AP42 Section:	Chapter 1
Related:	1
Title:	PCDD/PCDF Emissions from an Oil-Fired Boiler State of Vermont, Dept of Environmental Conservation Air Pollution Control Div. ENSR Document # 8357-660 December 1996

State of Vermont
Department of Environmental Conservation
Air Pollution Control Division

Waterbury, VT

Final Report: PCDD/PCDF Emissions from an Oil-Fired Boiler

ENSR

December 1996

Document Number 8357-660
Project Number 6354-001-300

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 PROGRAM SUMMARY

1.1 Summary of Test Results

Under sponsorship of the State of Vermont, Air Pollution Control Division, ENSR conducted testing of an oil-fired boiler to determine emission levels of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans (PCDDs/PCDFs) during normal plant operations. The facility selected for the test program was CPM, Inc. in East Ryegate, Vermont. The boiler tested was a 45 million Btu/hr unit used to generate steam for onsite paper production activities. The boiler burned No. 6 fuel oil as a source of energy during the entire test period. ENSR also conducted emission measurements for particulate matter under a separate arrangement with the facility; these data are being reported under separate cover.

Test runs for PCDDs/PCDFs were 4 hours in duration and followed procedures outlined in 40 CFR 60, Appendix A, Method 23 as amended by proposed rule on May 31, 1995. Three (3) test runs were completed on July 18-19, 1996. Results are reported on both a 2,3,7,8-TCDD toxic equivalency (TEQ) basis and congener class totals basis. Emissions averaged 0.0014 ng/m^3 corrected to 7 % O_2 (on a TEQ basis) and 0.097 ng/m^3 corrected to 7 % O_2 (on a congener class total basis). Analysis of the fuel burned during the test program showed that the No. 6 fuel oil was a typical material containing approximately 1.6 % (weight basis) sulfur and having a heat content of about 18,400 Btu/lb.

1.2 Discussion of Results

PCDD/PCDF emission levels observed at this facility are quite low, especially as compared to standards currently in place for other types of combustion facilities. For example, municipal solid waste (MSW) combustion facilities are required to meet a standard of 30 ng/m^3 @ 7 % O_2 on a congener class total basis. The emission level observed at CPM is approximately 300 times less than the MSW standard. For hazardous waste combustion facilities, EPA has recently proposed rules based on maximum achievable control technology (MACT) that provide limits for PCDDs/PCDFs from both new and existing facilities. The proposed MACT standard for both new and existing hazardous waste incinerators is 0.20 ng/m^3 @ 7 % O_2 on a TEQ basis. The emission level observed at CPM is approximately 143 times lower than the proposed MACT standard. It is also noted that no 2,3,7,8-TCDD was detected in any of the samples collected at the facility, but for the purposes of determining TEQ emissions, half the detection limit was used for any congeners that were not detected in the samples.

Although the No. 6 fuel oil does contain trace levels of chlorine (~600 ppm w/w), a prerequisite for dioxin formation, it is likely that the high temperatures maintained throughout the boiler with no opportunity for quenching or cooling of the gas stream is responsible for minimizing the potential for generation of byproduct dioxin/furan formation.

2.0 INTRODUCTION

2.1 Program Scope

ENSR was retained by the State of Vermont, Department of Environmental Conservation, Air Pollution Control Division (VT APCD) to quantify dioxin emissions from a fossil fuel-fired boiler. CPM, Inc., a paper mill in central Vermont, was selected on the basis of a series of site visits, followed by a formal site selection process. The test program was conducted on July 18 and 19, 1996.

The program consisted of testing the boiler, which operates solely on No. 6 fuel oil, for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Emissions were then calculated on a 2,3,7,8-TCDD toxic equivalent basis in accordance with VT APCD criteria. The toxic equivalency factors (TEFs) used are identical to those used by EPA.

2.2 Site Evaluation

Site evaluations were conducted prior to the test program based on the following key criteria: boiler size, operational feasibility, sampling access (platforms/ports), availability of prior test data, and willingness of facility cooperation.

CPM, Inc., the eventual choice for the emissions testing program, was selected following its evaluation against the above criteria. The five candidates for the program were, Norwich University (Northfield, VT), International Cheese Co. (Hinesburg, VT), Cabot/Agrimark Co. (Middlebury, VT), CPM, Inc. (East Ryegate, VT), and Rock-Tenn Co. (Sheldon Springs, VT). Of the five candidate facilities, only Norwich and CPM responded to the VT APCD's request for information in a timely manner. CPM offered the following advantages over Norwich:

- CPM's 45.0 x 10^6 Btu/hr fossil fuel-fired boiler operates on No. 6 fuel only.
- CPM's boiler is used to meet both process and heating needs. This enables the boiler to be operated at more consistent and higher loads during warm weather.
- CPM's boiler, which has never been tested for emissions, was easily modified to meet program testing requirements.
- ENSR conducted simultaneous particulate emission testing at CPM's request. This gave CPM a vested interest in seeing the program run smoothly, as delays would impact them as well as VT APCD.

