	92	2
	1	55	880.85	0.80	1.44	439	253	261	45	95	92	2
1711		120/off	884.260	0.75	1.35	440	253	260	45	96	92	2
			84.193		1.500					91.1		
				.9116		440.0						
			80.6912 std									

Bws = .1303

Vs = 66.92

99.46 % I

Qstd = 47,649

Avg/Tot.

Impinger	1	2	3	4	5	Total
Initial	613.1	580.1	467.5	625		
Final	818	612.1	471.8	640.6		
Total						256.8

Orsat	1	2	3	ave
O2	9.3	9.3	9.3	9.3
CO2	10.4	10.4	10.4	10.4

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough

ADDRESS 350 N. Falkenburg Rd

Unit #1

CITY Tampa

STATE FL

ZIP 34299

PHONE 813-684-5688

SOURCE ID NUMBER

PROCESS EQUIPMENT Municipal Waste→Energy

OPERATING MODE 100%

CONTROL EQUIPMENT ESP

OPERATING MODE on

DESCRIBE EMISSION POINT START One of 4 stacks in square shell STOP

HEIGHT ABOVE GROUND LEVEL START 220' STOP ✓

HEIGHT RELATIVE TO OBSERVER START 240' STOP —

DISTANCE FROM OBSERVER START 1000' STOP ✓

DIRECTION FROM OBSERVER START W STOP ✓

DESCRIBE EMISSIONS START not visible STOP ✓

EMISSION COLOR START none STOP ✓

PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT NO ☒ YES ☐

IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 10' above stack STOP ✓

DESCRIBE BACKGROUND START sky STOP ✓

BACKGROUND COLOR START blue STOP blue/wh

SKY CONDITIONS START scattered STOP ✓

WIND SPEED START 4-7 STOP ✓

WIND DIRECTION START N STOP ✓

AMBIENT TEMP START STOP

WET BULB TEMP

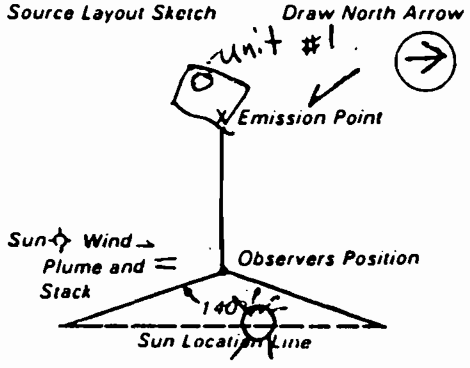
RH.percent

OBSERVATION DATE 4/18/96

START TIME 910

STOP TIME 1010

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0



AVERAGE OPACITY FOR HIGHEST PERIOD

NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT) F. Lee Garcia

OBSERVER'S SIGNATURE F Lee Garcia

DATE 4/18/96

ORGANIZATION ESE

CERTIFIED BY ETA

DATE

VERIFIED BY

DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

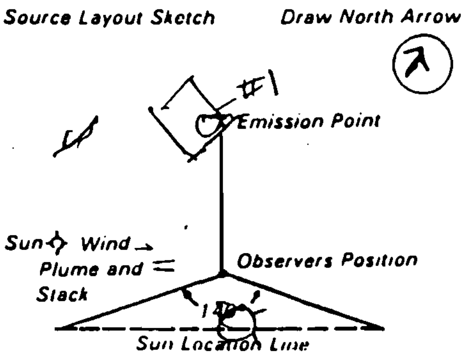
SIGNATURE

TITLE

DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough
ADDRESS 350 N. Falkenburg Rd
Unit #1
CITY Tampa STATE FL ZIP 34299
PHONE 813-684-5688
SOURCE ID NUMBER
PROCESS EQUIPMENT Municipal Waste →energy OPERATING MODE 100%
CONTROL EQUIPMENT ESP OPERATING MODE on
DESCRIBE EMISSION POINT START One of 4 stacks in STOP square shell
HEIGHT ABOVE GROUND LEVEL START 220 STOP ✓
HEIGHT RELATIVE TO OBSERVER START 240 STOP ✓
DISTANCE FROM OBSERVER START 800' STOP ✓
DIRECTION FROM OBSERVER START NW STOP ✓
DESCRIBE EMISSIONS START not visible STOP ✓
EMISSION COLOR START none STOP ✓
PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT NO ☒ YES ☐
IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 5' above stack STOP ✓
DESCRIBE BACKGROUND START sky STOP ✓
BACKGROUND COLOR START blue/white STOP blue/white
SKY CONDITIONS START partly cloudy STOP ✓
WIND SPEED START 4-7 STOP ✓
WIND DIRECTION START NE STOP ✓
AMBIENT TEMP START 77 STOP 77
WET BULB TEMP 64
RH.percent



COMMENTS

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SIGNATURE
TITLE
DATE

OBSERVATION DATE 4/18/96 START TIME 1210 STOP TIME 1310

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD
NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM MAXIMUM
OBSERVER'S NAME (PRINT) F. Lee Garcia
OBSERVER'S SIGNATURE F Lee Garcia DATE 4/18/96
ORGANIZATION ESE
CERTIFIED BY ETA DATE
VERIFIED BY DATE

BEST AVAILABLE COPY

Visible Emission Observation Form

SOURCE NAME Ogden Martin-Hillsborough

ADDRESS 350 N Falkenburg Rd
Unit #1

CITY Tampa
STATE FL
ZIP 34299

PHONE 813-684-5688
SOURCE ID NUMBER

PROCESS EQUIPMENT Municipal Waste to Energy
OPERATING MODE 100%

CONTROL EQUIPMENT ESP
OPERATING MODE on

DESCRIBE EMISSION POINT
START 1 of 4 stacks in STOP square shell

HEIGHT ABOVE GROUND LEVEL START 320 STOP ✓
HEIGHT RELATIVE TO OBSERVER START 230 STOP ✓

DISTANCE FROM OBSERVER START 550' STOP ✓
DIRECTION FROM OBSERVER START E STOP ✓

DESCRIBE EMISSIONS
START not visible STOP ✓

EMISSION COLOR START none STOP ✓
PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐
IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

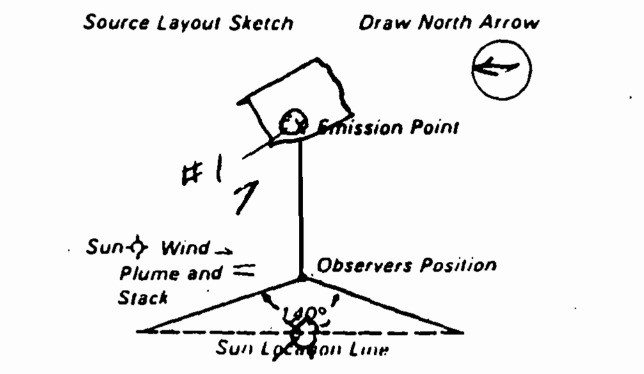
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START 5 above stack STOP ✓

DESCRIBE BACKGROUND
START Clouds STOP ✓

BACKGROUND COLOR START white STOP
SKY CONDITIONS START Partly cloudy STOP ✓

WIND SPEED START 4-7 STOP ✓
WIND DIRECTION START NW STOP ✓

AMBIENT TEMP START 81 STOP ~~85~~ 81
WET BULB TEMP 65
RH, percent



COMMENTS

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SIGNATURE
TITLE
DATE

OBSERVATION DATE 4/18/96
START TIME 1516
STOP TIME 1616

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
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26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD
NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS
MINIMUM
MAXIMUM

OBSERVER'S NAME (PRINT) F. Lee Garcia

OBSERVER'S SIGNATURE F Lee Garcia
DATE 4/18/96

ORGANIZATION ESE

CERTIFIED BY ETA
DATE

VERIFIED BY
DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough

ADDRESS 350 N. Falkenburg Rd

Unit #2

CITY Tampa STATE FL ZIP 34299

PHONE 813-684-5688 SOURCE ID NUMBER

PROCESS EQUIPMENT Municipal Waste Comb. OPERATING MODE 100%

CONTROL EQUIPMENT ESP OPERATING MODE On

DESCRIBE EMISSION POINT START One of 4 stacks in square blue shell STOP

HEIGHT ABOVE GROUND LEVEL START 220' STOP 220'

HEIGHT RELATIVE TO OBSERVER START 240' STOP 240'

DISTANCE FROM OBSERVER START 1000' STOP 1000'

DIRECTION FROM OBSERVER START W STOP W

DESCRIBE EMISSIONS START not always visible STOP same

EMISSION COLOR START White STOP White

PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT NO ☒ YES ☐

IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 5' above stack STOP same

DESCRIBE BACKGROUND START Scattered clouds STOP same

BACKGROUND COLOR START blue STOP blue

SKY CONDITIONS START Scattered STOP same

WIND SPEED START 13-18 STOP 13-18

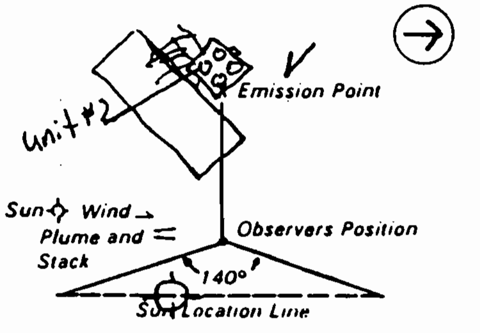
WIND DIRECTION START NW STOP NW

AMBIENT TEMP. START 64 STOP 64

WET BULB TEMP 56

RH.percent

Source Layout Sketch Draw North Arrow



OBSERVATION DATE 4/16/96 START TIME 0955 STOP TIME 1055

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
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2	5	5	0	0	32	5	0	0	0
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4	5	5	5	5	34	5	0	0	0
5	0	0	5	0	35	0	5	5	0
6	5	5	0	0	36	5	0	5	5
7	5	5	0	5	37	5	5	0	0
8	5	5	5	5	38	0	0	0	5
9	0	5	5	5	39	0	5	0	5
10	5	5	0	5	40	0	0	5	0
11	10	5	5	0	41	0	0	0	0
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21	0	5	5	5	51	0	5	0	0
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25	0	5	5	0	55	5	0	5	0
26	0	5	0	5	56	0	5	5	5
27	5	0	5	0	57	5	0	5	5
28	5	5	0	0	58	5	5	0	5
29	0	5	5	0	59	0	5	5	0
30	5	0	0	5	60	5	0	5	0

AVERAGE OPACITY FOR HIGHEST PERIOD

NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT) F. Lee Garcia

OBSERVER'S SIGNATURE F. Lee Garcia DATE 4/16/96

ORGANIZATION Env. Science + Eng.

CERTIFIED BY ETA DATE

VERIFIED BY DATE

COMMENTS because of wind + sun position reading just #2 not always possible

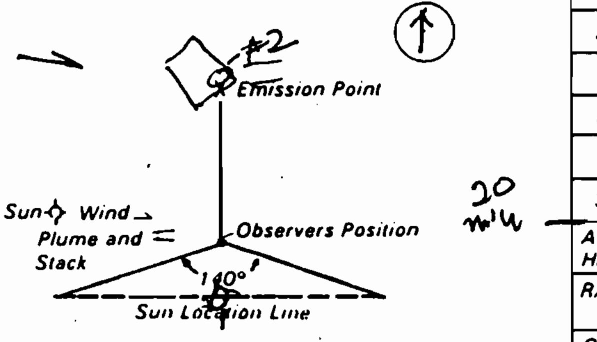
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE

TITLE DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin-Hillsborough
ADDRESS 350 N. Falkenburg Rd
Unit #2
CITY Tampa STATE FL ZIP 34299
PHONE 813-684-5688 SOURCE ID NUMBER
PROCESS EQUIPMENT Municipal Waste to Energy OPERATING MODE 100%
CONTROL EQUIPMENT ESP OPERATING MODE on
DESCRIBE EMISSION POINT START One of 4 stack in square shell STOP
HEIGHT ABOVE GROUND LEVEL START 220 STOP 220 HEIGHT RELATIVE TO OBSERVER START 230 STOP 230
DISTANCE FROM OBSERVER START 500 STOP ✓ DIRECTION FROM OBSERVER START NE STOP NE
DESCRIBE EMISSIONS START not visible STOP ✓
EMISSION COLOR START none STOP none PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT NO ☒ YES ☐ IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 8' above stack STOP ✓
DESCRIBE BACKGROUND START blue-sky STOP ✓
BACKGROUND COLOR START blue STOP ✓ SKY CONDITIONS START clear ✓ STOP ✓
WIND SPEED START 13-18 STOP 13-18 WIND DIRECTION START NW STOP NW
AMBIENT TEMP START 68 STOP 68 WET BULB TEMP 57 RH percent

Source Layout Sketch Draw North Arrow



COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE DATE

OBSERVATION DATE 4/16/96 START TIME 1355 STOP TIME 1455

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
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2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
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6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
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25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0 NUMBER OF READINGS ABOVE 10 % WERE 0
RANGE OF OPACITY READINGS 0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT) F. Lee Garcia
OBSERVER'S SIGNATURE F Lee Garcia DATE 4/16/96
ORGANIZATION ESE
CERTIFIED BY ETA DATE
VERIFIED BY DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough

ADDRESS 350 N Falkenburg Rd
Unit #2

CITY Tampa STATE FL ZIP 34299

PHONE 813-684-5688 SOURCE ID NUMBER

PROCESS EQUIPMENT Municipal Waste to Energy OPERATING MODE 100%

CONTROL EQUIPMENT ESP OPERATING MODE on

DESCRIBE EMISSION POINT START one of 4 stack in square shell STOP

HEIGHT ABOVE GROUND LEVEL START 220 STOP 220

HEIGHT RELATIVE TO OBSERVER START 230 STOP 230

DISTANCE FROM OBSERVER START 550 STOP ✓

DIRECTION FROM OBSERVER START E STOP ✓

DESCRIBE EMISSIONS START not visible STOP ✓

EMISSION COLOR START none STOP ✓

PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐

IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 10' above stk STOP ✓

DESCRIBE BACKGROUND START Sky STOP ✓

BACKGROUND COLOR START blue STOP ✓

SKY CONDITIONS START clear STOP ✓

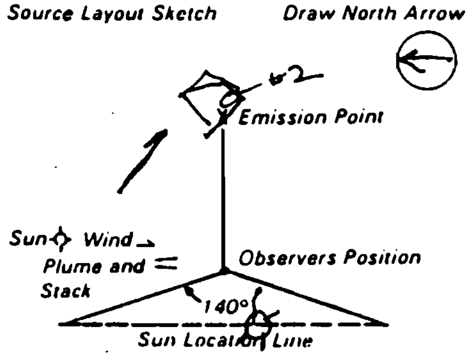
WIND SPEED START 8-12 STOP 8-12

WIND DIRECTION START N W STOP ✓

AMBIENT TEMP. START 73 STOP 73

WET BULB TEMP. 59

RH.percent



COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE

TITLE DATE

OBSERVATION DATE 4/16/96 START TIME 1721 STOP TIME 1821

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
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3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
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6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
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11	0	0	0	0	41	0	0	0	0
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13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0

NUMBER OF READINGS ABOVE 10 % WERE 0

RANGE OF OPACITY READINGS 0 MINIMUM 0 MAXIMUM

OBSERVER'S NAME (PRINT) F Lee Garcia

OBSERVER'S SIGNATURE F Lee Garcia DATE 4/16/96

ORGANIZATION ESE

CERTIFIED BY ETA DATE

VERIFIED BY DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin-Hillsborough

ADDRESS 350 N. Falkenburg Rd

unit #3

CITY Tampa STATE FL ZIP 34299

PHONE 813-684-5688 SOURCE ID NUMBER

PROCESS EQUIPMENT Municipal Waste → Energy OPERATING MODE 100%

CONTROL EQUIPMENT ESP OPERATING MODE on

DESCRIBE EMISSION POINT START One of 4 stack in square shell/ STOP

HEIGHT ABOVE GROUND LEVEL START 220' STOP 220' HEIGHT RELATIVE TO OBSERVER START 240' STOP 240'

DISTANCE FROM OBSERVER START 1000' STOP ✓ DIRECTION FROM OBSERVER START W STOP ✓

DESCRIBE EMISSIONS START not visible STOP ✓

EMISSION COLOR START none STOP ✓ PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐

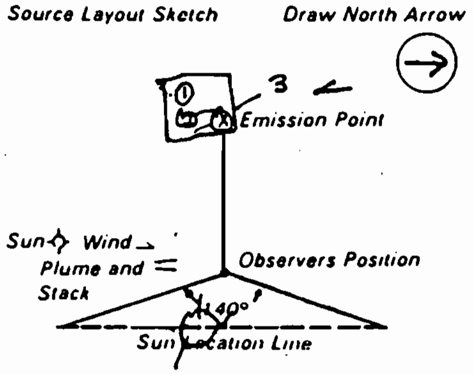
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 5' above Stack STOP ✓

DESCRIBE BACKGROUND START Clear sky STOP ✓

BACKGROUND COLOR START blue STOP ✓ SKY CONDITIONS START clear STOP ✓

WIND SPEED START 4-7 STOP 4-7 WIND DIRECTION START NE STOP

AMBIENT TEMP. START 67 STOP 67 WET BULB TEMP. 58 RH.percent



COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE

TITLE DATE

OBSERVATION DATE 4/17/96 START TIME 0835 STOP TIME 0935

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
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3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
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6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
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11	0	0	0	0	41	0	0	0	0
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14	0	0	0	0	44	0	0	0	0
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16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
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20	0	0	0	0	50	0	0	0	0
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25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0 NUMBER OF READINGS ABOVE 10 % WERE 0

RANGE OF OPACITY READINGS 0 MINIMUM 0 MAXIMUM

OBSERVER'S NAME (PRINT) F. Lee Garcia

OBSERVER'S SIGNATURE F Lee Garcia DATE 4/17/96

ORGANIZATION ESE

CERTIFIED BY ETA DATE

VERIFIED BY DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough
ADDRESS 350 N. Falkenburg Rd
Unit #3
CITY Tampa STATE FL ZIP 34299
PHONE 813-684-5688 SOURCE ID NUMBER
PROCESS EQUIPMENT Municipal Waste → Energy OPERATING MODE 100%
CONTROL EQUIPMENT ESP OPERATING MODE on
DESCRIBE EMISSION POINT
START one of 4 stacks in square shell STOP
HEIGHT ABOVE GROUND LEVEL START 220 STOP ✓ HEIGHT RELATIVE TO OBSERVER START 240 STOP ✓
DISTANCE FROM OBSERVER START 800' STOP ✓ DIRECTION FROM OBSERVER START NW STOP ✓
DESCRIBE EMISSIONS
START not visible STOP ✓
EMISSION COLOR START none STOP ✓ PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☒ YES ☐ IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START 5' above stack STOP ✓
DESCRIBE BACKGROUND
START clear sky STOP ✓
BACKGROUND COLOR START blue STOP ✓ SKY CONDITIONS START Clea ✓ STOP ✓
WIND SPEED START 4-7 STOP 4-7 WIND DIRECTION START NE STOP ✓
AMBIENT TEMP START 72 STOP 72 WET BULB TEMP 58 RH.percent

OBSERVATION DATE 4/17/96 START TIME 1205 STOP TIME 1305

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
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6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
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12	0	0	0	0	42	0	0	5	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
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21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
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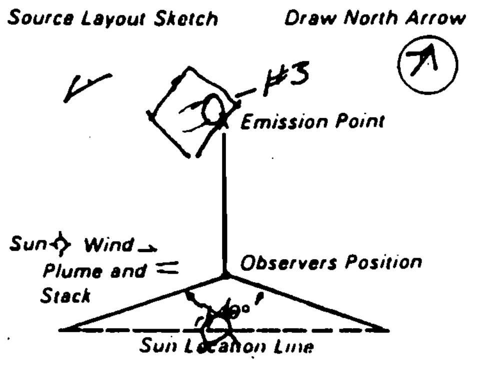

AVERAGE OPACITY FOR HIGHEST PERIOD
NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM MAXIMUM
OBSERVER'S NAME (PRINT) F. Lee Garcia
OBSERVER'S SIGNATURE F Lee Garcia DATE 4/17/96
ORGANIZATION ESE
CERTIFIED BY ETA DATE
VERIFIED BY DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE DATE

Visible Emission Observation Form

SOURCE NAME Ogden Martin - Hillsborough

ADDRESS 350 N, Falkenberg Rd
Unit #3

CITY Tampa
STATE FL
ZIP 34299

PHONE 813-684-5688
SOURCE ID NUMBER

PROCESS EQUIPMENT Waste ~~ESP~~ to Energy
OPERATING MODE 100%

CONTROL EQUIPMENT ESP
OPERATING MODE on

DESCRIBE EMISSION POINT
START one of 4 stack in STOP square sheel

HEIGHT ABOVE GROUND LEVEL START 220' STOP ✓
HEIGHT RELATIVE TO OBSERVER START 220' STOP ✓

DISTANCE FROM OBSERVER START 600 STOP ✓
DIRECTION FROM OBSERVER START E STOP ✓

DESCRIBE EMISSIONS
START not visible STOP ✓

EMISSION COLOR START none STOP ✓
PLUME TYPE CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START 10' above stack STOP ✓

DESCRIBE BACKGROUND
START sky STOP ✓

BACKGROUND COLOR START blue STOP blue/white
SKY CONDITIONS START Scattered STOP ✓

WIND SPEED START 4-7 STOP ✓
WIND DIRECTION START N STOP ✓

AMBIENT TEMP. START 77 STOP 77
WET BULB TEMP. 58
RH.percent

OBSERVATION DATE 4/17/96
START TIME 1500
STOP TIME 1600

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
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2	0	0	0	0	32	0	0	0	0
3	0	0	5	5	33	0	0	0	0
4	0	5	0	0	34	0	0	0	0
5	0	0	0	5	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	5	0	37	0	0	0	0
8	0	5	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	5	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
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17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
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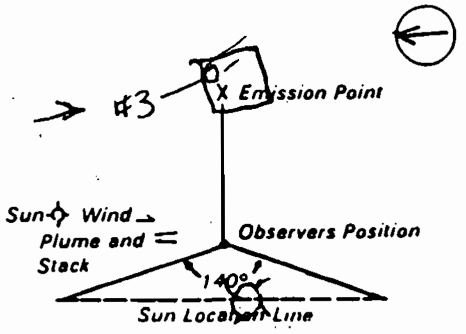
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD
NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS MINIMUM MAXIMUM

Source Layout Sketch Draw North Arrow



OBSERVER'S NAME (PRINT) F. Lee Garcia

OBSERVER'S SIGNATURE F Lee Garcia
DATE 4/17/96

ORGANIZATION ESE

CERTIFIED BY ETA
DATE

VERIFIED BY
DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE

TITLE
DATE

Bill Mayhew   from [illegible]

ESE Environmental Science & Engineering, Inc.
A CILCORP Company
O. Box 1703   Gainesville, Florida 32602-1703
4-332-3318   Fax 904-332-0507

JOB
SHEET NO. ____ OF ____
CALCULATED BY ____ DATE ____
CHECKED BY ____ DATE ____
SCALE

Particulate Data (total grams gained)

run #	grams
1-1	.0051
1-2	.0115
1-3	.0103
2-1	.0105
2-2	.009
2-3	.0101
3-1	.0103
3-2	.0103
3-3	.0111

Hg Data

run#	cf	$\sqrt{\Delta P}$	ΔH	T_s	T_m	O_2	CO_2	H_2O
1-1	65.866	.9221	.811	429.3	91.2	9.3	10.1	227
1-2	69.510	.9578	.8771	429.2	98.8	10.2	9.5	221.1
1-3	69.739	.9555	.873	429.1	102.6	9.3	10.4	209.2
2-1	71.017	.9531	.9117	439	92.9	10.07	9.4	223.4
2-2	72.882	.9875	.9783	439.8	97.9	10.1	9.6	237.4
2-3	75.403	1.0136	1.03	446	100.9	10.1	9.8	240.3
3-1	67.269	.9441	.848	440	83.6	9.3	10.2	218.9
3-2	70.268	.9744	.905	440.5	91.1	9.1	10.2	231.9
3-3	67.553	.9354	.833	439.9	96.8	9.3	10.4	211.7

Bill Mayhew   Lee Garcia

ESE
Environmental
Science &
Engineering, Inc.
A CILCORP Company
Box 1703   Gainesville, Florida 32602-1703
04-332-3318   Fax 904-332-0507

JOB

SHEET NO. OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

Method 5 data

run #	Vm	ave $\sqrt{\Delta P}$	ΔH	T_s	T_m	O_2	CO_2	H_2O
1-1	83.225	.8933	1.441	429.3	86.3	9.3	10.1	276.4
1-2	86.399	.9246	1.5442	429.3	92.9	10.2	9.5	274.1
1-3	88.715	.9396	1.5992	429.6	97.8	9.3	10.4	256.8
2-1	83.765	.9301	1.5629	439.8	86.8	10.07	9.4	265.2
2-2	84.186	.9457	1.6225	439.9	91.4	10.1	9.57	270.9
2-3	88.016	.9819	1.7371	446.1	93.9	10.1	9.8	281.4
3-1	84.249	.9100	1.4958	439.9	78.7	9.3	10.2	253
3-2	87.353	.9451	1.612	440.6	88	9.1	10.2	285.9
3-3	84.193	.9116	1.50	440	91.1	9.3	10.4	256.8
		Hg						
2-2	72.882	.9875	.9783	439.8	97.9	10.1	9.6	237.4
3-3	67.553	.9354	.833	439.9	96.8	9.3	10.4	211.7
1-1	65.866	.9221	.811	429.3	91.2	9.3	10.1	227
3-1	67.269	.9441	.848	440	83.6	9.3	10.2	218.9
1-2	69.510	.9578	.8771	429.2	98.8	10.2	9.5	222.1

APPENDIX D--CALIBRATION DATA

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 10/17/95 Meter box number N-1

Barometric pressure, P_b = 30.22 in. Hg Calibrated by

Orifice manometer setting (ΔH), in. H_2O	Gas volume		Temperatures					Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter		Dry gas meter					
			Pwtm	(t_w), °F	Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Avg[a] (t_d), °F			
4	5.002	4.964	-.9	71	73.5	71	72.3	4.40	.9982	1.720
2	5.003	5.067	-.5	71	73.5	71.5	72.5	6.21	.9840	1.712
1	5.002	5.109	-.3	71	73.5	72	72.8	8.50	.9795	1.603
								Avg	.9872	1.68

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w\ P_b(t_d + 460)}{V_d(P_b + \frac{\Delta H}{13.6})\ (t_w + 460)}$	$\Delta H@_i = \frac{0.0317\ \Delta H}{P_b\ (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$

---

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

(front side)

FORM 871

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC. | **METER BOX CALIBRATION DATA AND CALCULATION FORM**

(English units)

Date 10/16/95 Meter box number N-3

Barometric pressure, P_b = 30.17 in. Hg Calibrated by flg

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperatures: Wet test meter: Pwtm	Temperatures: Wet test meter (t_w), °F	Temperatures: Dry gas meter: Inlet (t_{d_i}), °F	Temperatures: Dry gas meter: Outlet (t_{d_o}), °F	Temperatures: Dry gas meter: Avg[a] (t_d), °F	Time (θ), min	Y_i	$\Delta H@_i$ in. H_2O
4	5	4.972	-.9	71	70	68.5	69.3	4.24	1.0093	1.610
2	5.001	5.073	-.5	71	71	68.5	69.8	6.19	.9774	1.713
1	4.999	5.115	-.3	71	72.5	69.5	71	8.51	.9744	1.617
								Avg	.9870	1.65

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$

---

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

(front side)

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 11/6/95 Thermocouple number NU-1

Ambient temperature 68.1 °F Barometric pressure 30.25 in. Hg

Calibrator NBC Reference: mercury-in-glass ________

other ________

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
1	Ambient	68.1	70.0	-0.36
2	ICED WATER	34.4	36.0	-0.324
3	HOT OIL	304.9	303.0	0.25

[a] Type of calibration system used.

[b] $$\left[\frac{(\text{ref temp, °F} + \overset{460}{\cancel{273}}) - (\text{test thermom temp, °F} + \overset{460}{\cancel{273}})}{\text{ref temp, °F} + \underset{460}{\cancel{273}}}\right] 100 \leq 1.5\%.$$

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 11/6/95 Thermocouple number NU3

Ambient temperature 67.7 °F Barometric pressure 30.25 in. Hg

Calibrator NRC Reference: mercury-in-glass ____________

other ____________

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
1	Ambient	67.7	66.0	0.3222
2	ICED WATER	33.9	35.0	-0.2227
3	HOT OIL	305.1	302	0.405

[a] Type of calibration system used.

[b] $$\left[\frac{(\text{ref temp, }^\circ F + \overset{460}{\cancel{273}}) - (\text{test thermom temp, }^\circ F + \overset{460}{\cancel{273}})}{\text{ref temp, }^\circ F + \underset{460}{\cancel{273}}}\right] 100 \le 1.5\%.$$

Date 1/8/96 Operator Initials flg

Pitot Tube I.D. No. B Length 8'

Pitot tube assembly level? yes ☑ no ☐

Quick connects attached, leak free? yes ☑ no ☐

α_1 = 3 ° α_2 = 3 °

β_1 = 3 ° β_2 = 2 °

γ = 4 °, θ = 1 °, A = .750 cm (in.)

$z = A \sin \gamma$ = .052 cm (in.);

$w = A \sin \theta$ = .013 cm (in.);

P_A = .375 cm (in.);

P_b = .375 cm (in.);

D_t = .250 cm (in.);

Acceptance Criteria

α_1 and $\alpha_2 < 10°$ yes ☑ no ☐

β_1 and $\beta_2 < 5°$ yes ☑ no ☐

z < 0.32 cm (1/8 in.) yes ☑ no ☐

w < 0.08 cm (1/32 in.) yes ☑ no ☐

P_A and P_b, $1.05\ D_t < P < 1.50\ D_t$ yes ☑ no ☐

D_t, 0.48 cm (3/16 in) $\leq D_t \leq$ 0.95 cm (3/8 in) yes ☑ no ☐

Pitot Tube Acceptable? yes ☑ no ☐

Comments:

Pitot Tube Inspection Form

BEST AVAILABLE COPY

Date 4/2/96 Operator Initials flg

Pitot Tube I.D. No. F Length 6"

Pitot tube assembly level? yes ☑ no ☐

Quick connects attached, leak free? yes ☑ no ☐

α_1 = 2 ° α_2 = 1 °

β_1 = 2 ° β_2 = 2 °

γ = 2 °, θ = 2.5 °, A = .748 cm (in.)

$z = A \sin \gamma$ = .03 cm (in.);

$w = A \sin \theta$ = .039 cm (in.);

P_A = .374 cm (in.);

P_b = .374 cm (in.);

D_t = .250 cm (in.);

Acceptance Criteria

α_1 and $\alpha_2 < 10°$ yes ☑ no ☐

β_1 and $\beta_2 < 5°$ yes ☑ no ☐

$z < 0.32$ cm (1/8 in.) yes ☑ no ☐

$w < 0.08$ cm (1/32 in.) yes ☑ no ☐

P_A and P_b, $1.05\ D_t < P < 1.50\ D_t$ yes ☑ no ☐

D_t, 0.48 cm (3/16 in) $\leq D_t \leq$ 0.95 cm (3/8 in) yes ☑ no ☐

Pitot Tube Acceptable? yes ☑ no ☐

Comments: ______

Pitot Tube Inspection Form

1181655R

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

POSTTEST DRY GAS METER CALIBRATION DATA FORM

(English units)

Test numbers M5 Date 4/23/96 Meter box number N1 Plant Ogden Martin Hillsborough

Barometric pressure, P_b = 30.29 in. Hg Dry gas meter number N1 Pretest Y .9872

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature					Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F		Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
			P_m		Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
1.6	5	5.072	-.4	75.5	72.5	72.5	71.5		2	.9872	.9736
1.6	4.996	5.071	-.4	75.5	74	71.5	72.8		2		.9754
1.6	5.001	5.091	-.4	75.5	75.5	72.5	74		2		.9747
										Y =	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

POSTTEST DRY GAS METER CALIBRATION DATA FORM

(English units)

Test numbers Hg Date 4/23/96 Meter box number N3 Plant Ogden Martin Hillsborough
Barometric pressure, P_b = 30.29 in. Hg Dry gas meter number N3 Pretest Y .9870

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature					Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter		Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)}$
			Pm	(t_w), °F	Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
.9	5	4.957	.3	75.5	70	68	69		2		.9935
.9	7.~~398~~ 408	7.388	.3	75.5	73	71	72		2		.9932
.9	5	4.943	.3	75.5	74	72	73		2		1.0038
										Y =	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

V_w = Gas volume passing through the wet test meter, ft^3.
V_d = Gas volume passing through the dry gas meter, ft^3.
t_w = Temperature of the gas in the wet test meter, °F.
t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.
t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.
t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.
ΔH = Pressure differential across orifice, in H_2O.
Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.
Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y
P_b = Barometric pressure, in. Hg.
θ = Time of calibration run, min.

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Lee Garcia

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

President

251726
Certificate Number

Vice President

Orlando, Florida

David B. Savage, Jr.
Program Manager

February 21, 1996
Date of Issue

VISIBLE EMISSIONS EVALUATION

This is to certify that

Lee Garcia

did complete a course in the methods of determining opacity of visible emissions from sources as specified by Federal Reference Method 9 conducted by Eastern Technical Associates of Raleigh, North Carolina.

William H. Charles

Course Moderator

Orlando, Florida

Location

February 20, 1996

Date

ESE Field Nozzle Calibration Sheet

Client: Ogden Martin & OPi

Plant: Hillsborough Cnty

Location:

Date: 4/16/96

Nozzle	Measurement (")				Average
	1	2	3	4	
Method 5	.244	.244	.243		.244
M 101 A	.212	.212	.212		.212

APPENDIX E–LABORATORY DATA

Environmental Science & Engineering, Inc. 04/23/96 PAGE # 1

PROJECT NUMBER 1296008V L203 PROJECT NAME OGDEN MARTIN - MERCURY
FIELD GROUP OMHG1 PROJECT MANAGER BARBARA RITTER

RESULTS OF ANALYSIS

STORET CODE: 99774
METHOD CODE: 7470-G

PARAMETER: HG
UNITS: UG

FLD.GRP.	#	SAMPLE ID	DATE	
OMHG1	14	REAGENTBLK	04/18/96	<1.30
OMHG1	15	UNIT-1,RUN-1	04/18/96	440
OMHG1	8	UNIT-1,RUN-2	04/18/96	218
OMHG1	9	UNIT-1,RUN-3	04/18/96	324
OMHG1	7	UNIT-2,RUN-1	04/16/96	403
OMHG1	11	UNIT-2,RUN-2	04/16/96	305
OMHG1	10	UNIT-2,RUN-3	04/16/96	348
OMHG1	6	UNIT-3,RUN-1	04/17/96	461
OMHG1	13	UNIT-3,RUN-2	04/17/96	400
OMHG1	12	UNIT-3,RUN-3	04/17/96	228

ESE BATCH : G70165
ANALYSIS : EPA 7470

HOD BLANK CORRECTION METHOD : NONE

SAMPLE CODE	CLIENT ID
OMHG1*14	REAGENTBLK
OMHG1*6	UNIT-3,RUN-1
OMHG1*8	UNIT-1,RUN-2
OMHG1*12	UNIT-3,RUN-3
OMHG1*15	UNIT-1,RUN-1
OMHG1*7	UNIT-2,RUN-1
OMHG1*9	UNIT-1,RUN-3
OMHG1*10	UNIT-2,RUN-3
OMHG1*11	UNIT-2,RUN-2
OMHG1*13	UNIT-3,RUN-2

Method Blank Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	FOUND	DET LMT
04/19/96	MB*QC*1	99774*7470-G	MERCURY	UG	ND	0.200
04/19/96	MB*REAGENT*1	99774*7470-G	MERCURY	UG	ND	4.00

Standard Matrix Spike Recovery Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	TARGET	FOUND	%RECV	RECV CRIT
04/19/96	SP*QC*1	99774*7470-G	MERCURY	UG	5.00	5.02	100.4	83-125

Laboratory Control Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	TARGET	FOUND	%RECV	RECV CRIT
04/19/96	LCS*QC*1	99774*7470-G	MERCURY	UG	100.0	90.6	90.6	N/A

Replicate Analysis Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	REP #1	REP #2	RPD	RER	CRIT
04/19/96	RP*OMHG1*14	99774*7470-G	MERCURY	UG	<1.30	<1.30			N/A
/19/96	RP*OMHG1*6	99774*7470-G	MERCURY	UG	461	449	2.60		N/A
/19/96	RP*OMHG1*8	99774*7470-G	MERCURY	UG	218	220	0.900		N/A
04/19/96	RP*OMHG1*12	99774*7470-G	MERCURY	UG	228	231	1.30		N/A
04/19/96	RP*OMHG1*15	99774*7470-G	MERCURY	UG	440	430	2.30		N/A
04/19/96	RP*OMHG1*7	99774*7470-G	MERCURY	UG	403	409	1.50		N/A
04/19/96	RP*OMHG1*9	99774*7470-G	MERCURY	UG	324	321	0.900		N/A
04/19/96	RP*OMHG1*10	99774*7470-G	MERCURY	UG	348	366	5.00		N/A
04/19/96	RP*OMHG1*11	99774*7470-G	MERCURY	UG	305	310	1.60		N/A
04/19/96	RP*OMHG1*13	99774*7470-G	MERCURY	UG	400	405	1.20		N/A

Standard Addition (SA) Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	KNOWN CNC	RESP	UNC CNC	FINAL CNC	CORR
04/19/96	SA0*OMHG1*11	99774*7470-G	MERCURY	UG	0.0	34.5	4.82	293	.998
04/19/96	SA1*OMHG1*11	99774*7470-G	MERCURY	UG	1.00	43.0			
04/19/96	SA2*OMHG1*11	99774*7470-G	MERCURY	UG	2.00	49.25			
04/19/96	SA3*OMHG1*11	99774*7470-G	MERCURY	UG	3.00	56.5			

Sample Matrix Spike Recovery Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	UNSPIKED	TARGET	FOUND	%RECV	CRIT	RPD	CRIT
04/19/96	SPM1*OMHG1*11	99774	MERCURY	UG	5.02	5.00	5.08	101.6	N/A		
04/19/96	SPM2*OMHG1*11	99774	MERCURY	UG	5.02	5.00	4.83	96.6	N/A	5.00	N/A

ESE BATCH : G70165

Environmental Science and Engineering Analytical Services
Computer QC Checks

h No.: G70165 **Analysis Date:** 04/19/96 **Analyst:** KENT BRAKEFIELD

		"Exceptions"	
	Yes	No	Comment / Corrective Action
Are ALL units documented in batch?	X		
Analysis holding time within criteria?	X		
No. of calibration standards present acceptable?	X		
Curve correlation coefficient >= 0.995?	X		
Calibration curve y-intercept < curve detection limit?	X		
Sample responses within highest standard response?	X		
CCV present?	X		
CCV within acceptance criteria?	X		
ICV present?	X		
ICV within acceptance criteria?	X		
Method blank present?	X		
Method blank within acceptance criteria?	X		
Standard matrix spike present?	X		
Standard matrix spike within acceptance criteria?	X		

Note: Any "NO" answer requires a comment.