2.3 Report Organization

This report is comprised of five sections and three appendices. Section 1 presents an overview and discussion of program results. Section 2 outlines the program scope and site selection process. Section 3 provides a description of the sampling and analytical procedures followed throughout the course of the program. Section 4 covers the test results in greater detail, and Section 5 covers the QA/QC procedures adhered to throughout the program and presents a summary of QA data as compared to program objectives. Field data sheets, calibration records, laboratory analysis reports, and facility process data are contained in Appendices A through C.

3.0 SAMPLING AND ANALYTICAL PROGRAM OVERVIEW

3.1 Boiler Operating Conditions

During the emission test program the boiler was operated under normal operating conditions at its maximum attainable load. During the test days, it was unseasonably warm, resulting in reduced energy demand by the plant which did not allow the facility to operate at 80% of maximum capacity, as planned. (The average boiler load for the test was approximately 73%.) However, the onsite observer from the VT APCD deemed the operations to be sufficiently representative to allow testing to proceed. Facility operating data are presented in Table 3-1.

3.2 Sampling and Analytical Methods

Sampling of the boiler effluent gas stream was conducted approximately 2 feet above roof level in a vertical portion of the stack. A schematic diagram depicting the sampling locations is shown in Figure 3-1. Testing was conducted using two test ports positioned 90° from each other. The selected ports did not meet the ideal requirement of being 8 duct diameters downstream and 2 duct diameters upstream from the closest disturbances. Thus, the maximum number of points (24, 12 per diameter) were used during sampling. Specific methods used are noted below.

3.2.1 PCDDs/PCDFs in Stack Gas

Sampling for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans (PCDDs/PCDFs) was conducted in accordance with EPA Reference Method 23 as amended by proposed rule on May 31, 1995 (40 CFR Part 60, Appendix A). The amendment to Method 23 provides for technical corrections to the method, improved analytical QA/QC, and elimination of the methylene chloride front half rinse. The front half rinse of the sampling train consists of acetone followed by toluene (combined). Method 23 includes analysis by EPA Method 8290 (high resolution GC/MS). Each of the three dioxin test runs were 4 hours in duration (10 minutes/point). The train fractions recovered for analysis include the front half rinse, the particulate filter and the XAD resin trap. PCDD/PCDF analyses were conducted by Alta Analytical Laboratories in El Dorado Hills, CA.