Batch Narrative - G70165 Analysis: EPA 7470

Updated by 3546, 3546

The sample results are ug/L as calculated by a quadratic curve based on the sample responses of peak heights.

Dilution factor for the aliquot analyzed is calculated using the following:

$$\text{Dil. factor} = \frac{\text{volume of filtrate}}{\text{vol. of sample filtered}} \times \frac{100}{\text{aliquot of filtrate analyzed}}$$

50.0 mL of each sample was filtered for use.
The aliquot analyzed for each sample is designated on the analysis run log.

Environmental Science & Engineering, Inc. 04-09-96 *** FIELD LOGSHEET *** FIELD GROUP: OMHG1
PROJECT NUMBER 1296008V L203 FG NAME: OGDEN MARTIN - MERCURY LAB COORD. BARBARA RITTER

ESE #	SITE/STA	HAZ?	FRACTIONS(CIRCLE)	DATE	TIME	PARAMETER LIST
*1			IMP			XOMHG
*2			IMP			XOMHG
*3			IMP			XOMHG
*4			IMP			XOMHG
*5			IMP			XOMHG
[✓ *6]	unit-3, run-1		[✓ IMP]	4/17		XOMHG
[✓ *7]	unit-2, run-1		[✓ IMP]	4/16		XOMHG
[✓ *8]	unit-1, run-2		[✓ IMP]	4/18		XOMHG
[✓ *9]	unit-1, Run-3		[✓ IMP]	4/18		XOMHG
[✓ *10]	unit-2 run-3		[✓ IMP]	4/16		XOMHG

NOTE -CHANGE OR ENTER SITE ID AS NECESSARY; UP TO 9 ALPHANUMERIC CHARACTERS MAY BE USED
-CIRCLE FRACTIONS COLLECTED. ENTER DATE,TIME,FIELD DATA (IF REQUIRED), HAZARD CODE AND NOTES
-HAZARD CODES: I-IGNITABLE C-CORROSIVE R-REACTIVE T-TOXIC WASTE H-OTHER ACUTE HAZARD; IDENTIFY SPECIFICS IF KNOWN
-PLEASE RETURN COMPLETED LOGSHEETS WITH SAMPLES TO Environmental Science & Engineering, Inc.

RELINQUISHED BY: (NAME/ORGANIZATION/DATE/TIME)	VIA:	REC'D BY (NAME/ORGANIZATION/DATE/TIME)
1		ESE 4/19/56 0500
2		
3		ESH 4-19-96 17:12

SAMPLER: Shipped on Ice? [✓ Yes]/No; I anticipate shipping ____ (#) more samples on __/__
SAMPLE CUSTODIAN: Custody Seals Used? Yes/[✓ No] If Yes, Seals Intact? Yes/[✓ No] Interior Temp? 6° Deg C
Preservatives Audited? [✓ Yes]/No Any Problems? Yes/[✓ No] If Yes, describe:

Environmental Science & Engineering, Inc. 04-09-96 *** FIELD LOGSHEET *** FIELD GROUP: **OMHG1**
PROJECT NUMBER 1296008V L203 FG NAME: OGDEN MARTIN - MERCURY LAB COORD. BARBARA RITTER

ESE #	SITE/STA	HAZ?	FRACTIONS (CIRCLE)	DATE	TIME	PARAMETER LIST
*11	unit-2 Run -2		[✓ IMP]	4/1~~9~~1		XOMHG
*12	unit 3, Run 3		[✓ IMP]	4/17		XOMHG
*13	unit-3, Run 2		[✓ IMP]	4/16		XOMHG
*14	Reagent Blk		[✓ IMP]	4/18		XOMHG $H_2O, H_2SO_4, HCl, KMnO_4$
*15	unit-1, Run-1		[✓ IMP]	4/18		XOMHG
			IMP			XOMHG
			IMP			XOMHG
			IMP			XOMHG
			IMP			XOMHG
			IMP			XOMHG

NOTE -CHANGE OR ENTER SITE ID AS NECESSARY; UP TO 9 ALPHANUMERIC CHARACTERS MAY BE USED
-CIRCLE FRACTIONS COLLECTED. ENTER DATE,TIME,FIELD DATA (IF REQUIRED), HAZARD CODE AND NOTES
-HAZARD CODES: I-IGNITABLE C-CORROSIVE R-REACTIVE T-TOXIC WASTE H-OTHER ACUTE HAZARD; IDENTIFY SPECIFICS IF KNOWN
-PLEASE RETURN COMPLETED LOGSHEETS WITH SAMPLES TO Environmental Science & Engineering, Inc.

	RELINQUISHED BY: (NAME/ORGANIZATION/DATE/TIME)	VIA:	REC'D BY (NAME/ORGANIZATION/DATE/TIME)
1			ESE 4/19/96 0900
2			
3			ESH 4-19-96 17:12

SAMPLER: Shipped on Ice? Yes/No; I anticipate shipping ____ (#) more samples on __/__
SAMPLE CUSTODIAN: Custody Seals Used? Yes/[✓ No]; If Yes, Seals Intact? Yes/[✓ No] Interior Temp? 6° Deg C
Preservatives Audited? [✓ Yes]/No Any Problems? Yes/[✓ No]; If Yes, describe:

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

LABORATORY ANALYSIS

Project Name: Ogden Martin - Hillsborough
Project No.:

Date Sampled: 4/96
Date Analyzed: 4/96
Analyzed By: flg

All analysis performed within guidelines set by EPA
Federal Register, Thursday, August 18, 1977. Part II-

	$V_{m(std)}$ 84.1884	80.6645		
Run No.	3-3	BLK		
Beaker No.	17A	110		
Beaker Vol. (ml)	80	150		
Final Wt. (g)	101.5649	100.1346		
Tare Wt. (g)	101.5604	100.1347		
Wt. Gain (mg)	.0045	-.0001		
Blk. Corr. (mg)	—	—		
Net Wt. (mg)	.0045	—		
Filter No.	A-35 ✓	X5		
Final Wt. (g)	.3537	.3951		
Tare Wt. (g)	.3481	.3951		
Wt. Gain (mg)	.0066	—		
Blk. Corr. (mg)	—	—		
Net Wt. (mg)	.0066	—		
Total Particulate Wts.				
Filter (mg)	.0066	—		
Wash (mg)	.0045	—		
Total (mg)	.0111 ✓	—		
Silica Gel Wt. Gain (g)				

ANALYTICAL BALANCE WEIGHT CHECK (Traceable NBS Class S Wts)

Pre Sample Wt. ________ mg.
Post Sample Wt. ________ mg.
Weight Size ________ mg.
Weight Size ________ mg.

Remarks: All weights shown are in g, not mg.

ESE EN NMENTAL SCIENCE
AN ENGINEERING, INC.

LABORATORY ANALYSIS

Project Name: Ogden Martin-Hillsborough
Project No.: ______
Date Sampled: 4/96
Date Analyzed: 4/96
Analyzed By: flg

All analysis performed within guidelines set by EPA Federal Register, Thursday, August 18, 1977. Part II-

UNIT–RUN
↓ ↓

V_m(std) = 80.2936 ft³ → 82.3814   83.8578   80.9246

Run No.	1-1	1-2	1-3	2-1
Beaker No.	78	Z29	25	Z38
Beaker Vol.	100 ml	90 ml	100 ml	95 ml
Final Wt.	107.1061 g	111.5070 g	99.0555 g	111.6196 g
Tare Wt.	107.1030 g	111.5036 g	99.0520 g	111.6148 g
Wt. Gain	.0031 mg g	.0034 mg	.0035 mg	.0048 mg
Blk. Corr.	— mg	— mg	— mg	— mg
Net Wt.	.0031 mg g	.0034 mg	.0035 mg	.0048 mg
Filter No.	A36 ✓	X3 ✓	X4 ✓	Z18 ✓
Final Wt.	.3529 g	.4028 g	.4012 g	.3798 g
Tare Wt.	.3509 g	.3947 g	.3944 g	.3741 g
Wt. Gain	.002 mg g	.0081 mg g	.0068 mg	.0057 mg
Blk. Corr.	— mg	— mg	— mg	— mg
Net Wt.	.0020 mg g	.0081 ~~mg~~ g	.0068 mg	.0057 mg
Total Particulate Wts.				
Filter	.0020 mg g	.0081 mg	.0068 mg	.0057 mg
Wash	.0031 mg ↓	.0034 mg	.0035 mg	.0048 mg
Total	.0051 mg ✓	.0115 mg ✓	.0103 mg ✓	.0105 mg ✓
Silica Gel Wt. Gain	____ g	____ g	____ g	____ g

Run #1
SAMPLE CALC:

$$\frac{.0051\,g}{80.2936\,dscf}\Big|\frac{15.43\,grains}{g}$$

$$= 0.00098\,\frac{grains}{dscf}$$

Qstd = 46,587.6 dscfm

PM(lb/hr) =

$$\frac{.00098\,grains}{dscf}\Big|\frac{46587.6\,dscf}{min}\Big|\frac{60\,min}{hr}\Big|\frac{1\,lb}{7000\,grains}$$

$$= 0.391\,lb/hr$$

ANALYTICAL BALANCE WEIGHT CHECK (Traceable NBS Class S Wts)

Pre Sample Wt. ________ mg.
Post Sample Wt. ________ mg.

Weight Size ________ mg.
Weight Size ________ mg.

Remarks: All weights shown are in grams, not mg

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

LABORATORY ANALYSIS

Project Name: Ogden Martin-Hillsborough

Project No.:

Date Sampled: 4/96

Date Analyzed: 4/96

Analyzed By: flg

All analysis performed within guidelines set by EPA
Federal Register, Thursday, August 18, 1977. Part II-

V_m(std)	80.6625	83.977	82.5754	84.1884
Run No.	2-2	2-3	3-1	3-2
Beaker No.	2	Z-48	79	Z-46
Beaker Vol.	90 ml	100 ml	110 ml	100 ml
Final Wt.	105.6004 g	113.1721 g	106.4424 g	108.3739 g
Tare Wt.	105.5975 g	113.1677 g	106.4356 g	108.3716 g
Wt. Gain	.0029 mg	.0044 mg	.0068 mg	.0023 mg
Blk. Corr.	— mg	— mg	— mg	— mg
Net Wt.	.0029 mg	.0044 mg	.0068 mg	.0023 mg
Filter No.	Z19 ✓	Z20 ✓	Z17 ✓	A17
Final Wt.	.3687 g	.3622 g	.3709 g	.3444 g
Tare Wt.	.3626 g	.3565 g	.3674 g	.3364 g
Wt. Gain	.0061 mg	.0057 mg	.0035 ~~mg~~ g	.008 ~~mg~~ g
Blk. Corr.	— mg	— mg	— mg	— mg
Net Wt.	.0061 ~~mg~~ g	.0057 ~~mg~~ g	.0035 ~~mg~~ g	.0080 ~~mg~~ g
Total Particulate Wts.				
Filter	.0061 ~~mg~~ g	.0057 ~~mg~~ g	.0035 ~~mg~~ g	.008 ~~mg~~ g
Wash	.0029 ~~mg~~ g	.0044 ~~mg~~ g	.0068 ~~mg~~ g	.0023 ~~mg~~ g
Total	.009 ~~mg~~ g ✓	~~.010~~ ~~mg~~ g .0101 ✓	.0103 ~~mg~~ g ✓	.0103 ~~mg~~ g ✓
Silica Gel Wt. Gain	____ g	____ g	____ g	____ g

(DATA SHEET SAYS 5-2, but petrie dish for this run is A17. - Miscommunication to sampler - data sheet incorrect.) Zh.

ANALYTICAL BALANCE WEIGHT CHECK (Traceable NBS Class S Wts)

Pre Sample Wt. ________ mg.

Post Sample Wt. ________ mg.

Weight Size ________ mg.

Weight Size ________ mg.

Remarks All weights shown are in grams, not mg

APPENDIX F--PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

ESE

Cliff Bittle	Project Director
Bill Mayhew	Project Manager / Field Team Leader
Tom Macdonald	Environmental Technician
Lee Garcia	Environmental Technician
Keith Glynn	Staff Scientist
Barbara Ritter	Laboratory Coordinator
Claudia Hodge	Document Coordinator

OPI

Joe Aldina	Sr. Vice President/ Environmental Testing
Michelle Herman	Test Engineer

OMSP

John Burbridge	Facility Manager

Procedures for Startup and Shutdown

OGDEN MARTIN SYSTEMS OF
HILLSBOROUGH, INC,

OPERATING INSTRUCTIONS: 6
DATE: NOVEMBER 9, 1994
REVISED:

PLANT AND INSTRUMENT AIR SYSTEM START-UP

This instruction assumes that no air compressors are operating and no air pressure exists in the system.

VERIFY THAT ALL SAFETY CLEARANCES HAVE BEEN PROPERLY RELEASED BEFORE PREPARING THE UNIT FOR SERVICE.

__1. Inspect the air compressors and instrument air dryers. Verify that they are ready for service.

__2. Verify that power is available to the air compressors and air dryers.

__3. Verify the closed cooling water system is in operation. Line closed cooling water up to both compressors with valves CCL-014 and CCV-015 (A and B).

NOTE: In the event that the closed cooling water system is not available, it is possible to rig hoses to the compressors and use water form the service water system to operate the compressors. <u>CAUTION</u>! If the above arrangement is done, care should be exercised when eventually switching the compressors to the closed cooling water system. Flush the service water out of the compressors and associated piping before lining up to the closed cooling water system to avoid contaminating the condensate in the closed cooling water system with the tertiary water used in the service water system.

__4. Before starting the compressors, ensure that the crankcase oil levels fill 3/4 of the crankcase oil level sight glasses. When running, the oil levels should fill the sight glasses to 1/2 full.

__5. Select one of the compressors to be the running unit. (the other one will be the standby unit) Set the control switch for the running unit to "continuous" and press the "start" button.

__6. The "running" compressor should come up to speed and build normal operating pressure and unload automatically. Inspect and verify proper operation.

__7. Verify that the discharge receiver traps are lined up.

__8. Slowly crack open the receiver outlet valve to move pressure out to the inlet isolation valve for the air dryer pre-filter. Also crack open the outlet valve for the receiver of the standby compressor, pressure the receiver and fully open the receiver outlet valves for both compressors.

Set the control switch for the standby compressor to "auto" and press the start button. The standby compressor is now set to start automatically when the receiver pressure drops to 105 psig.

__9. Energize the air dryer by positioning the control switch to "on". Verify power by a lit indicating lamp.

__10. Slowly pressure the air dryer through the pre-filter inlet isolation valve. When the dryer is fully pressured, completely open the pre-filter inlet valve.

__12. Slowly pressure up the instrument air header by cracking open the dryer after-filter isolation valve. When the header is fully pressured, open the valve the rest of the way.

__13. Verify proper operation of the compressor and air dryer.

--14 Test run the standby compressor.

__15. Verify that all instrument air system branch line isolation valves listed below are open., If they are not, open slowly until the branch section is up to pressure, then open fully.

1.	Riser at Col. G3 and 11	CAV-003
2.	Riser at Col. E8 and 11	CAV-004
3.	Riser at Col. E8 and 14.2	CAV-005
4.	Riser at Col. F8 and 14.2	CAV-006

5. Riser at Col. G8 and 14.2 CAV-007
6. To ash building and dust collection area CAV-009
7. To neutralization tank, cooling tower, fire protection tank, chlorine building, and cholrination tank area. CAV-008
8. By the south boiler room sump.
9. By the east end of the storeroom. (2 Vlvs)
10. To the #3 precipitator flapgates.
11. To #3 OFA fan.

__16. If it is desired to also pressure the service air header, isolate the hand valve below the service air system automatic isolation valve; at the nearby wall-mounted control box, move the control switch to open and hold in place for about five seconds until the automatic valve opens, then crack open the manual isolation valve below it and slowly pressurize the service air header. When the header is fully pressurized, finish opening the manual isolation valve.

OGDEN MARTIN SYSTEMS OF
HILLSBOROUGH, INC.

OPERATING INSTRUCTIONS: 13
DATE NOVEMBER 9, 1994
REVISED:

ELECTROSTATIC PRECIPITATOR START-UP

I. PRECIPITATOR START-UP

VERIFY THAT ALL SAFETY CLEARANCES HAVE BEEN PROPERLY RELEASED BEFORE PREPARING THE UNIT FOR SERVICE.

__1. Twelve hours before precipitator start-up, verify that the breaker is closed for the insulator heater breaker panel, and energize the heaters in the insulator enclosures.

__2. Verify that all foreign materials have been removed from the interior of the electrostatic precipitator (ESP).

__3. Through each access door, inspect plates for straightness, ash bridges, and equally distant clearances at all points between the field grids and the plates.

__4. Verify all precipitator hoppers are clear of ash and no high hopper level alarms exist.

__5. Verify that all precipitator access doors are secured and sealed. Assure that all grounding hooks are moved to outside of the doors.

__6. Verify that all keys are returned to their normal "precipitator operating" positions by:

   a. Closing all precipitator openings and removing the "E1"key from each.

   b. Insert the "E1" keys into the first available positions after the positions of the "D1" keys until all of the keys are in.

   c. Beginning with the key which is furthest from the "D1" keys, rotate each one in turn, working your way back toward the "D1" keys. When the end of a row of keys is reached, go to the key directly above it and proceed back in the opposite direction. When all of the keys have been rotated in turn until you have worked all the way back to the "D1" keys, rotate them also and withdraw them from their slots. Take the "D1" keys to the "high voltage/grounding switches between the transformer/rectifiers (T/R) and the field heater/insulator housings. Insert a "D1" key into the available key slot and rotate to unlock the switching arm. Move the switching arm to the "high voltage" position, rotate and remove the key there to lock the switching arm in its new position. Repeat the process at the other two "high voltage/grounding switches, take the three keys "A1", "B1", and "C1" you have removed from the "high voltage/grounding switches to the precipitator control room and insert them into their respective positions at the breaker handles of the "A", "B', and "C" precipitator field control panels. When they are inserted and rotated, the breaker handles will be unlocked and can be closed.

___7. Verify that the breakers are closed for:

a. Hopper vibrator control panel.

b. Rapper panel

c. "A" T/R (field)

d. "B" T/R (field)

e. "C" T/R (field)

___8. Verify that the local switches for each of the rapper motors is in the "on" position.

___9. Verify that the local switches for each of the hopper vibrators is in the "on" position.

___10. Turn on the hopper vibrator control panel and set each of the vibrators for automatic operation.

___11. Turn on the rapper control panel. Manually initiate a rapping operation with each rapper in turn. Confirm operation locally. If all rappers have operated successfully, set them for automatic operation.

__12. Place the flyash system in service as per start-up procedure #21.

__13. Close the breaker on each of the precipitator field control panels and press the "on" button. Observe that the current and voltages begin to ramp up normally and achieve normal values.

OGDEN MARTIN SYSTEMS OF
HILLSBOROUGH, INC.

OPERATING INSTRUCTIONS: 20
DATE: NOVEMBER 10, 1994
REVISED:

SHUTTING DOWN & LOCKING OUT ELECTROSTATIC PRECIPITATOR

THIS INSTRUCTION MUST BE FOLLOWED EVERY TIME THE PRECIPITATOR HAS TO BE INSPECTED OR WORK HAS TO BE PERFORMED INSIDE.

--1. Verify that the FD AND OFA fans are off and that conditions are such that shutting off the precipitator will not cause an opacity excursion.

__2. De-energize each transformer/rectifier (T/R) set by pushing the "off" pushbutton o the T/R control panel for each of the three precipitator fields. Verify that the primary voltage, primary current, precipitator voltage and precipitator current meters all fall to zero.

__3. Open and tag-out the three feeder breakers for the T/R sets.

__4. Open and tag-out the breaker for the rapper control panel.

__5. Open and tag-out the breaker for the hopper vibrators.

__6. Open and tag-out the breaker for the hopper heaters.

__7. Open and lock-out the breaker for the screw conveyor for the precipitator in question.

__8. Open the breaker handle at the top of the "A", "B", and "C" field precipitator control panels. Rotate and remove the "A1", "B1", and "C1" keys from their slots immediately above the breaker handles. (The "A1", "B1", etc. nomenclature is only for the #1 precipitator. For #2 it is "A2", "B2", and "C2". For #3 precipitator it is "A3", "B3", and "C3".) Removal of the key locks the handles in the open position. Practice here is to additionally apply padlocks and tabs on the handles at this point in the procedure.

__9. Take the three keys to the precipitator roof. Install the "A", "B", and "C" keys in their respective slots on the "A", "B", and "C" field "High Voltage/Ground" switches located between the transformer/rectifiers and the field insulator housings. Rotate the keys to disengage the locks holding the switch handles in the "High Voltage" position. Move the handles to the "Ground" position. Rotate and remove the "D1" keys from their slots at the "Ground" end of the switch operating handles. This action locks the switches in the "Ground" position. (All three are designated "D1") All locks should be sprayed with a penetrant/lubricant such as "Blaster" on each occasion of use.

__10. Take the three "D1" keys to the key box located at the top of the precipitator stairs, insert into the "D1" slots and rotate beginning with the left-most one. This action allows you to remove the entire series of "E1" keys in the keybox. The "E1" keys install in the locking mechanisms found at all of the precipitator openings. Install the "E1" keys at each of the openings, rotate to unlock, withdraw the captured piece at the end of the restraining chain, then open the door.

__11. At the openings giving access to the bottom end of the precipitator fields, there are found wooden handled hooks equipped with grounding cables. Examine the hooks for any problems with the grounding cables or connections. If no problems are found, hang the hooks on the structure of the high voltage fields inside of the doors. (It is essential that these hooks provide a sound grounding path. If any problem is seen with the cables or connection, they must be corrected before personnel enter.) (These doors have external covers which do not involve locks. Remove the covers to gain access to the inner doors which are locked.)

__12. Do a preliminary inspection of the inside of the precipitator through the open doorways to check for any apparent hazards to the entry of personnel. If none are seen, test the interior for the presence of normal atmospheric levels of oxygen, for the absence of explosive gasses and for acceptable levels of heat for human occupation.

__13. If the hopper doors are to be opened, be certain to inspect from above on the inside to assure that no accumulations of ash exist in the hopper which might pose a hazard to persons opening the hopper doors. **NOTE: IN ADDITION TO THE OUTER DOORS WHICH OPEN OUTWARD, THE HOPPER DOORS ARE EQUIPPED WITH INNER DOORS WHICH OPEN INWARD. THESE ARE AN IMPORTANT SAFETY FEATURE BECAUSE THEY PREVENT PERSONS OPENING THE HOPPER DOORS FROM BEING EXPOSED TO THE POTENTIALLY FATAL CIRCUMSTANCE OF BEING ENGULFED IN AN AVALANCHE OF HOT ASH WHILE OPENING THE OUTWARD OPENING OUTER DOORS. WHEN CLOSING THE PRECIPITATOR AT THE CONCLUSION OF WORK INSIDE YOU MUST BE SURE THAT THE INNER DOORS ARE CLOSED. THE IMPORTANCE OF THIS CANNOT BE OVERSTATED.**

__14. If the conditions inside of the precipitator are found to be satisfactory according to the above inspections and tests, issue a confined space entry permit for the work to be done inside.

__15. The precipitator is now ready to be entered and worked upon.

4. MWC UNIT STARTUP, SHUTDOWN, AND MALFUNCTION PROCEDURES

4.1 MWC UNIT STARTUP PROCEDURES

4.1.1 COMBUSTION UNIT STARTUP

INTRODUCTION
This procedure covers the startup of one unit consisting of the boiler/stoker and its auxiliaries as well as all associated air pollution control equipment. The procedure assumes that other units are already in normal operation and all plant systems that are common to all units are also operating in a normal manner.

VERIFY THAT ALL SAFETY CLEARANCES HAVE BEEN PROPERLY RELEASED BEFORE PREPARING THE UNIT FOR SERVICE.

1. Verify that the electrostatic precipitator insulating compartment and ash hopper heating systems are energized and have operated properly for approximately 4 hours before boiler start-up.

2. Verify that the feedchute, feed rams, feed table, grate surface, clinker roller, ash discharger, riddlings hoppers, riddlings chutes and boiler fans are clear of personnel, tools and debris.

3. Verify that all ductwork and hoppers for the electrostatic precipitator, economizer, superheaters and boiler section are clear, secured, and ready for service and all doors are bolted shut.

4. Verify that overfire air nozzles in the front and rear furnace walls are clear of slag and ready for service.

5. Verify that the feedchute and transition piece water-jackets are at normal level and ready for service.

6. Verify that all feeder area cover plates are latched shut.

7. Check that all access doors in the feeder riddling hoppers and ducts are closed and latched.

8. Verify that the stoker central greasing system is ready for service. Start system and verify satisfactory operation.

9. Verify that residue and flyash handling systems are ready for service and all ash hoppers and flapgates are clear.

10. Verify power to the Martin control board.

11. Verify power to the boiler instrumentation boards in control room.

12. Verify proper ash discharger water levels and check setting of the level probe. NORMAL WATER LEVEL IS 18 INCHES BELOW THE UPPER EDGE OF THE ASH DISCHARGER RESERVOIR.

13. Inspect the stoker hydraulic system and verify availability for service. Check reservoir oil level and that cooling water is lined up properly.

14. Start one stoker hydraulic pump, check the system and verify:

    - System pressure is 1460 psig.
    - Feedchute damper operation (opens and re-closes).
    - Feedrams operation from the local pushbuttons.
    - Grates operation from the local pushbuttons.
    - Clinker rollers operation (Non-Interlocked position)
    - Ash Dischargers operation (Non-Interlocked position)

15. Allow the hydraulic pump to run for approximately 3 minutes. Shutdown #1 pump and start #2 pump. Check for proper operation of the pump and system pressure of 1460 psig. Shutdown #2 pump, repeat test for #3 pump and shutdown.

16. Verify line up of riddlings supply air to the Martin hydraulic cabinet and inside of the Martin hydraulic cabinet.

17. Check condition of the seal air filters and verify dampers are open.

18. Open all steam side vents and drains. Open economizer vents.

19. We desire to avoid placing thermal stress on the boiler and at times also desire to avoid heating the evaporator flue section of the boiler (where workmen are usually doing the final phases of tube shield replacement (annual outages) during the re-filling of the boiler). Accordingly, fill the boiler with cool water as follows:

    (Water temperature must be 80 degrees Fahrenheit minimum if a hydrostatic test is to be done.)

    a. Verify that the boiler's common drain valve at the boiler drain tank is closed and that both sootblower header drains, and superheater sootblower header drains are closed.

    b. Rig a clean firehose from the source fitting and valve on the condensate pump header to the atmospheric valve on the boiler drain header above the common drain isolation valve at the drain tank.

c. Open all water wall drains and economizer drains.

d. Open the valves at both ends of the firehose and place the second condensate transfer pump in service.

e. Fill the boiler until a level is established sufficient to produce one lighted L.E.D. on the control room L.E.D. boiler drum indicator. Stop the filling process by closing all boiler water side drains.

f. Close the economizer vents when liquid water begins to be vented from them.

g. If the boiler is to be hydrostatic tested, this filling process is continued until water is seen coming out of the steam side vents. See appendix 'A' for procedure for boiler hydrostatic test.

h. Shut off the second condensate transfer pump, isolate the valves at both ends of the fire hose, drain pressure from hose and disconnect. Close the economizer drains. Open the common drain header valve at the drain tank. Re-open the sootblower drains, provided the drum is filled to a normal starting level.

20. If there exists no consideration for why the boiler cannot be re-filled with hot water, the boiler may be filled much more rapidly using the boiler feed water pump and the feedwater regulator valve. If the boiler is to be filled by this method, proceed as follows:

a. Verify that the water side drains are closed.

b. Verify that the economizer drains are closed.

c. If the economizer has been drained, verify that the economizer vents are open.

d. Verify that the economizer inlet valve is open.

e. Verify that the feedwater regulator valve is in manual control and closed.

f. Verify that the feedwater regulator isolation valves are open.

g. Begin filling the boiler through the feedwater regulator while keeping is under manual control.

h. If the economizer has been drained and the vents are open, close the vents when liquid water begins to be blown from them.

i. When the economizer vents are closed, the fill rate of the boiler may be raised to the highest rate sustainable by the supply from the Deaerator and the limitations imposed by the water requirements of the operating boilers and the pumping capacity of the boiler feed water pump, experience has shown this rate to be approximately (60K pph). To help sustain the level in the D.A., place the second condensate transfer pump in service and by-pass the D.A. level control valve and the blow-down pre-heater. (The hot side of the blow-down pre-heater <u>must</u> be isolated before by-passing the cold side.)

These "helping" steps must be reversed when the boiler fill is complete.

21. Place Furnace Pressure Controller in "Manual" and verify that the I.D. fan damper is ready for service.

22. Start the Induced Draft Fan, inspect and verify satisfactory operation.

23. Place the furnace pressure controller in "Auto" and set to hold -0.5"WG.

24. Place Underfire Air Pressure Controller in "Manual" and verify 100% closed.

25. Place the Overfire Air Pressure Controller in "Manual" and verify 100% closed.

NOTE: The (AO) which precedes the instructions for the following tests designates that the test is only done following <u>annual outages</u> unless a specific need has arisen to test them at other times.

(AO). Start F.D. & OFA fans, check low level trips by blowing down the drum electrode column, fans should trip.

(AO). Re-start the F.D. and OFA fans, check the magnetrol trip by isolating the lower leg of the electrode column to prevent its operation, then drain the boiler past the -6" below normal operating level mark. The F.D. and OFA fans should trip. Open lower isolation valve on the electrode column and re-establish boiler drum level to one L.E.D.

(AO). Check low low furnace pressure I.D. fan trip by applying low suction pressure to the lo-lo furnace draft trip switch (PSL-1552). The I.D. fan should trip at -6 inches WG.

Note: For accuracy to be obtained, this test and the one following must be performed by an I&E technician. These tests are normally part of the I&E outage routine.

(AO). <u>Check hi-hi furnace draft trip</u> at +6 inches WG, apply pressure to the hi-hi pressure switch PSH-1551. The F.D. and the OFA fans should trip.

(AO). <u>Check OFA fan vibration trip</u> by dialing down the trip setpoint until the fan trips.

Compare to design trip of 4.77 Mils. Reset to original position.

(AO). Check FD fan vibration trip by dialing down the trip setpoint until the fan trips. Compare to design trip of 7.16 Mils. Reset to original position.

(AO). Check ID fan vibration trip by dialing down the trip setpoint until the fan trips. Compare to design trip of 9 Mils. Reset to original position.

26. Place the furnace pressure controller in "Manual". Start the I.D. fan and verify satisfactory operation.

27. Place furnace pressure controller in "Auto" and set furnace pressure for -0.3"WG.

28. Verify stoker controls are as follows:

    a. Feeders all locally in "Hand" with rams all the way into the boiler. (Rams protect feedtable for initial refuse charging.)
        - (Speed @ 10%)
        - (Stroke @ 18cm)

    b. Grates all individual switches "ON" & Interlocked
        - Main Switch "Off"
        - Speed 10%-15%

    c. Optimizing Controller
        - "OFF"
        - Run Time: Set for 75%
        - Integration Time: Set on short cycle

    d. Martin Combustion Controller (Fuel)
        - Set Point: 0%
        - Furnace Temperature

    e. Martin Combustion Controller (Air)
        - Step 0
        - "Manual"

    f. UFA zone dampers (all)
        - "Auto"
        - (under common manual control with the combustion controller in furnace temperature control)

29. Verify that the by-pass condenser is set up for service.

30. Start the flyash handling equipment. Verify proper operation

31. Verify that the boiler main steam isolation valve is closed and that the 4" valve to the by-pass condenser is 2 rounds open. Verify that the steam header gate valve and non-return valves are open.

    - Place electrostatic precipitator in service. (Procedure #2) Inform crane operator to prepare to charge boiler with refuse.

    - The initial several charges of refuse should be selected for apparent dryness and good burning qualities.

32. Verify proper alignment and start two stoker hydraulic pumps and verify satisfactory operation.

33. Open the feedchute damper. Have crane operator charge feed chute. Log the time down to use later for boiler availability calculations.

34. Locally stroke feed rams to push refuse to feed table edge, use a single stroke of 800 mm. Light off at the feed table with a torch. The initial temperature rise in the furnace should be held below 500 degrees F.

35. Verify that the Underfire Air Pressure Controller is in "Manual " and start the F.D. fan. Verify satisfactory operation.

36. Manually bring UFA pressure up to 6"WG discharge pressure and hold until the fire is well caught and the initial temperature rise has passed peak. Hold the rise to less than 500 F if possible.

37. Verify OFA Pressure Controller is in "Manual" and start the OFA fan . Verify satisfactory operation.

38. Manually bring OFA pressure up to 18 inches as specified for initial starting conditions. Keep all settings as per the Martin settings chart throughout the start-up sequence. See appendix 'B' for a copy of the chart.

39. Start the following equipment:

    - Central Greasing system
    - Riddling Discharge system
    - Clinker rollers - 30% speed (Interlocked)
    - Ash dischargers - 30% speed (Interlocked)

40. Switch the grate's main switch to "ON" and interlocked.

41. Adjust the Martin Combustion Controller (Fuel) setpoint approximately 2.5% above actual gas temperature. Verify that the grates start.

42. Place the feeders' local switches back into auto. Set feeder speed to 10%. Set feeder stroke length to 15cm. Verify all feeder individual switches are "ON" and interlocked.

43. Switch the feeders main switch to "ON", verify operation and satisfactory burning across feeders.

44. Allow the feeders to make two strokes, then switch off until temperature rise in the furnace passes peak, then switch back on. Monitor and control the extent of the temperature rise.

45. Switch the optimizing controller to speed/stroke control.

46. In accordance with the Martin Boiler Start-up curve, slowly increase firing rate to achieve a constant ramp rate of no more than 10°F/minute - see appendix 'C'.

47. As temperature/pressure increases, the drum level will increase. Control swelling by blowing down at drum drains.

48. Place boiler's feedwater regulator valve in "Manual" and close it.

49. Line up boiler feedwater regulator valve with its inlet and outlet isolation valves. Verify its bypass valve is closed. If leak through is experienced, close the economizer inlet valve.