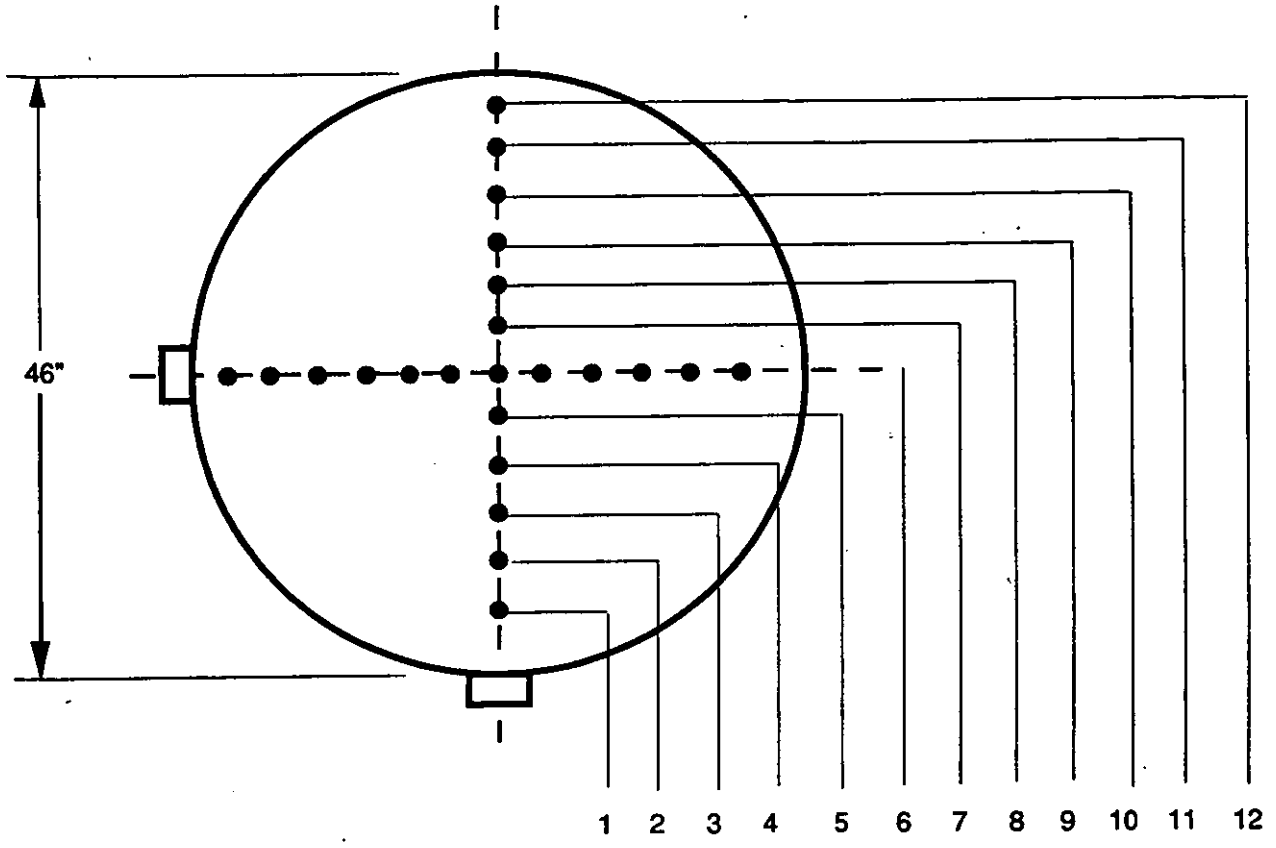
3.2.2 No. 6 Fuel Oil

During the dioxin emissions test program one composite fuel sample was taken during each 4-hour test run. The composite samples were then delivered to Industrial Testing Laboratories in St. Louis, MO for analysis. The samples were subsequently analyzed for the determination of total chloride, ash, heat content, sulfur, density and percent carbon, hydrogen, nitrogen and oxygen in accordance with applicable ASTM test methods.

Table 3-1
Facility Operating Data Summary

Process Parameter	Units	Run 1 07/18/96 15:58-20:26	Run 2 07/18/96 21:30-01:30	Run 3 07/19/96 12:32-16:36
Stack Temperature	°F	599	595	587
Oxygen	%	2.9	3.0	2.8
Fuel Oil Burned	gal/hr	238.222	235.250	219.250
Steam Produced	lb/hr	22,156	21,950	21,025
Steam Pressure	psi	225	225	224
Oil Temp. at Tanks	°F	137	140	143
Oil Temp. at Burners	°F	210	210	207
Feed Water Temperature	°F	210	227	226
Oil Pump Pressure	psi	91	92	86
Fuel Oil Density @ 210° F	lb/gal	7.78	7.77	7.77
Fuel Oil Heat Content	Btu/lb	18,398	18,497	18,346
Heat Input	Btu/hr	34,098,281	33,810,528	31,253,741

A:\FIELD\BOILINFO.WK4



Point	Distance % of Diameter	Actual Distance (inches)
1	2.1	.97
2	6.7	3.08
3	11.8	5.43
4	17.7	8.14
5	25.0	11.50
6	35.6	16.38
7	64.4	29.62
8	75.0	34.50
9	82.3	37.86
10	88.2	40.57
11	93.3	42.92
12	97.9	45.03

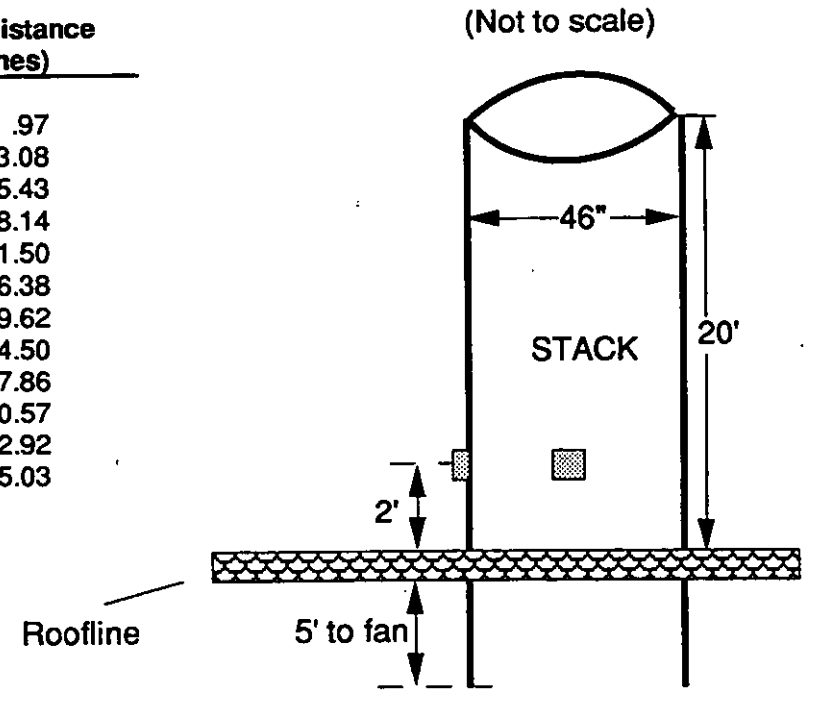


FIGURE 3-1

Stack Sampling Location for CPM, Inc.

4.0 TEST RESULTS

This section presents all sampling and analytical results for the test program. All data presented are judged to be completely acceptable based on data review and documented QA protocols. All pertinent QA/QC data and related discussions are presented in Section 5.0.