50. Ensure superheater attemperator trip valve is closed and its isolation valve is open.

51. Open the economizer inlet isolation valve when drum level make-up is needed.

52. When the drum pressure reaches 25-35 psig. Verify steam is blowing through each, then close the steam drum vent, primary superheater vent, intermediate superheater vent, the final superheater vent and drain in between main steam stop and non-return valves.

53. Check carefully the superheater inlet flue gas temperature. Temperature shall not exceed 700°F and may be increased only when the steam flow through the superheater provides sufficient cooling.

54. When the drum pressure reaches 50 psig, place the boiler chemical injection system in service.

55. When the drum pressure reaches 75 psig, close the steam drains. Superheater backpass steam drain, primary superheater steam drain, intermediate superheater steam drain, final superheater steam drain, and main steam header steam drain.

56. When the economizer inlet flue temperature reaches 450°F, water flow must be established through the economizer to avoid turning the water in its tubes to steam. This consideration is why the drum level was established at the low level of a single L.E.D. The boiler should be producing steam by this point, making way for the establishment of feedwater make-up. Use the drum drains as required to maintain a small amount of make-up in progress, but be careful not to overflow the re-use sump in the process.

57. Blow down water wall drains at 150 psig.

58. The following limits must be monitored and maintained:

    - Economizer outlet O_2 according to the Martin setting table
    - Furnace gas temperature above refractory: 1500 to 1700°F
    - Front and rear OFA dampers set such that flames never reaching above the furnace refractory. Open at 900°F.
    - UFA central plenum pressure must be 16"WG.

59. The Martin Combustion Controller (Fuel) setpoint should be increased no more than 2.5% per five minutes to allow conditions to stabilize. Keep O_2 within specifications of Martin setting table by using UFA zone dampers.

60. At 900°F open front and rear manual dampers to a normal position.

61. Increase furnace temperature 2.5% (50°F) every five minutes to 1,000°F. After each increase, wait for actual temperature to catch up before making the next increase. Hold @ 1,000-1,100 for boiler to warm up & pressure to build.

62. Use the steam header local pressure gauge and the 4" valve to the by-pass condenser to regulate the steam header pressure according to the Martin firing curve specifications.

63. When the steam header pressure is nearly up to normal value and has attained a temperature of at least 650°F, and the boiler is producing at least 40K lbs of steam per hour, place the boiler on line by restricting the flow through the 4" line to the by-pass condenser to cause the steam header pressure to slowly rise (**Caution: Do not shut off. Superheater tubes require flow for cooling**). As the steam pressure crosses just above the pressure of the other boiler (s) already on the main header, crack open the 12" main steam isolation valve for the boiler coming on line. If a slight rise in megawatt production is seen, finish opening the 12" valve, then slowly close off the 4" valve to the by-pass condenser, regulating the rate of closure to achieve the generator manufacturer's specified rate of generator loading. (1.16 MW per minute)

64. If when cracking open the 12" valve, a drop in megawatt production is seen, then the oncoming boiler is not yet quite up to required pressure to push out onto the main steam header.

65. When boiler is fully on line and the 4" valve to the by-pass condenser is closed, set the by-pass condenser back up for normal stand-by.

APPENDIX "A"

OGDEN MARTIN SYSTEMS OF
HILLSBOROUGH, INC.

OPERATING INSTRUCTIONS: 28
DATE:NOVEMBER 14,1994
REVISED:

BOILER HYDROSTATIC TEST

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1. Preliminary considerations for performing a hydrostatic test on a boiler.

   a. water used to fill the boiler must be within 75 degrees fahrenheit of the temperature of the boiler drum metal, and at least 80 degrees fahrenheit minimum.

   b. Maximum pressure to be exerted on the boiler is 500-550 psig.

   c. Boiler drum metal temperature must be 70 degrees fahrenheit minimum.

   d. Raising or lowering of boiler pressure during hydrostatic testing shall proceed no faster than 50 psig per minute.

   e. Boiler pressure is to be monitored at the drum pressure gauge, and it must be known to be in calibration.

2. Fill the boiler with water as follows:

   a. Verify that the boiler and superheater atmospheric vents are open and that the steam header gate and non-return valves are tightly closed.

   b. verify that the boiler's common drain valve at the boiler drain tank is closed and that both sootblower drains are closed.

   c. Rig a clean firehose from the source fitting and valve on the condensate pump header to the atmospheric valve on the boiler drain header above the common drain isolation valve at the drain tank.

   d. open all water wall drains and economizer drains.

   e. Open the valves at both ends of the firehose and place the second condensate transfer pump in service.

   g. Fill the boiler and economizer until water is seen coming out of the atmospheric vents. Close off in turn each of the vents as water begins to come out of them until all are closed. As the boiler is filling, make periodic visual checks inside of the boiler to detect early leaks should any be present.

APPENDIX "A"

3. Close all of the boiler waterside drains, shut off the second condensate transfer pump, isolate the source valve for the fill hose, and open the boiler drain valve to the drain tank.

4. Shut off the destination valve for the fill hose and disconnect the fill hose.

5. Line up one of the superheater attemperation valves and slowly add water to the boiler, being careful to not raise the boiler pressure faster than 50 psi per minute and not higher than 550 psig.

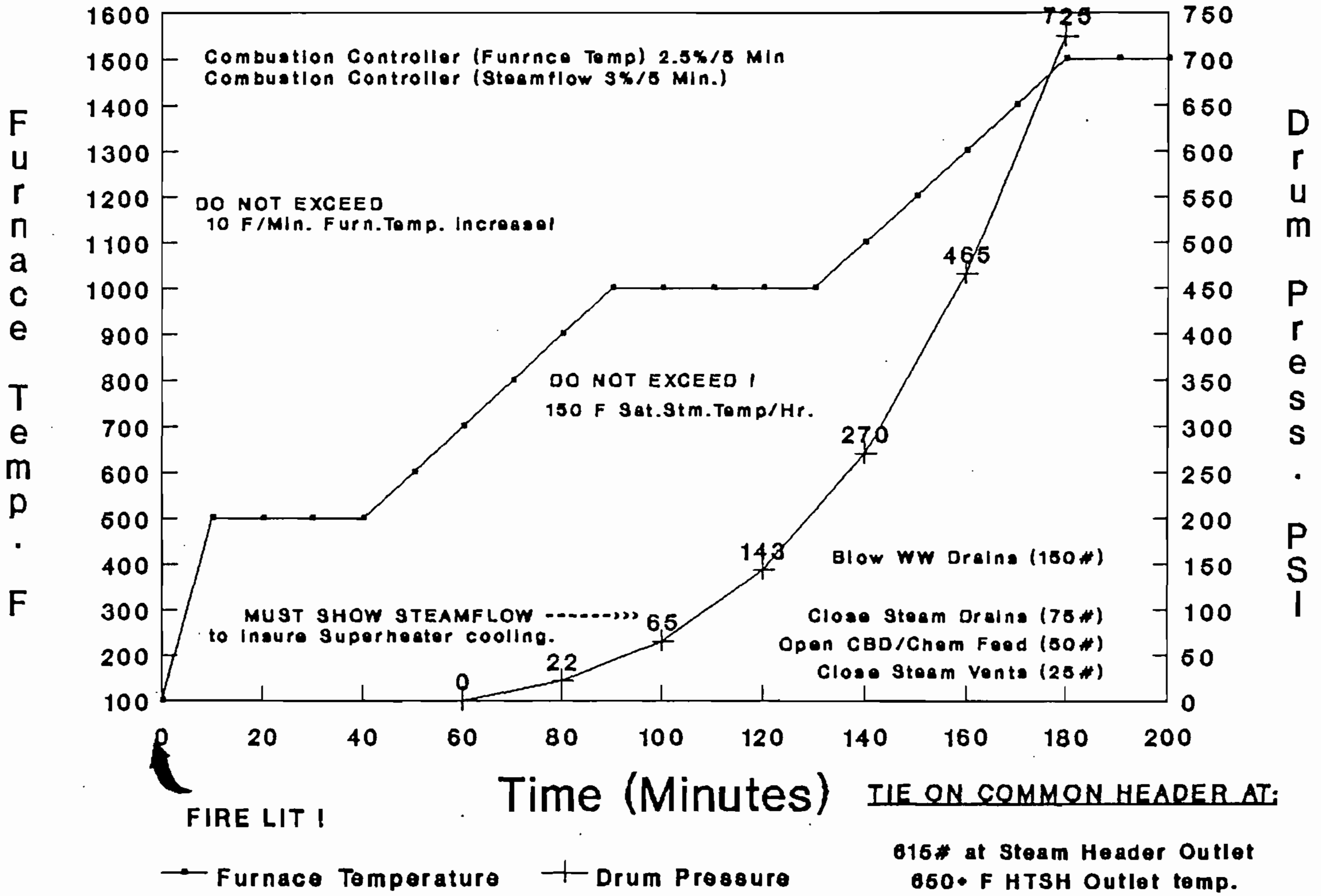
6. When test pressure is reached, isolate the attemperation water.

7. Visually check the interior of the boiler for leaks and record the amount of pressure deterioration during the fifteen minutes following the isolation of the attemperation water.

8. Provided that leaks are not found, drain the boiler to a normal firing level and open the steam side drains and vents.

APPENDIX C

Start up Curve



TIE ON COMMON HEADER AT:

615# at Steam Header Outlet
650• F HTSH Outlet temp.
40K• Steamflow

Revision 10-03-95, R.P.Kilgore
Approved by Facility Manager JLB
J.P.Burbridge

4.1.2 COMBUSTION UNIT HOT RESTART

INTRODUCTION
This procedure covers the hot restart of one unit consisting of the boiler and its auxiliaries as well as all associated air pollution control equipment. The procedure assumes that plant systems which are common to all units are already operating in a normal manner.

VERIFY THAT ALL SAFETY CLEARANCES HAVE BEEN PROPERLY RELEASED BEFORE PREPARING THE UNIT FOR SERVICE.

1. Verify power to the MARTIN control panel.

2. Verify power to unit instrumentation in control room, and electrostatic precipitator insulating compartment and ash hopper heating systems are energized and operating properly.

3. Verify water level in ash discharger and check setting of float valve.

4. Record Stoker Operating Hours in the control room.

5. Close the Superheater Attemperator stop valves.

6. Open main steam drains to maintain sufficient flow through superheaters.

7. Verify stoker controls are as follows:
   - Feeders (all)- "ON"
     - Interlock "OFF"
     - Speed 10% - 15%
     - Stroke 18cm
   - Grates (all)- "ON"
     - Interlock "OFF"
     - Speed 10% - 15%
   - Optimizing Controller - "OFF"
     - Running Time 75%
   - Combustion Controller - Setpoint 0%
     - Furnace Temperature
   - UFA Damper Controllers - "MANUAL"
     - Opening Step 1
   - UFA Dampers (all) - "AUTO"
   - OFA Dampers closed.
   - Riddling Flaps - Long (off)

8. Start stoker hydraulic pump. Verify satisfactory operation.

9. Start the Induced Draft Fan. Verify satisfactory operation.

10. Place ID Fan damper control on "AUTO" and set furnace pressure for -0.5 inches WG.

11. Set the Forced Draft Fan dampers to "Manual" and close them.

12. Start the Forced Draft Fan. Verify satisfactory operation.

13. Place FD Fan inlet damper control on AUTO and set fan discharge pressure for 16 inches WG.

14. Start the Overfire Air Fan. Verify satisfactory operation.

15. Start the following equipment:

    - Stoker Grease Pump
    - Ash Discharger - 40% speed (interlocked)
    - Clinker Roller - 10-20% speed (interlocked)
    - Riddling Flaps - Long cycle

16. Set Underfire Air dampers on "AUTO".

17. Set the Grate to "ON" and interlocked.

18. Adjust the Fuel Controller set point approximately 2.5% above the actual flue gas temperature. Verify the grates start.

19. Set the Feeders to "ON" and interlocked. Verify satisfactory burning across the feeder.

20. Check burning conditions on the grate and if satisfactory, open the front and rear Overfire Air dampers to maintain 8 inches WG.

21. Observe the fire development on the grate. In the event of a poor fire, periodically stop the feeders and grates. This will allow a smooth fire to develop on the grates before being covered by new, wet refuse. During this phase, it is absolutely necessary to observe the refuse feed and fire development continuously. On the basis of these observations manually adjust, as necessary, the feed and grate speeds as well as the Underfire Air damper openings.

22. When steam flow is sufficient, 40K, open superheater Attemperator stop valves and adjust the final Attemperator set point to 750°F.

23. When the refuse fire is stable and furnace temperature reaches 900°F, open the front and lower rear Overfire Air dampers to 18 inches WG.

24. Partly close the main steam drains when a steady flow of dry steam occurs at each. Leave sufficiently cracked to ensure some flow through the superheater.

25. As necessary, adjust Fuel Controller set point to achieve 750° superheat outlet temperature and 615 psig. Be sure to continuously maintain at least 1000 to 1100°F furnace roof temperature. NOTE with this valving arrangement the boiler will tie on to the common steam header when sufficient pressure is present. YOU MUST MAKE A MINIMUM OF 700°F. BEFORE THIS TIE ON.

26. Slowly increase the Fuel Controller set point and verify increasing main steam flow and generator load. Monitor boiler pressure, main steam temperature and furnace gas temperatures.

27. When all conditions are stable switch the Fuel Controller to "STEAM FLOW" and adjust the set point to current steam flow, steam flow should be at least 47%. This corresponds to a steam flow of 56,400 lbs/hr, the minimum operating steam flow.

28. Gradually increase the boiler output to the desired level by increasing the Fuel Controller setpoint in steps, approximately 3% every 5 minutes. Stoker setting table should be referred to for the different steam output.

29. The following conditions should be monitored and maintained:

    - Economizer outlet 0_2 - 8.0% to 9.5%.
    - Furnace roof temperature - 1550°F maximum.
    - Underfire air pressure in plenum must be 16 inches WG at all times.

30. Increase boiler load utilizing settings in accordance with the Stoker Settings Table.

31. Turn on the Optimizing Controller.

    - Select the appropriate underfire air flow for the actual steam flow.
    - Front and rear overfire air dampers must be set such that flames never reach above the furnace refractory.
    - Set the Fuel Controller to 0_2 and the setpoint to 8% (40% on the Controller).

4.2 MWC UNIT SHUTDOWN PROCEDURES

4.2.1 COMBUSTION UNIT SHUTDOWN

INTRODUCTION
This procedure covers the shutdown of one unit consisting of the boiler/stoker and its auxiliaries as well as all associated air pollution control equipment. The procedure assumes the second unit will remain in normal operation and all plant systems that are common to both units will continue operating in a normal manner.

1. Discontinue feeding refuse to the feed chute hopper.

2. Remove the underfire air preheater from service.

3. When refuse in feedchute drops low enough, close the feedchute damper and note the time.

4. When the furnace temperature begins to fall, switch from O_2 control to steam flow control.

5. When steam flow has dropped below 40,000 lbs/hr:

   - Turn off the Optimizing Controller.
   - Set Feeder speed to 50%.
   - Set Feeder stroke to 50cm.

NOTE: **MAKE SURE YOU HAVE ENOUGH STEAM FLOW FOR SUPERHEATER COOLING AS LONG AS THE SUPERHEATER INLET FLUE GAS TEMPERATURE IS ABOVE 700° F.**

6. As the steam flow continues to decrease, increase feeder stroke length 30cm every 3 minutes until 126cm is reached.

7. Isolate and vent the air cannon, raise the furnace draft to -.7 inches (stay within amperage limitation of I.D. fan) and commence clearing the bull nose at the sixth level using air lances. Persons performing this work must wear proper protective gear, including HEPA filters, face shields, firemans' jacket and gloves. All hardened ash accumulations must be removed from the bullnose and screen tubes. If work is to be done in the downstream side of the flue pass, the concave side of the bullnose must be cleaned also.

8. Approximately 10 minutes or 3-4 strokes after the feeder stroke length reaches 126cm verify the feedtable is empty. If so, turn feeders main switch off, set feeder stroke length to 18cm and speed to 10%. Verify that the feeders return to the extended zero mm setting.

9. If the nature of the work to be done so dictates, clean the convection hopper. Wash from the open manways at the 6th level with a large washdown hose equipped with a suicide nozzle which has been fitted with a ball-type shut-off valve. The washing strategy must be to wash through the bottom of the hopper and down through the chute and to constantly enlarge the hole in the ash.

CAUTION! Water embedded into thick hot ash will flash to steam causing blow-back! Wash <u>only</u> at the edges of the hole being washed through! Should it prove necessary to wash through the convection hopper door from the outside, <u>always</u> stand to one side of the door because of the danger of blow-back! Wear appropriate safety gear!

10. When steam from the boiler drops below 650° F or below 10 K per hour, isolate the main steam isolation valve and route the remaining steam to the by-pass condenser through the 4" by-pass line. Regulate the 4" by-pass valve to control the rate of decreasing drum steam pressure to 260 psig at the end of 1 hour (17.33% on control board), 62 psig at the end of 2 hours (4.13% on control board), 0 psig at the end of 3 hours. This limits the rate of temperature decline of the boiler water to 100° F **saturated steam** temperature per hour.

11. When the superheater inlet flue gas temperature drops below 700° F, isolate feedwater to the attemperators.

12. When the refuse on the grate is mostly burned out:

    a. Set ash discharger at 100%. (non-interlocked)
    b. Set grate speed at 100%. (non-interlocked)
    c. Set clinker roller at 100%. (non-interlocked)
    d. Set underfire air steps and fan pressure at maximum with consideration to UFA fan maximum amps.
    e. Isolate water make-up to ash discharger.

    The objective is to force cool the boiler with the extra air and to run all possible ash off of the grates.

13. Secure the boiler continuous blowdown.

14. Secure chemical injection pumps for this boiler.

15. When boiler pressure reaches 35 psig, open steam drum and superheater vents.

16. Secure feedwater to boiler.

17. When the boiler has ceased producing steam, lock out the steam header, boiler drain tank isolation valve, superheater attemperation water, sootblower drains, and the feedwater supply.

18. When the drum pressure reaches 25 psig, begin draining the boiler as rapidly as the capacity of the boiler room sump pumps will allow. Be careful to not overflow the re-use sump. In some cases, like outages for broken grate bars, it may not be necessary to drain the entire boiler, but only those walls close to where the work is to be done. Draining is usually done to reduce the heat for maintenance workers going inside of the boiler.

19. Thirty to forty minutes later (or after the unit has sufficiently cooled for entry, do three riddlings sequences, shutdown and lockout the UFA and OFA fans and stoker hydraulic cylinders, first positioning the grate cylinders in the mid-travel position.

20. Shut off the flyash system and the central greasing system. Unless the nature of the work to be done dictates otherwise, leave one hydraulic pump running and lined up to both headers to enable maintenance to move temporarily released cylinders as required.

21. Turn grates main switch off and set grate speed to 10% - 15%.

22. Set Martin Combustion Controller (Fuel) and Combustion Controller (Air) setpoints to 0%.

23. Reduce OFA fan controller to 0" WG

24. Turn the riddling system off.

25. Adjust UFA zone dampers to 20%. Reduce Underfire Air Pressure Controller set point to "0" WG.

26. Shutdown:

- ♦ Clinker Rollers
- ♦ Ash Dischargers
- ♦ Central Greasing System

27. Open the round doors above the feedrams and do a preliminary safety check, looking for dangerous clinker formation.

28. Open the Martin door, install the bridge, and do a check for the presence of explosive gas, for oxygen content and test for ambient heat stress.

29 Provided the above conditions are satisfactory, issue a boiler entry permit (safety procedure #16) Move a crew inside to scale the walls and sweep the grates. All personnel engaged in this task must use protective clothing (tyvek suits) and supplied air hoods. Workers employed in this task must also be instructed to always work on wall clinkers standing in positions where the clinker cannot fall on them. An experienced Ogden employee must be assigned to supervise the work crew to ensure that these rules are adhered to.

30. Open boiler drum and flue system bolted doors when and if required.

31. Shut down and lock out the precipitators, this cannot be done till cleaning of the furnace is complete, and ID fan when and if required.

4.3 MWC UNIT MALFUNCTION PROCEDURES

4.3.1 PLANT BLACKOUT

This procedure covers the action to be taken in the even of a total loss of ac power in the Facility.

1. Verify all personnel are accounted for:
   All shift operators should assemble in the Control Room or report in via radio.
   All Administration personnel should report to the southernmost parking lot area.
   All Maintenance personnel should report to the southernmost parking lot area. Except that one will be assigned, by the Maint. Supervisor, to inspect and insure the firepump is in "READY" status should there be a need.

2. Assign Auxiliary Engineers to inspect the plant to verify the site is clear of all personnel, visitors, temporary help, etc.. The Auxiliary Engineers will also inspect for damage, fire or other potential hazards.

3. Notify the (power system) Load Dispatcher and Facility Manager of the blackout condition and any known causes.

4. Verify the satisfactory trip/shutdown of the plant equipment including:
   - Turbine/generator Emergency Lube Pump is in operation and T/G unit is in coastdown.
   - Boiler drum level and pressure control.
   - Boiler feed pump and turbine shutdown.
   - Load center feeder breakers open.
   - Main transformer circuit breakers open.
   - Generator breaker open.
   - Equipment circuit breaker open or starters dropped out as appropriate.
   - ID fan inlet dampers open.

5. Inspect transformer, line and generator protective relays for trip-target indication. Log all findings, but do not reset any trip-targets until directed to do so by the Shift Supervisor or Facility Manager.

6. Upon completion of the above steps, when outside power is available and if the Main Transformer and associated switchgear is found to be in satisfactory condition for service, after notifying the (power system) Load Dispatcher, energize the transformer.

7. Verify satisfactory operation of the Main Transformer and commence energizing the Auxiliary Power Transformers and associated load centers and MCCs. In each case, verify satisfactory conditions before proceeding to the next section.

8. Inspect and verify satisfactory operation of the battery charger.

9. After inspecting and determining the readiness of each for operation, place the following equipment and systems in service:
   - Precipitators, and verify the hopper heaters are operational.
   - Turbine-generator ac lube oil pump and turning gear.
   - Cooling tower fans and circulating water pumps and associated equipment.
   - Closed Cooling Water system.
   - Air compressors and control air system.
   - Demineralized (Condensate) water transfer pumps.
   - Motor driven Boiler Feed Pump.
   - Bottom Ash transfer conveyor system.
   - Unit flyash conveyors and flap gate valves.

10. Evaluate the readiness of the units for hot restart and verify the following conditions exist in each unit:
    - Furnace roof temperature is in excess of 1200°F.
    - Precipitator in service
    - All systems in service (condensate feedwater flyash etc.).

11. If the above conditions are satisfactory, contact the Shift Supervisor or Facility Manager for authorization to proceed with hot restart of the units. Refer to Operating Procedure 4.1.2 Combustion Unit Hot Restart.

4.3.2 MARTIN STOKER SYSTEM: FEEDCHUTE PLUGS

4.3.2.1 INTRODUCTION

Refuse plugging at the feedchute throat is a common problem associated with operating the Martin Stoker System. The feedchute's design, with its inclined face giving way to the narrower feedchute, creates a bottleneck. This limits the size of material admitted to the stoker. When refuse becomes lodged in this throat, the fuel level underneath continues to fall as the feedrams push fuel onto the grates. The fuel level above the plug along the inclined face remains stationary. It is blocked from entrance to the throat by this "bridge" of refuse (Fig. 4.3.2-1, Item 1.)

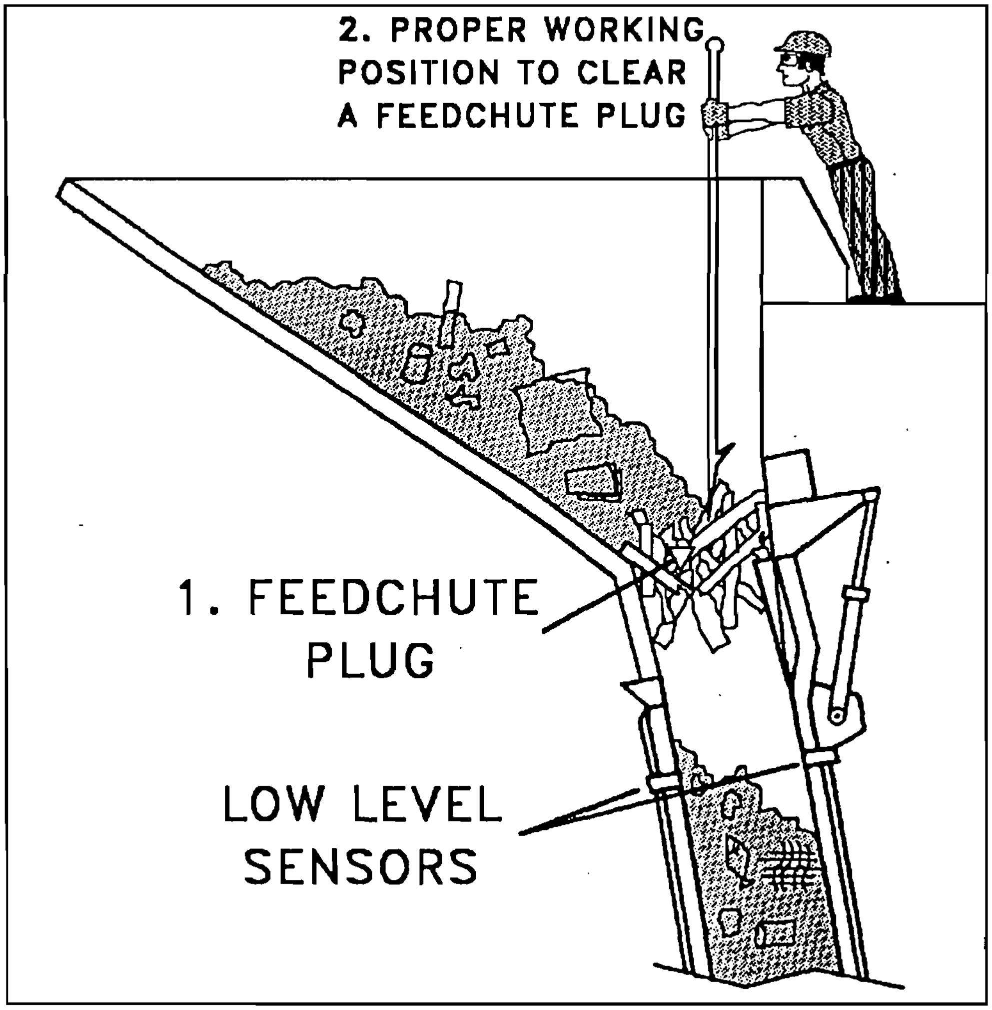


Figure 4.3.2-1: Martin Stoker System Feedchute Plug

The problems associated with feedchute plugs include:

1. Loss of proper fuel feed control to the grates. The feedrams adjust automatically to deliver a calculated amount of fuel to the grates with each forward stroke. These adjustments are made with certain assumptions, one of which is the constant weight of refuse "head" provided by a full feedchute. If this refuse head pressure suddenly decreases (as during a feedchute plug) the feedrams deliver less refuse to the grates with each forward stroke. The automatic fuel controls cannot accommodate for this great a change in refuse head. Combustion is severely impaired. Steamflow excursions are the result.

2. In extreme cases, the seal from atmosphere is lost at the stoker front. This results in loss of boiler draft control. Also, raw air is pulled through the boiler, causing loss of a reliable oxygen signal and probable emissions violations.

3. An extremely dangerous situation results when a path opens for the combustion fire to escape to atmosphere through the feedchute.

4.3.2.2 CAUSES

Feedchute plugs form in several ways. A common cause is a bulky item, such as a refrigerator, water heater, etc. accidentally loaded to the feedchute.

Material such as sheaves or bales of cardboard can also cause plugs. They tend to compress upon themselves as they descend into the feedchute throat.

Plugs also occur if too much of a certain material, such as long boards, piping, or wooden pallets, is loaded at one time. These types of material cause a "logjam" affect as they descend into the feedchute throat.

4.3.2.3 PREVENTION

The best way to avoid feedchute plugs is for an alert crane operator to observe carefully the fuel as he mixes it in the pit. Separate and reject any bulky items that will not burn or cannot be broken up. Break up and scatter items such as cardboard bales or quantities of wooden pallets, boards, and piping.

Discharge the bucket at the top of the inclined face. This allows the refuse to break up and separate as it falls down the incline.

4.3.2.4 RECOGNITION

Despite the best efforts of the crane operator, feedchute plugs will occur. Early recognition and reaction decreases the time and effort necessary to clear these plugs.

During normal operation, the refuse level steadily falls as the feedrams push the fuel onto the grates below. This makes it necessary to charge the feedchute with a fresh bucket of refuse every five to ten minutes to keep the level constant on the inclined face. If this refuse level remains stationary, it indicates a feedchute plug. Closer observation will show a bulky item lodged in the throat or the formation of a refuse bridge. A gap will open below as the feedrams continue to feed fuel. In extreme cases the feedchute low level alarm will sound. An alert operator should recognize a feedchute plug before the level falls this low.

Any time a plug is verified, or even suspected, *do not load any additional fuel.* On rare occasions the additional weight of another bucket of refuse collapses the plug. But the usual result is that the plug becomes more firmly lodged. This increases the time and effort needed to clear the plug.

4.3.2.5 CORRECTION

When a plug occurs, attack it without delay. Correct the problem using the following procedure:

1. Immediately inform the Shift Engineer of the plug's nature, location, and extent. The shift engineer must assure negative draft so flames and burning material do not blow to atmosphere if the boiler seal is lost.

2. Attack the plug without delay using the gaff poles provided. These are long poles with pointed probes and hooks on the end to ram into, or hook and pull at, the plug. Probe for the weak spot in the plug. If you can destroy the weakest area, the remainder of the "bridge" will collapse. (Fig. 4.3.2-1, Item 2.)
   In addition to the gaff pole a chain fall, mounted overhead on a beam, with a large hook is provided for lowering beneath the pluggage, hooking, then using the chain fall to pull the pluggage upward breaking a portion of the plug structure.

DANGER! NEVER LEAN OVER THE FEEDCHUTE EDGE WHILE CLEARING A PLUG. IT IS ALSO ABSOLUTELY FORBIDDEN TO CLIMB ATOP THE FEEDCHUTE EDGE WHILE THE STOKER IS OPERATING.

These actions may seem necessary to gain leverage against the plug, but the risk of falling into the feedchute is too great.

3. If the plug cannot be cleared within the first few minutes, notify the Lead Engineer and request additional help.

4. If the plug is caused by a bulky item, it may be necessary to lower grappling hooks by cables to seize the item. Attach the cables to the overhead crane and remove the item.

DANGER! IT IS ABSOLUTELY FORBIDDEN TO CLIMB INTO THE FEEDCHUTE FOR ANY REASON WHILE THE STOKER IS OPERATING.

If the plug cannot be cleared using one of, or combination of, the procedures discussed above, shut down the unit so men can enter the feedchute from above to clear the plug.

4.3.3 MARTIN STOKER SYSTEM: BROKEN GRATE BARS

4.3.3.1 INTRODUCTION

A problem that occasionally occurs while operating the Martin Stoker System is that of broken grate bars. This is when one or more of the individual grate bar castings break due to heat, stress, or concussion.

The problems associated with broken grate bars include:

1. Oversize material falls through the gap left by the broken grate bar. This causes riddlings discharge system plugs.
2. The gap left by the broken grate bar allows other grate bars on the same step to slide out of position along their common T-bar. This increases space between the grate bars of that step which increases jamming and the chance of damage to additional grate bars.
3. It upsets combustion as locally excessive air flows through the broken grate bar's gap.
4. Burning material from the fuel bed falls through the gap. This may damage the components in this area such as the grate drive beam support and guide rollers.
5. In extreme cases, the air zone beneath the broken grate bar fills with material which has fallen through the gap. This can lift entire sections of the grate system, breaking numerous grate bars and causing extensive damage to the T-bars and air zone components.

4.3.3.2 CAUSES

Concussion, heat stress, and mechanical stress cause broken grate bars.

1. Heavy material falling from above causes *concussion* damage. This includes items such as engine blocks, etc. entering the grate system from the feeders. However the main source of concussion breaks results from the clinker formation on the firebox walls. These clinkers, weighing hundreds of pounds, can crash down onto the grates causing extensive damage to many grate bars at a time.
2. Improper fuel bed height or underfire air flow cause grate bar *heat stress*. If the bed is too thick or underfire air flow is insufficient, too much heat remains at the grate surface. Too thin a bed reduces the cushion that protects the grate bars from concussion damage discussed above.
3. Bolts, ball bearings, and other small, solid material can lodge between grate bars despite the grate's self-cleaning action. Over time, this can bind the grate bars and cause breakage due to *mechanical stress*.

4.3.3.3 PREVENTION

Proper operation of the stoker system reduces broken grate bars. Proper furnace temperature and combustion air flow reduces firebox wall clinker formation. This reduces the chance of heavy clinkers crashing down to cause concussion damage.

The crane operator can also reduce concussion damage by rejecting heavy, incombustible material from the fuel stream.

In addition, proper fuel bed height assures a cushion against this concussion damage. It also maintains grate surface temperatures within range to avoid heat stress.

Reduce mechanical stress due to grate bar jamming by proper maintenance during stoker outages. Proper grate casting tension reduces the chance of small solid material becoming lodged between individual grate bars.

4.3.3.4 RECOGNITION

Despite the efforts of the plant staff, grate bar damage will occasionally occur. A broken grate bar's domino effect on surrounding grate bars is reduced or eliminated by early recognition of, and reaction to, the problem. Broken grate bars are indicated by:

1. Riddlings discharge system plugs. If material larger than 1" wide, such as tin cans, etc., fall through the grate system, the stoker has a broken grate bar.

2. Inspection of the fuel bed and flame formation will show localized high or low areas, or a locally disrupted flame pattern in the area of the break.

3. Feel the round manhole access doors on the outside of each air zone if underfire air preheat in use. The door to the air zone beneath the affected area is cooler if that zone is filled with material that has fallen through a broken grate bar gap.

DANGER! NEVER OPEN THESE DOORS DURING STOKER OPERATION. EXTREMELY HOT AIR UNDER PRESSURE AND POSSIBLY BURNING MATERIAL WILL BLOW TO ATMOSPHERE CAUSING SEVERE BURNS.

4. In extreme cases, material from the fuel bed fills the air zone. It can bind the grate drive beams, preventing the grates from making a full stroke. If the problem has gone this far there is probably extensive grate bar and grate support damage.

4.3.3.5 CORRECTION

The only way to repair broken grate bars is to secure the unit following the plant's normal shut-down procedure. However assure that the affected air zone does not clog completely before the unit is secured.

Do this by rodding out the air zone hopper from underneath through the riddlings discharge duct and flapgate. Do this procedure only with the immediate lead engineer's direct permission and/or supervision. Work with a U-shaped bar (bent re-bar works well) and only from above the discharge duct access door (Fig. 4.3.3-1). Observe the following guidelines to prevent serious injury while performing this procedure:

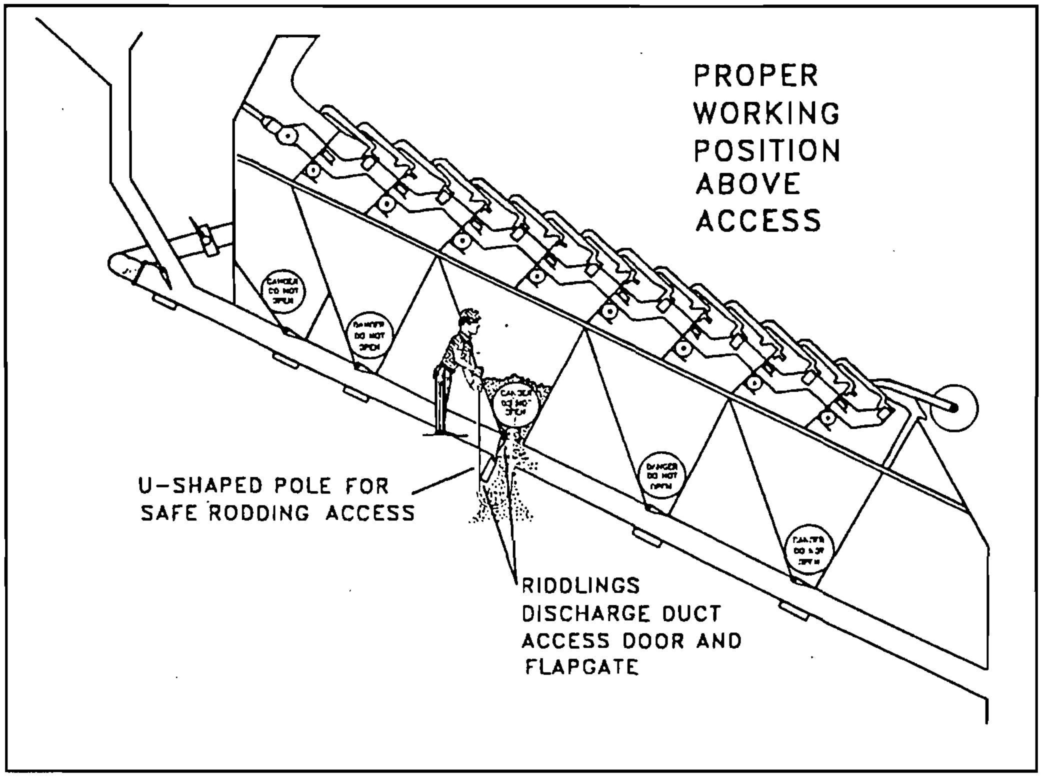


Figure 4.3.3-1: Clearing an underfire air zone

1. Rope off the area beneath the affected zone(s). This assures that falling debris will not injure anyone below. Post warning signs along this barrier. Inform everyone on the plant site to stand clear of the area.