4.1 PCDDs/PCDFs

Three runs were completed (as per amended Method 23) to determine emission levels of PCDDs/PCDFs. Data are presented on the basis of 2,3,7,8-TCDD toxic equivalents (TEQs) using the 1989 US EPA/International toxic equivalency factors (TEFs). These TEFs are identical to those currently used by the VT APCD. Emission data on a TEQ basis are provided in Table 4-1, while data on the basis of congener class totals are given in Table 4-2. Emission levels averaged 0.0014 ng/m^3 @ 7% O_2 (TEQ basis) and 0.097 ng/m^3 @ 7% O_2 (congener class totals basis). It should be noted that in the computation of emission data on a TEQ basis, one-half the detection limit was used for any congeners not detected in the sample.

A complete summary of sampling-related parameters as well as all relevant field data sheets and supporting documentation are provided in Appendix A. Laboratory analysis reports are provided in Appendix B.

4.2 No. 6 Fuel Oil

During each of the three 4-hour test runs one composite fuel sample was taken. Upon completion of the field program the three composite fuel samples were delivered under chain of custody seal to Industrial Testing Laboratories for analysis of physical parameters. A summary of the test results is presented in Table 4-3.

Table 4-1
PCDD / PCDF Emission Results - TEQ Basis

	Run No.		1		2		3
	Date		18-Jul-96		18-Jul-96		19-Jul-96
	Start Time		15:58		21:30		12:32
	Stop Time		20:26		01:30		16:36
	Units						
Sample Volume	dscf		162.973		154.932		143.569
Sample Volume	m^3		4.61		4.39		4.07
Moisture Content	% v/v		11.3		11.3		12.0
O_2 Conc.	% v/v (dry)		5.50		5.00		5.00
CO_2 Conc.	% v/v (dry)		12.25		11.50		11.25
Isokinetics	%		109		101		103
Stack Flowrate	dscfm		7,829		8,065		7,283
Boiler Heat Input	Btu/hr		3.41E+07		3.38E+07		3.13E+07
PCDD / PCDF Parameters	TEF (a)	pg/ sample	ng/m^3 TEQ	pg/ sample	ng/m^3 TEQ	pg/ sample	ng/m^3 TEQ
2,3,7,8-TCDD	1	0.8 *	1.7E-04	0.55 *	1.3E-04	1.3 *	3.2E-04
TOTAL TCDD	0	22	0.0E+00	14	0.0E+00	110	0.0E+00
1,2,3,7,8-PeCDD	0.5	0.6 *	6.5E-05	0.85 *	9.7E-05	0.65 *	8.0E-05
TOTAL PeCDD	0	9.2	0.0E+00	5.2	0.0E+00	7.0	0.0E+00
1,2,3,4,7,8-HxCDD	0.1	1.7	3.7E-05	2.2	5.0E-05	0.95 *	2.3E-05
1,2,3,6,7,8-HxCDD	0.1	3.5	7.6E-05	4.7	1.1E-04	3.1	7.6E-05
1,2,3,7,8,9-HxCDD	0.1	2.5	5.4E-05	3.2	7.3E-05	0.85 *	2.1E-05
TOTAL HxCDD	0	29	0.0E+00	32	0.0E+00	16	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	16	3.5E-05	41	9.3E-05	17	4.2E-05
TOTAL HpCDD	0	30	0.0E+00	68	0.0E+00	31	0.0E+00
OCDD	0.001	58	1.3E-05	120	2.7E-05	120	3.0E-05
2,3,7,8-TCDF	0.1	4.4	9.5E-05	4.2	9.6E-05	4.1	1.0E-04
TOTAL TCDF	0	73	0.0E+00	38	0.0E+00	39	0.0E+00
1,2,3,7,8-PeCDF	0.05	4.3	4.7E-05	5.1	5.8E-05	3.1	3.8E-05
2,3,4,7,8-PeCDF	0.5	3.4	3.7E-04	2.8	3.2E-04	2.1	2.6E-04
TOTAL PeCDF	0	44	0.0E+00	31	0.0E+00	24	0.0E+00
1,2,3,4,7,8-HxCDF	0.1	6.0	1.3E-04	8.3	1.9E-04	5.0	1.2E-04
1,2,3,6,7,8-HxCDF	0.1	5.7	1.2E-04	7.5	1.7E-04	4.9	1.2E-04
2,3,4,6,7,8-HxCDF	0.1	5.0	1.1E-04	8.6	2.0E-04	4.5	1.1E-04
1,2,3,7,8,9-HxCDF	0.1	1.1 *	2.4E-05	5.3	1.2E-04	1.15 *	2.8E-05
TOTAL HxCDF	0	40	0.0E+00	61	0.0E+00	32	0.0E+00
1,2,3,4,6,7,8-HpCDF	0.01	29	6.3E-05	49	1.1E-04	30	7.4E-05
1,2,3,4,7,8,9-HpCDF	0.01	6.0	1.3E-05	18	4.1E-05	6.4	1.6E-05
TOTAL HpCDF	0	49	0.0E+00	110	0.0E+00	52	0.0E+00
OCDF	0.001	33	7.2E-06	95	2.2E-05	36	8.9E-06
TOTAL TEQs (ng/m^3)		=	0.0014		0.0019		0.0015
TOTAL TEQs (ng/m^3 @ 7 % O_2)		=	0.0013		0.0017		0.0013
TOTAL TEQs (g/s)		=	5.3E-12		7.2E-12		5.1E-12
TOTAL TEQs (lb/MMBtu)		=	1.2E-12		1.7E-12		1.3E-12

(a) U.S.EPA (1989) Toxic Equivalency Factor

* Value represents one-half the detection limit for a non-detected parameter.

Table 4-2
PCDD / PCDF Emission Results -- Congener Class Totals

	Run No.	1		2		3	
	Date	18-Jul-96		18-Jul-96		19-Jul-96	
	Start Time	15:58		21:30		12:32	
	Stop Time	20:26		01:30		16:36	
	Units						
Sample Volume	dscf	162.973		154.932		143.569	
Sample Volume	m^3	4.615		4.39		4.07	
Moisture Conten	% v/v	11.3		11.3		12.0	
O_2 Conc.	% v/v (dry)	5.5		5.0		5.0	
CO_2 Conc.	% v/v (dry)	12.3		11.5		11.3	
Isokinetics	%	109		101		103	
Stack Flowrate	dscfm	7,829		8,065		7,283	
Boiler Heat Input	Btu/hr	3.41E+07		3.38E+07		3.13E+07	
PCDD / PCDF Parameters		pg/ sample	ng/m^3	pg/ sample	ng/m^3	pg/ sample	ng/m^3
TOTAL TCDD		22	4.8E-03	14	3.2E-03	110	2.7E-02
TOTAL PeCDD		9.2	2.0E-03	5.2	1.2E-03	7.0	1.7E-03
TOTAL HxCDD		29	6.3E-03	32	7.3E-03	16	3.9E-03
TOTAL HpCDD		30	6.5E-03	68	1.5E-02	31	7.6E-03
OCDD		58	1.3E-02	120	2.7E-02	120	3.0E-02
TOTAL TCDF		73	1.6E-02	38	8.7E-03	39	9.6E-03
TOTAL PeCDF		44	9.5E-03	31	7.1E-03	24	5.9E-03
TOTAL HxCDF		40	8.7E-03	61	1.4E-02	32	7.9E-03
TOTAL HpCDF		49	1.1E-02	110	2.5E-02	52	1.3E-02
OCDF		33	7.2E-03	95	2.2E-02	36	8.9E-03
TOTAL tetra-octa (ng/m^3)	=	0.084		0.131		0.115	
TOTAL tetra-octa (ng/m^3 @ 7 % O_2)	=	0.076		0.115		0.101	
TOTAL tetra-octa (g/s)	=	3.1E-10		5.0E-10		3.9E-10	
TOTAL tetra-octa (lb/MMBtu)	=	7.2E-11		1.2E-10		1.0E-10	

A:\FIELD\M23R13.WK4

Table 4-3
Analytical Data For No. 6 Fuel Oil

Test Parameter	Run #1	Run #2	Run #3	Test Method
Ultimate Analysis				
Sulfur, % by wt.	1.68	1.56	1.61	ASTM D-129
Nitrogen, % by wt.	0.44	0.46	0.46	(1)
Hydrogen, % by wt.	10.10	9.97	10.31	(1)
Carbon, % by wt.	85.47	85.69	85.03	(1)
Oxygen, % by wt.	2.08	2.18	2.49	By Difference
Chlorine, % by wt.	0.09	0.05	0.04	ASTM D-808/E776
Ash, % by wt.	0.14	< 0.1	< 0.1	ASTM D-482
Proximate Analysis				
Heat of Combustion, Btu/lb	18,398	18,497	18,346	ASTM D-240
Density @60°F, lb/gal	8.24	8.23	8.23	ASTM D-287
Density @210°F, lb/gal	7.78	7.77	7.77	ASTM D-287
Specific Gravity @60°F	0.988	0.987	0.987	ASTM D-287
Specific Gravity @210°F	0.933	0.932	0.932	ASTM D-287
Moisture, % by wt.	0.39	0.37	0.35	ASTM D-95
(1) High Temperature Combustion/Thermal Conductivity Detector				

A:\FIELD\FUELANAL.WK4

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This test program incorporated routine QA/QC measures to ensure the validity of the final results. These measures were based upon routine field and laboratory practices as well as specific requirements delineated in the applicable sampling and analytical protocols. Specific measures were outlined in the **Workplan for Implementation of a Source Assessment Program for Quantification of PCDD/PCDF Emissions from a Fossil-Fuel-Fired Boiler,** dated April 1996 (ENSR Document No. 6354-001-100).

This section presents the results of all QA/QC measures implemented during the field sampling program and during all phases of sample analysis. Data generated for the program are judged to be valid as overall accuracy and precision goals consistent with general program objectives were achieved. Analytical QA/QC data are presented to support all sample results used for determining dioxin emissions.

5.1 Stack Sampling QA/QC

The sampling program incorporated a variety of measures to ensure that sound data would be obtained. All samples were collected in accordance with EPA Method 23, 40 CFR 60, Appendix A. One field blank of the sampling train was also submitted for analysis.