2. Isolate compressed air to the riddlings discharge flapgates in the hydraulic distribution cabinet. This valve should be clearance tagged closed. Put the feedrams and grates in non-interlock operation during this procedure.

3. Manually initiate a riddlings discharge cycle. This bleeds any remaining air from the system so the affected riddlings flapgate(s) can be opened manually.

4. The system is now ready for safe clearing of the affected hopper. Tie the affected riddlings flapgate open. Open the access door on the bottom of the riddlings discharge duct directly underneath.

DANGER! THERE IS NOW A PATH FOR HOT COMBUSTION AIR, DEBRIS, AND POSSIBLY MOLTEN LIQUID TO BLOW TO ATMOSPHERE UNDER PRESSURE.

Minimum personnel protection includes PAPR equipment, and leather gloves. Never put the hands, feet, or any body parts beneath the riddlings discharge duct (Fig. 4.3.3-1).

5. Clear the plug with the U-shaped bar. If possible, recover any broken grate bars that may emerge to help determine the extent of damage. Once the plug is clear, return the system to normal operation. If a riddlings discharge duct plug is suspected, manually run several riddlings discharge cycles in a row. If necessary, temporarily increase underfire air pressure to a maximum of 20" during these cycles. Repeat the procedure as necessary until the unit is secured. Remember that the procedure above is only a temporary measure until the unit is secured to repair the broken grate bar(s).

4.3.4 MARTIN STOKER SYSTEM: RIDDLINGS DISCHARGE SYSTEM PLUGS

4.3.4.1 INTRODUCTION

A riddlings discharge system plug is any blockage of the system that can occur in various places. This includes the main discharge duct, individual air zone hoppers and flapgates, or the feedram drive area hopper and duct. (Fig. 4.3.4-1.)

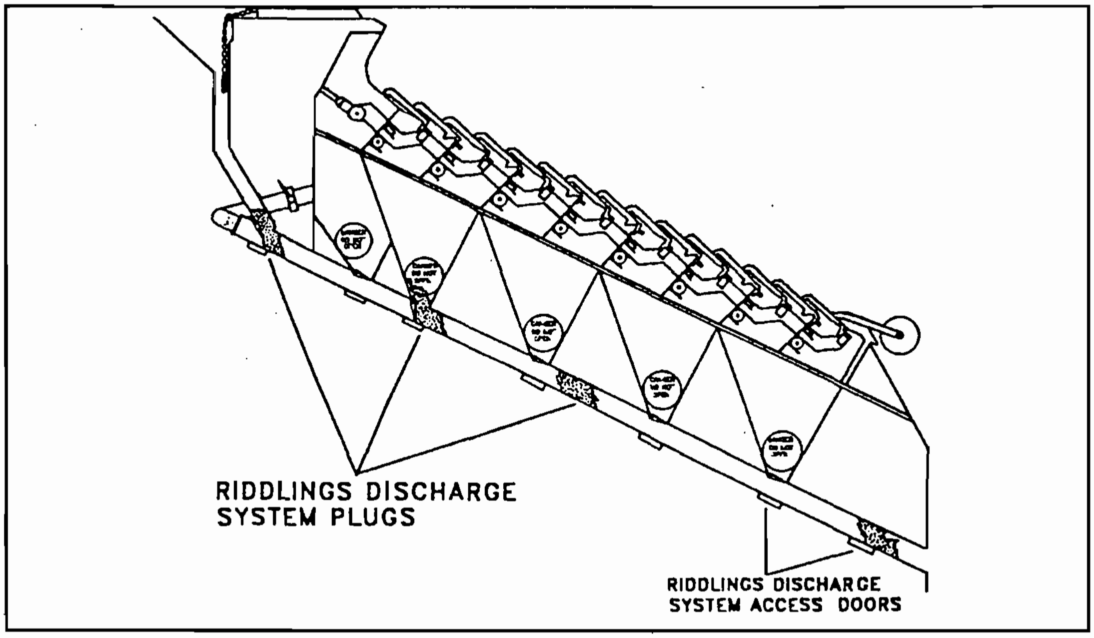


Figure 4.3.4-1: Martin Stoker Riddlings Discharge System Plugs

4.3.4.2 CAUSES

Plugging which occurs at the underfire air zone flapgates or in the discharge duct can be caused by grate bar wear. This increases the area between individual grate bars leading to excessive riddlings accumulation between cycles. Plugs in these areas also form when material that melts on the grates (aluminum, plastic, etc.), flows down through the air zones and hardens in the riddlings hoppers.

Broken grate bars can also leave gaps through which oversized material falls to plug these areas.

Feedram drive hoppers can also plug. Heavy feedram scraper wear allows excessive riddlings into this area. Plugs also form if the weighted chains riding with the feedrams have become entangled or disconnected.

Riddlings discharge plugs also occurs if water enters the system (such as spraying water into the feedchute).

4.3.4.3 PREVENTION

Reduce riddlings discharge system plugs by:

1. Never spray water into the feedchute unless an extreme emergency exists, such as live flame in the feedchute hopper which threatens to ignite the refuse pit. Even then use the water sparingly and only in a fine mist spray.

WARNING! WATER SPRAYED INTO THE FEEDCHUTE CAN CAUSE EXTENSIVE WARPING OF HOT METAL PARTS BELOW IN ADDITION TO CAUSING RIDDLINGS DISCHARGE SYSTEM PLUGS.

2. Proper maintenance during stoker outages. Replace grate bars as necessary and assure that grate step tension is correct. Replace feedram scrapers.

3. If there is excessive riddlings accumulation in any of these areas, it may be advisable to switch to the more frequent twenty minute riddlings discharge cycle.

4.3.4.4 RECOGNITION

The most obvious sign of riddlings discharge system plugs is if the flapgates do not fully close after a cycle. This situation actuates an alarm in the control room but the operator should also make visual checks once a shift and anytime in the area. Check that all flapgate cylinder rods are fully retracted between cycles. Also at least once a shift observe a riddlings discharge cycle. Any sign of flapgate binding may be evidence of a developing plug. In extreme cases, the grate drives or feedram may be unable to complete a full stroke due to riddlings accumulation.

4.3.4.5 CORRECTION

Clear these plugs using the same procedures discussed in section 4.3.3 for keeping air zones clear while securing a unit for broken grate bar repair. Follow the same preparations, cautions, and procedure after returning the system to service.

4.3.5 MARTIN STOKER SYSTEM: ASH DISCHARGER PLUGS

4.3.5.1 INTRODUCTION

Ash discharger plugs are a problem that occasionally occurs while operating the Martin Stoker System. These plugs form when a bulky item, or items, lodge in the ash discharger pit so the ram cannot make its full stroke (Fig. 4.3.5-1).

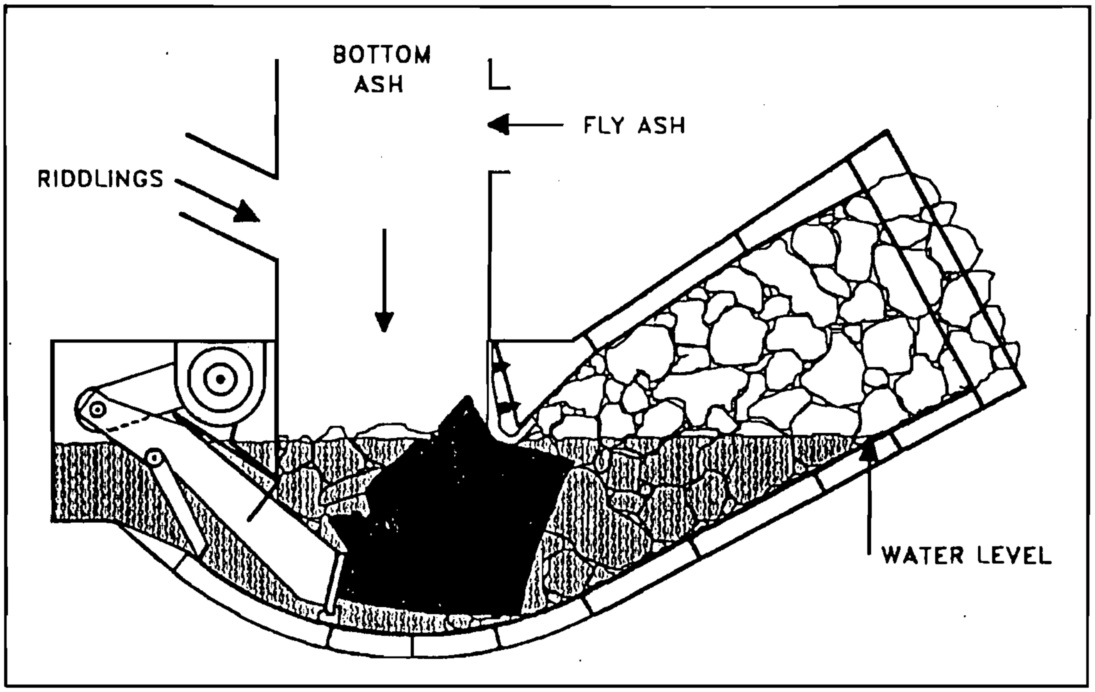


Figure 4.3.5-1: Martin Stoker System Ash Discharger Plug

4.3.5.2 CAUSES

In theory, anything that passes through the feedchute throat is small enough to clear the ash discharger. In practice, bulky items that clear through the feedchute sometimes become turned or distorted so they lodge in the ash discharger. Occasionally more than one bulky item combines to form a plug.

4.3.5.3 PREVENTION

The best way to avoid an ash discharger plug is for the crane operator to separate bulky items from the fuel stream.

4.3.5.4 RECOGNITION

The first indication of an ash discharger plug is almost always when the ash discharger kicks out of interlock due to incomplete stroke.

4.3.5.5 CORRECTION

The operator should try several things to clear the plug before shutting down the unit. They include:

1. Place the ash discharger ram in local control from the manual override box. Stroke the ram forward as far as it will travel until the plug stops it. Then back the ram off a few inches and drive it forward into the plug again. Continue this procedure as long as the plug moves forward. Once the ram achieves complete forward travel the bulky item should clear from the discharger. Return the ash discharger to automatic control and watch the discharge mouth until the item clears onto the plant's ash conveying equipment.

2. If the plug does not move as you perform these short manual strokes, or if it starts to move and then lodges again, alternate ten to twenty of these short strokes with one full retraction of the ram. This often allows smaller material lodged with the bulky item to collapse, providing enough clearance for the plug to pass.

3. If these actions do not clear the plug, attack it from above with rigid poles through the viewports in the ash discharger transition chute doors.

DANGER! THERE IS THE POSSIBILITY OF HOT ASH, RIDDLINGS, OR SCALDING WATER FROM THE ASH DISCHARGER BLOWING OR SPLASHING THROUGH THESE PORTS.

Any time the operator is trying to clear a plug through these ports he should always stand to one side. Minimum personnel protection includes leather gloves and full-coverage goggles. Try to break the plug apart or turn it with the pole. Repeat steps #1 and #2 above.

4. If these actions do not clear the plug, drain the ash discharger water to the ash settling sump. *For environmental reasons, never drain ash discharger mud and/or water directly to waste.* Draining the water often collapses the plug. Repeat steps #1 through #3 above as necessary to clear the plug.

WARNING! DRAINING THE ASH DISCHARGER WATER MAY CAUSE LOSS OF THE STOKER SEAL FROM ATMOSPHERE.

The debris and ash build-up behind the plug is normally sufficient to maintain temporarily the seal. But stay in close communication with the control room operator and be prepared to refill the discharger if indications show that the seal is failing. These indications include:

a.) Abnormal emissions increase.
b.) Dramatic increase of the excess oxygen content.
c.) Loss of boiler draft control and/or Induced Draft Fan overloading.

5. If none of these actions clear the plug, secure the unit following the plant's normal shut-down procedure.

6. Once secured, isolate the grates, clinker roll, FD Fan, OFA Fan, Air Cannon, and fly ash screw conveyers with clearance tags.

7. Open the door in the rear wall of the stoker at the clinker roll level. Clear any material that remains atop the clinker roll that could fall onto men working below.

DANGER! THERE IS THE POSSIBILITY THAT ANY REMAINING FUEL ON THE GRATES IS HOT ENOUGH TO EXPLODE AEROSOL CANS, ETC.

Minimum personnel protection includes leather gloves and full-coverage goggles. Stand to one side of the door while performing this operation.

8. Open the ash discharger transition chute doors. Assure that no material remains atop the clinker roll that could fall onto men working below.

DANGER! ASH AND DEBRIS MAY HAVE ACCUMULATED TO A POINT ABOVE THESE DOORS. STAND ABOVE AND TO ONE SIDE OF THESE DOORS WHEN OPENING.

Attack the plug as necessary. It may be necessary to shovel debris from around the plug before it can be removed, cut, or turned so it will clear the system.

9. If the plug cannot be cleared from above, it is necessary to open the lower doors in the ash discharger itself.

DANGER! WATER MAY BE TRAPPED BEHIND THE RAM. ASSURE RAM IS FULLY EXTENDED TO ALLOW DRAINAGE BEFORE OPENING DOORS.

EXTREME DANGER!

EVEN IF THE WATER HAS BEEN DRAINED, SCALDING HOT POOLS WILL REMAIN TRAPPED IN THE DEBRIS OF THE DISCHARGER. LARGE QUANTITIES OF THIS WATER WILL SPILL FROM THE DISCHARGER WHEN THE LOWER DOORS ARE OPENED. ALWAYS STAND ABOVE AND TO ONE SIDE OF THE DOORS WHEN OPENING.

Clear the plug by whatever means necessary and return the system to service.

Reference OMSH "Operating Instruction #8-87"

4.3.6 MARTIN STOKER SYSTEM: ASH DISCHARGER TRANSITION CHUTE PLUGS

4.3.6.1 INTRODUCTION

Ash discharger transition chute plugs occur when a bulky or solid item become lodged downstream of the clinker roll in the vertical chute leading to the ash discharger.

4.3.6.2 CAUSE

These plugs form when material such as bedsprings, clinkers, etc. leave the clinker roll. They can lodge in the transition chute as it narrows down to join the ash discharger. Additional material leaving the clinker roll falls onto the initial plug to lodge it more firmly in place.

4.3.6.3 PREVENTION

The best way to avoid these plugs is for the crane operator to separate bulky items from the fuel stream.

4.3.6.4 RECOGNITION

The operator will notice these plugs as he checks the fuel bed and flame formation each hour through the rear wall viewports. In extreme cases the additional debris falling onto the initial plug will build to a point even above the clinker roll level.

4.3.6.5 CORRECTION

The only way to attack these plugs without securing the unit is from below through the viewports in the ash discharger transition chute doors or from the rear wall viewports.

DANGER! THERE IS THE POSSIBILITY OF HOT ASH, RIDDLING, OR SCALDING WATER FROM THE ASH DISCHARGER BLOWING OR SPLASHING THROUGH THESE PORTS.

Any time the operator is trying to clear a plug through these ports he should:

a.) Stand to one side.
b.) Wear minimum personnel protection including leather gloves and full-coverage goggles.
c.) Try to turn, break apart, or lift the plug to redistribute its weight so it will collapse.

If this does not clear the plug, secure the unit so men can attack it from above.

4.3.7 MARTIN STOKER SYSTEM: BOILER TUBE RUPTURE

4.3.7.1 INTRODUCTION

A boiler tube rupture, or other emergency loss of water level, is not technically a Martin Stoker System problem. However the operator must understand that proper stoker operation following one of these emergencies is critical to avoid serious boiler damage. Allowing hot flue gas to flow over dry boiler tubes causes extensive heat stress damage to the unit.

4.3.7.2 CAUSES

Corrosion, overheating, and erosion cause boiler tube ruptures.

CORROSION:

1. Incorrect boiler water chemical control causes water and steam side corrosion.
2. Improper fuel combustion causes fire side corrosion when unburned gases attack tube metal.
3. Live flame on bare metal also corrodes tubes.

OVERHEATING:

1. Improper boiler water chemical control causes overheating when deposits form on the water or steam side. The deposits blanket the tube from the water or steam's cooling effect. The flue gas then causes localized hot spots.
2. Sediment accumulation causes overheating when it impairs boiler water circulation. If water does not circulate in a tube section, it flashes to steam. This blankets that section of tube from the water's cooling effect.
3. Insufficient steamflow during start-up, shut-down, and low load operation causes superheater overheating. Steam must flow in the superheater to provide tube cooling.

EROSION:

1. Excessive particulate in the flue gas cause fire side tube erosion.
2. Improperly positioned soot blow lances also cause fire side tube erosion.

4.3.7.3 PREVENTION

Control boiler water chemicals properly to avoid tube ruptures caused by corrosion or overheating at deposits. Proper chemical and drum level control also prevents tube ruptures caused by deposits when water foams or carries over to the superheater. Perform bottom blowdowns regularly to avoid sediment accumulation.

Open vents and drains as necessary to assure superheater steamflow during start-up, shut-down, and low load operation.

Proper stoker operation prevents tube ruptures caused by fire side corrosion and erosion. Proper combustion air and fuel bed height control provides maximum gas burnout and prevents excessive particulate from leaving the fuel bed. Overfire air control also prevents live flame on bare metal above the firebox.

Assure correct soot blow lance alignment at each boiler outage.

4.3.7.4 RECOGNITION

The following indicate water bearing boiler tube ruptures. Steam carrying tube ruptures give similar indications although probably not as severe. These indications include:

1. Nearly instantaneous loss of drum water level and boiler pressure.
2. Forced draft fan and overfire air fan trip due to loss of drum water level.
3. Feedwater flow increases to maximum as the controller tries to maintain drum level. This can lead to feedwater pump overloading or loss of deaerator tank level.
4. The Martin Stoker System kicks out of interlock due to loss of underfire air pressure and drum water level.
5. Steam and smoke blows from the boiler casing.
6. Flue gas temperatures downstream of the rupture rapidly decrease as steam and water enter the flue gas stream.