Sampling QA/QC measures for this program included the calibration of all applicable manual sampling equipment used as described below. Field equipment was calibrated according to EPA procedures specified in EPA-600/4-77-027b (Aug. 1977) and 40 CFR 60, Methods 1-6, as well as manufacturers' specifications.

1) Dry Gas Meters and Orifice Meters/EPA Method 5. The dry gas meters for all sampling trains are calibrated against a wet test meter which has been calibrated against a spirometer. The orifice meters are calibrated against the wet test meter and checked against the dry gas meter to which it is attached. Meter boxes are calibrated annually. All annual calibration sheets are provided in Appendix A.

1a) During each field program ENSR conducts onsite meterbox calibration checks. These verification calculations are done in accordance with the Alternative Method 5 Post-Test Calibration Procedure as outlined by EPA's Emission Measurement Technical Information Center. The use of this procedure eliminates the need to conduct full wet meter post test

calibrations of the meter boxes. The document describing the procedure is presented in Appendix A.

2) Sampling Nozzles. Each nozzle was measured with a micrometer onsite prior to testing. The internal diameter of each nozzle is measured to 0.001 inches along three points of the circumference with a dial vernier caliper, and the three measurements are then averaged. The calibration forms are provided in Appendix A.

3) Balance. The analytical balance used in the field to determine initial and final silica gel weights is calibrated against Class M weights provided by the Mettler Corporation.

4) Thermocouples. The Type K thermocouples in each meter control box, heated sample box, impinger umbilical connector and sample probe are calibrated against ASTM mercury in glass thermometers at three points: an ice bath, ambient temperature and a boiling water bath. Calibration data are provided in Appendix A.

5) Pitot Tube. Each "S" type stainless steel pitot tube used is designed to meet geometric configurations as defined in EPA Method 2. Data sheets are provided in Appendix A.

Chain of custody for all stack gas samples was initiated and maintained as follows:

- Samples were collected, sealed and labeled with preprinted sample labels. Each isokinetic train was recovered in a separate area located near the base of the stack.
- Preprinted sample lists were used to check that all samples were collected and each container was checked upon completion of recovery and labeling.
- All samples were packed in bubble wrap and placed in either coolers or appropriate DOT shipping boxes ("Dangerous Goods" items). All samples were subsequently shipped via Priority Overnight Federal Express service to the designated laboratory.

Copies of all associated chain of custody forms are provided in Appendix B along with the analytical data sheets.

5.2 Analytical QA/QC

Data quality indicators (DQIs) were used throughout the program to assess the validity of the analytical data. This section provides a review of these indicators and the subsequent impact on the analytical data.

5.2.1 Analysis for PCDDs/PCDFs (M23 Train)

Evaluation of the validity of the PCDD/PCDF data resultant from the analysis of the Method 23 sampling train samples was based on three sets of DQIs. These were:

- Recoveries of internal and pre-spike recovery standards (see Table 5-1 for list) added to the samples prior to sampling. Recoveries of these standards are listed in Table 5-1 for all Method 23 samples.

- Results of analysis of Laboratory Control Samples (LCS) for the 17 PCDD/PCDF isomers listed in EPA Method 23. Results of these LCS sample analyses are provided in Table 5-2.

- Results of analyses of field and method blank samples for PCDD/PCDFs. These results are provided in Table 5-3.

Accuracy goals for PCDD/PCDF stack sample analyses conducted for this type of program vary for pre-spike recovery surrogates and level of chlorination, as shown in Table 5-1. All pre-spike recovery standards and internal standard recoveries for program and blank samples met these criteria, as shown in Table 5-1. Two of the internal standard recoveries for laboratory control samples were slightly above the upper acceptance limit, but this has no impact on program results since recoveries of related spiked target analytes in the LCS samples were within designated acceptance limits (see Table 5-2). All recovery values for 2,3,7,8-substituted dioxins and furans in the two laboratory control samples fell within the ± 50% acceptance range, as shown in Table 5-2.

As can be seen from the referenced tables, all but two internal standards, all recovery standards and all LCS recoveries were within defined limits. Also, as shown in Table 5-3, only small quantities of octa isomers were detected in the field blanks. (Results were not blank-corrected for these isomers, however.) On the basis of these data, no sample analyses were rejected, and all results were determined to be valid. Completeness was therefore determined to be 100% for all PCDD/PCDF results from the Method 23 train samples.

5.2.2 Analysis of Fuel Oil

QA/QC measures implemented to assess accuracy of fuel oil analyses consisted of duplicate analysis of the samples from Run 1. Results are presented in Table 5-4; all analyses were within the acceptance criteria of < 35% relative percent difference (RPD).

Table 5-1
Internal and Recovery Standards for PCDD/PCDF Surrogates

	Isotopic Recovery Results - %						
	Run 1	Run 2	Run 3	LCS1	LCS2	Field Blank	Method Blank
Internal Standards --							
^{13}C-2,3,7,8-TCDD	114%	101%	86%	95%	125%	98%	104%
^{13}C-1,2,3,7,8-PeCDD	102%	101%	91%	122%	131% *	87%	98%
^{13}C-1,2,3,6,7,8-HxCDD	89%	95%	97%	86%	101%	98%	103%
^{13}C-1,2,3,4,6,7,8-HpCDD	83%	92%	103%	82%	87%	87%	90%
^{13}C-OCDD	88%	98%	103%	73%	94%	86%	92%
^{13}C-2,3,7,8-TCDF	92%	106%	108%	84%	99%	92%	98%
^{13}C-1,2,3,7,8-PeCDF	117%	95%	88%	134% *	129%	93%	107%
^{13}C-1,2,3,6,7,8-HxCDF	86%	89%	83%	64%	66%	74%	78%
^{13}C-1,2,3,4,6,7,8-HpCDF	82%	91%	95%	75%	86%	85%	92%
Pre-Spike Recovery Standards --							
^{37}Cl-2,3,7,8-TCDD	91%	94%	95%	N/A	N/A	97%	NA
^{13}C-2,3,4,7,8-PeCDF	77%	93%	103%	N/A	N/A	89%	NA
^{13}C-1,2,3,4,7,8-HxCDD	93%	82%	82%	N/A	N/A	73%	NA
^{13}C-1,2,3,4,7,8-HxCDF	95%	94%	98%	N/A	N/A	99%	NA
^{13}C-1,2,3,4,7,8,9-HpCDF	118%	123%	120%	N/A	N/A	126%	NA
Alternate Recovery Standard --							
^{13}C-1,2,3,7,8,9-HxCDF	89%	100%	98%	N/A	N/A	114%	110%

Acceptance Limits for Recoveries :

Tetra - Hexa (Internal Standards) --	40%	-	130%
Hepta & Octa (Internal Standards) --	25%	-	130%
Pre-Spike & Alt. Recovery Standards -	70%	-	130%

A:\FIELD\DFSURRQC.WK4

Table 5-2
PCDD/PCDF Laboratory Control Sample Results

Parameter	% Recoveries		Relative Percent Difference
	LCS 1	LCS 2	
2,3,7,8-TCDD	94%	93%	1.1%
1,2,3,7,8-PeCDD	102%	105%	2.9%
1,2,3,4,7,8-HxCDD	97%	89%	8.6%
1,2,3,6,7,8-HxCDD	101%	103%	2.0%
1,2,3,7,8,9-HxCDD	92%	92%	0.0%
1,2,3,4,6,7,8-HpCDD	105%	107%	1.9%
OCDD	108%	110%	1.8%
2,3,7,8-TCDF	96%	101%	5.1%
1,2,3,7,8-PeCDF	108%	109%	0.9%
2,3,4,7,8-PeCDF	85%	97%	13.2%
1,2,3,4,7,8-HxCDF	113%	118%	4.3%
1,2,3,6,7,8-HxCDF	109%	110%	0.9%
2,3,4,6,7,8-HxCDF	100%	107%	6.8%
1,2,3,7,8,9-HxCDF	126%	130%	3.1%
1,2,3,4,6,7,8-HpCDF	107%	111%	3.7%
1,2,3,4,7,8,9-HpCDF	139%	147%	5.6%
OCDF	111%	109%	1.8%

Acceptance Limits :

Relative Percent Difference	35%
Upper Recovery Limit	150%
Lower Recovery Limit	50%

A:\FIELD\DFLCS.WK4

Table 5-3
PCDD/PCDF Blank Results

Parameter	Quantity Detected, pg	
	Field Blank	Method Blank
2,3,7,8-TCDD	< 1.0	< 0.74
TOTAL TCDD	< 1.0	< 0.92
1,2,3,7,8-PeCDD	< 1.5	< 0.65
TOTAL PeCDD	< 1.5	< 0.65
1,2,3,4,7,8-HxCDD	< 1.8	< 1.6
1,2,3,6,7,8-HxCDD	< 1.6	< 1.5
1,2,3,7,8,9-HxCDD	< 1.6	< 1.5
TOTAL HxCDD	< 1.8	< 1.6
1,2,3,4,6,7,8-HpCDD	< 3.1	< 2.4
TOTAL HpCDD	< 3.1	< 2.4
OCDD	20	< 6.8
2,3,7,8-TCDF	< 1.1	< 3.0
TOTAL TCDF	< 1.1	< 3.2
1,2,3,7,8-PeCDF	< 1.6	< 1.3
2,3,4,7,8-PeCDF	< 1.5	< 1.2
TOTAL PeCDF	< 1.6	< 1.3
1,2,3,4,7,8-HxCDF	< 1.6	< 0.90
1,2,3,6,7,8-HxCDF	< 1.4	< 0.78
2,3,4,6,7,8-HxCDF	< 1.5	< 0.88
1,2,3,7,8,9-HxCDF	< 1.8	< 1.2
TOTAL HxCDF	< 1.8	< 1.2
1,2,3,4,6,7,8-HpCDF	< 2.0	< 0.90
1,2,3,4,7,8,9-HpCDF	< 2.0	< 1.1
TOTAL HpCDF	< 2.0	< 1.1
OCDF	5.6	< 2.6