4.3.7.5 CORRECTION

Of course the operator must secure the unit to repair a tube rupture. Unfortunately, during an emergency such as this, the stoker system cannot immediately isolate fuel feed. A fuel bed is already established on the grates and the feedchute is loaded with refuse.

But as previously stated; allowing hot flue gas to pass over dry boiler tubes causes extensive damage to the unit. Since the water and steam's cooling effect no longer protects the tubes, the goal here is to assure as rapid a decrease in flue gas temperatures as possible.

Follow OMSH Operating Procedure #32, "Tube Rupture Procedure" (copy attached)

OGDEN MARTIN SYSTEMS OF
HILLSBOROUGH, INC.
Approved: ____________
Facility Manager

OPERATING PROCEDURE: 32
ISSUED: 12-27-88
REVISED: 09-28-95
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TUBE RUPTURE PROCEDURE

THIS PROCEDURE ASSUMES A TUBE RUPTURE HAS OCCURRED WHILE OPERATING ALL THREE UNITS AND TURBINE GENERATOR DURING ROUTINE OPERATIONS.

GOALS ARE:
- ♦ Safeguard all personnel against injury.
- ♦ Maintain Environmental Compliance Commitments.
- ♦ Remove existing fuel supply without further damage to unit components

1.0 INDICATION OF AN BOILER TUBE RUPTURE

1.1 Drum level decreasing rapidly while feedwater flow increases. In the extreme, immediate loss of drum level.

1.2 Steam pressure and steamflow of damaged boiler decreasing rapidly. In the extreme, immediate loss of steamflow and pressure.

1.3 Flue gas temperatures downstream of the leak drop sharply.

1.4 Steam and smoke blowing out of the boiler casing.

1.5 D.A. Level decreasing. Note: A low level endangers the feedwater pump and the operation of the other boilers

1.6 Low low drum level trips the U.F.A. and O.F.A. fans.

1.7 Over amping of the boiler feedwater pump.

1.8 Martin system alarms come in after the fans tripped.

2.0 Plant personnel safety:

Anyone having seen blowing steam and smoke from any of the boilers should immediately report the incident to the control room via radio communications, phone system, or personally come to the control room by using the safest path. STAY CLEAR OF THE RUPTURE SITE.

---

3 <u>In cases of and EXTREME EXTERNAL rupture:</u>

3.1 The control room operator will announce the rupture event and the boiler area affected, and sound the fire alarm. All non-essential personnel will evacuate, via the safest path, to the southernmost end of the parking lot. Reference Operating Procedure #1-87, "Fire & Medical Emergencies"

3.2 The crane operator shall remain in the crane cab and follow the instructions of Operating Procedure #1-87, "Fire & Medical Emergencies"

3.3 The operations personnel should assemble in the control room, or report their location via radio and await instructions. **ALL PERSONNEL MUST BE ACCOUNTED FOR.**

3.4 After all personnel (including visitors, maintenance, administration, and county employees) are accounted for and the situation is under control the Shift Supervisor will advise of the "safe" areas where people may return to work.

4.0 SECURING/PROTECTING THE DAMAGED UNIT IMMEDIATE RESPONSES.

4.1 Make sure U.F.A. fan, O.F.A. fan, grates and feeders have tripped with the low low drum level cut off. IF NOT, trip them.

4.2 Observe the I.D. fan amps. Go to manual damper control, as necessary, to avoid over amping.

4.3 Take manual control of the feedwater regulator. Maintain a minimum flow of 8000 pph to insure water level is maintained to at least the level of the rupture.

4.4 Observe the D.A. level and control low level by putting the emergency condensate transfer pump into service.

<u>NOTE: DO NOT IMMEDIATELY RESTART THE I.D. FAN IF IT HAS TRIPPED !</u>

Maintain a minimum draft to insure combustible gases are exhausted but, not enough to cause the remaining fuel to fire.

4.5 Monitor opacity closely, adjust draft accordingly.

5.0 SECURING/PROTECTING THE DAMAGED UNIT PREPARATION RESPONSES.

5.1 Close Martin U.F.A. distribution dampers at the Martin Control Panel, each zone in manual and reduced to 0% open.

5.2 Stop soot blowing, if in progress.

5.3 Inform the crane operator, ONLY at the specific direction of the Shift Supervisor, may he hose down (minimum use of water!) any fires which might develop in the shut down unit. Use of the feed hopper spray system may be appropriate.

5.4 Have the crane operator remove as much fuel as possible from the feed chute.

5.5 Open the bypass fill to the feedchute water jacket and transition piece a couple of turns. To insure cool cooling water for possible burn back. This will reduce the possibility of warpage during burn-back.

5.6 Remove the affected boiler from the common steam header. If still pressurized use either the 4" start up line or the steam header drains to regulate the shutdown per Operating Procedure #1. Otherwise keep all vents/drains closed to maintain slight pressure till the fuel is burned off the grates.

5.7 Isolate superheater attemperators as soon as the steam temperatures at every point of the superheaters stay at or below 650°F. with attemperators closed.

5.8 Isolate the air preheater steam coils, continuous blowdown system, and chemical feed system.

Now **wait until the sidewall temperature has decreased to 500°F.**

6.0 CLEARING FEEDCHUTE, FEEDERS AND GRATES OF STILL BURNING REFUSE

6.1 As soon as the furnace fluegas temperature has decreased to 500°F, at ALL points. And if there is a major tube leak, the boiler steam pressure is at or below 150 psig, continue water feeding to the boiler at a low rate of not more than 8000 pph until water drains out of the damaged boiler tube. Water feeding to the boiler is to be maintained in such a way, that the water level in the boiler is at least up to elevation of the tube leak. With small leaks fill the boiler to normal drum level.

6.2 Obtain the Draft Fan interlock key from the Supervisor and bypass the drum level interlocks if the drum level, because of the size of the leak, cannot be brought to normal. U.F.A. and O.F.A. fan as well as feeders and grates must be ready for operation, <u>but don't start them.</u>

6.3 Proceed with establishing a flue gas purge by starting the I.D. Fan and settin draft to -1.0 "WG.

- **Watch your furnace temperature for incidental firing of the fuel remaining on the grates**

6.4 Close the O.F.A. fan inlet damper and start O.F.A. fan. The I.D. Fan is still on at this time and its damper controls should be in AUTO and -1.0 draft setpoint. Bring the O.F.A. fan discharger pressure as high as possible without over amping the O.F.A. fan motor.

6.5 Close the U.F.A. fan inlet damper

- **VERIFY the U.F.A. dampers on the Martin Stoker Panel are in manual at 0%.**

6.6 Start the U.F.A. fan. Watch the furnace temperature very close. If it reaches 650°F, the U.F.A. pressure must be reduced or the U.F.A. fan must be turned off. After furnace temperature drops try to restart the process to increase the U.F.A. pressure until:

- 16" U.F.A. fan pressure is reached or
- the I.D. fan has reached its maximum amps or
- the U.F.A. fan has reached its maximum amps

If the maximum amps at the I.D. fan or the U.F.A. fan are reached, further investigation MUST be made. This is a clear indication that severe damage may have been done to expansion joints, furnace wall membrane, flyash hoppers, or stoker structure.

Furnace roof temperatures above 650°F will do serious damage to the boiler because of the very low water level in the boiler.

6.7 After U.F.A. fan pressure is reached the fuel bed must be burned off. To accomplish this in the most controlled manner, slowly open the U.F.A. zone dampers at the martin control panel, one at a time, 0% to 100% and return to the normal automatic step 0 position, starting with zone #5. This will allow for a monitored air flow through each burn zone and should provide the best control of furnace temperatures.

6.8 Slowly increase the U.F.A. damper openings, at the Martin Control Panel, to the maximum step. This will insure maximum cooling capacity during the run off of the fuel bed.

Maintain close observation of O_2 and furnace temperature readings, at the Martin Stoker Control Panel. A sudden drop in O_2 indicates emanate light off, this may be your first indication.

6.9 As soon as full air flow[1] has been established and the furnace temperature stays at or below 500°F proceed as follows:

- 6.9.1 Insure that feeder and grate main switches are in OFF position
- 6.9.2 The main switch of the Martin UFA dampers is in Automatic and at maximum step.
- 6.9.3 Both combustion controllers (fuel & air) have their setpoints adjusted to 0%.
- 6.9.4 The selector switch for the operating mode is switched to furnace temperature.
- 6.9.5 The feeders are at minimum speed and stroke length.
- 6.9.6 Start the riddlings sequence
- 6.9.7 Switch the grate main switch to the ON position.
    - 6.9.7.1 Allow the grates to stroke, no more than four times (established from past practice). Maintain close observation of O_2 readings. A sudden drop in these indicate emanate light off, this will be your first indication.
    - 6.9.7.2 Follow section 6.9.7.1 above till the furnace temperature remains below 500_{o}F and the grates are running continuously.
- 6.9.8 Increase the grate speed to 100%
- 6.9.9 Increase the clinker roller speed to 100%.
- 6.9.10 Close the feedchute damper as soon as possible.

---

[1] Full air flow means I.D. Fan set at -1.0 and O.F.A fans at 20+", with 16" of Underfire Air with U.F.A. zone dampers at maximum step on the Martin Stoker control panel. Allowing MAXIMUM cooling effect of furnace flue gases.

6.9.11 Manually increase the setpoint of the combustion controller, Furnace Temperature Mode, to match the actual furnace roof temperature but NOT HIGHER THAN 500°F.

6.9.12 Switch the feeders ON and allow them to stroke at the minimum speed and stroke length.

IT IS IMPERATIVE THAT FURNACE TEMPERATURES BE MANUALLY CONTROLLED TO INSURE NO EXCURSIONS/SPIKES ABOVE 650°F.

6.10 As soon as the furnace temperature stays again at all times below 500°F (running out of fuel) increase step by step feeder stroke length and speed like with a normal shut down. As soon as feeders and grates are cleared, shut the stoker system down.

6.11 Stop feeding water to the boiler when:

- The steamflow has dropped to 0 lb/h. and
- All fuel has been burned off the grates and
- The leak has been identified

6.12 Maintain maximum cooling of the furnace till conditions are met for entry inspection and permitting. If the leak is identified drain the affected wall for faster cooling effect.

6.13 Continue process per Operating Procedure #1 "Combustion Unit Shutdown"

TUBE RUPTURE PROCEDURE

GENERAL REMARKS:

A. Water must never be used to extinguish fire on the grates or the feeders. Water will do severe damage to feeder castings, grate-bars and refractory.

The goal of above operation is to burn all the fuel on the grates, feeders, and in the feedchute with as high as possible airflow and as little as possible fire, through small fuel dosage, in order to have a very controlled fluegas temperature.

Operations and Maintenance Plan

Note: The cover page and table of contents have been included in lieu of the complete volume. The complete volume is on file at the facility site.

Note: Volume I contains general information on all Ogden Martin Facilities.

HILLSBOROUGH

RESOURCE RECOVERY FACILITY

AN OGDEN COMPANY

ENVIRONMENTAL COMPLIANCE

OPERATING MANUAL

VOLUME II

"OPERATIONS TRAINING"

OGDEN MARTIN SYSTEMS OF HILLSBOROUGH, INC.
TAMPA, FLORIDA

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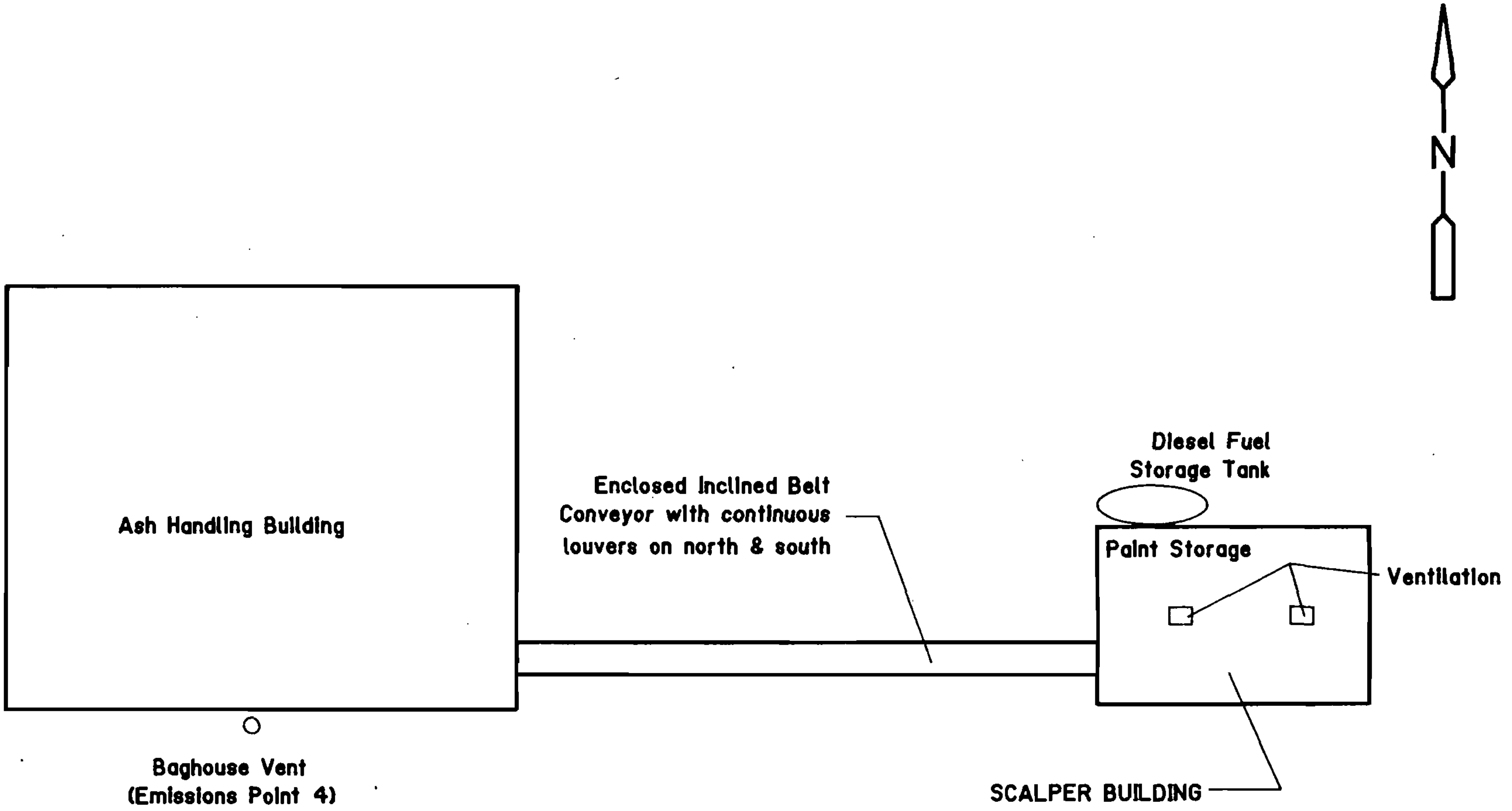
Ash Handling Building Supplemental Information

Point Identification



GRAPHIC SCALE:
N.T.S.

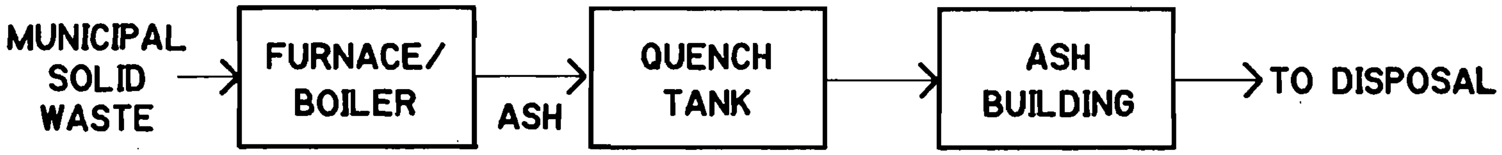
HILLSBOROUGH COUNTY SOLID WASTER ENERGY RECOVERY FACILITY

ASH HANDLING AND SCALPER BUILDING

CDM
environmental engineers, scientists, planners, & management consultants

Process Flow Diagram

A:\ HILLSASH 06/13/96 14:28:23 0:17:25 Darwish El-Hajji



HILLSBOROUGH COUNTY

PROCESS FLOW DIAGRAM

CDM

environmental engineers, scientists, planners, & management consultants

Detailed Description of Equipment

Following is the description of the baghouse located on the ash handling facility. The operating, equipment, and construction data are attached.

Model Number:	84-WRBC-144
Baghouse Operating Temperature:	Ambient Conditions
Filter Bag Temperature Rating:	275° F
Baghouse Control Efficiency:	Variable

BG-1,2

Flex-Kleen

Research-Cottrell

OPERATING, EQUIPMENT, AND CONSTRUCTION DATA

CUSTOMER: Fairfield Engineering Co.

P.O. NO.: DU-365D

FKO NO.: 12-84-30564

MODEL NO.: 84-WRBC-144(IIIG)

QTY.: 1

DATE: 02/21/86

TAG INFO.: P.O. #DU-365D

DRAWING NO.: A-86JC-040
DOC.REV.DATE: 04/11/86
DOC.REV.MARK: [a]

The information below will be considered CERTIFIED and no further transmittals of this document will be made unless there are changes agreed to between the customer and Flex-Kleen.

OPERATING DATA

Volume: 12,000 acfm
Cloth Area: 1,526 ft^2
Ratio: 7.86/1
Dust: Fly Ash
Dust Size:
Dust Density: lb/cu.ft.
Dust Loading: gr/cu.ft.
Temperature: 70°F
Dew Pt.: Deg.F
(collector temperature must be kept well above dew point)
End Use: Unknown
Weight: 5450 lbs.
Location: Outdoors
Design Press.: 17" W.G.
Operating Press.: 10"W.G. (Neg.)
Compressed Air Reqmts.: 21.0 scfm @ 90-100 psig
(compressed air to be clean, dry, and oil free)

EQUIPMENT DATA

Timer(s): T16054/NEMA-4 (M14507)
(electrical reqmts. 120V, 50/60 Hz, 1 phase, 100 w each)
Diaph. Valves: M14909
Bag Cages: C10111
Solenoid Valves: E24104
Bag Clamps: M12803
Venturis: M11038
Bag Cups: M10725
Filter Bags: 16oz. Polyester/singed (B25614)