A:\FIELD\DFBLANKS.WK4

Table 5-4
Duplicate Analysis Summary
for No. 6 Fuel Oil Analyses

Parameter	Units	Sample (Run 1) (ppm)	Duplicate (ppm)	RPD (%)
Sulfur	%	1.68	1.60	4.9%
Nitrogen	%	0.44	0.43	2.3%
Ash	%	0.14	0.11	24.0%
Moisture	%	0.39	0.40	2.5%
Heat of Combustion	Btu/lb	18,398	18,350	0.3%
Acceptance Criteria:				**< 35%**
			A:\FIELD\OILQC.WK4	

APPENDIX A

Field Data Sheets and Calibration Records

Method 23 Sampling Parameters
Vermont / CPM, Inc. Dioxin Test -- Runs 1 - 3

Run No. Date Start Time Stop Time	Units	1 18-Jul-96 15:58 20:26	2 18-Jul-96 21:30 01:30	3 19-Jul-96 12:32 16:36	AVGS
Nozzle Diameter	inches	0.410	0.410	0.410	0.410
Barometric Pressure	in. Hg	29.96	29.84	29.44	29.75
Net Sampling Time	min.	240.0	240.0	240.0	240.0
Volume Metered	dcf	172.623	158.248	149.618	160.163
Avg. DGM Temp.	°F	104.5	81.7	85.0	90.4
Avg Delta H	in H_2O	1.88	1.55	1.29	1.57
Avg Delta H	in. Hg	0.1385	0.1136	0.0950	0.1157
DGM Calibration Factor	--	1.0033	1.0033	1.0033	1.0033
Gas Sample Volume	**dscf**	**162.973**	**154.932**	**143.569**	**153.825**
Total Water Collected	mL	440.0	418.5	414.0	424.2
Volume of Water Vapor	scf	20.746	19.732	19.520	19.999
Moisture (measured)	% v/v	11.3	11.3	12.0	11.5
Moisture (@ saturation)	% v/v	45.6	45.8	46.4	46.0
Dry Mole Fraction, 100-%M	--	0.8871	0.8870	0.8803	0.8848
CO_2 at Stack	% dry	12.3	11.5	11.3	11.67
O_2 at Stack	% dry	5.5	5.0	5.0	5.17
CO + N_2	% dry	82.25	83.50	83.75	83.17
Dry Molecular Weight	lb/lb-mole	30.18	30.04	30.00	30.07
Wet Molecular Weight	lb/lb-mole	28.80	28.68	28.56	28.68
Excess Air at Stack	%	33.9	29.3	29.2	30.8
Stack Area (for 46-in ID)	sq. in.	1661.9	1661.9	1661.9	1661.9
Static Pressure	in H_2O	-0.16	-0.16	-0.15	-0.16
Stack Pressure	in. Hg	29.95	29.83	29.43	29.74
Avg. Stack Temp.	°F	525.1	522.6	519.2	522.3
Avg. Sqroot of Delta P	--	0.3095	0.3184	0.2906	0.3062
SDE Average	--	9.715	9.981	9.094	9.597
Pitot Coefficient	--	0.84	0.84	0.84	0.84
Stack Gas Velocity	afpm	1,425	1,471	1,352	1,416
Stack Flowrate	wet acfm	16,451	16,972	15,599	16,340
Stack Flowrate	wet scfm	8,826	9,092	8,273	8,730
Stack Flowrate	**dscfm**	**7,829**	**8,065**	**7,283**	**7,726**
Isokinetics	**%**	**109**	**101**	**103**	**104**
Meter Box No.	--	80611	80611	80611	--
Delta H @	in. Hg	2.0003	2.0003	2.0003	--
Field QA Yqc	--	1.0230	0.9947	0.9723	0.9966
[Deviation] Pre-Y	%	2.0%	0.9%	3.1%	2.0%

PT	*RUN 1 AVGS -- PCDDs/PCDFs*						*RUN 2 AVGS -- PCDDs/PCDFs*						*RUN 3 AVGS -- PCDDs/PCDFs*					
	DP	SQRT DP	DGM IN	DGM OUT	DH	STACK TEMP	DP	SQRT DP	DGM IN	DGM OUT	DH	STACK TEMP	DP	SQRT DP	DGM IN	DGM OUT	DH	STACK TEMP
a1	0.15	0.3873	103	104	5.73	539	0.06	0.2449	78	77	0.88	517	0.07	0.2646	78	78	1.03	513
a2	0.14	0.3742	105	104	2.44	529	0.07	0.2646	78	78	1.03	525	0.07	0.2646	79	79	1.03	515
a3	0.18	0.4243	108	105	3.14	534	0.07	0.2646	80	78	1.03	528	0.05	0.2236	83	80	0.73	518
a4	0.16	0.4000	111	107	2.81	528	0.10	0.3162	82	79	1.50	553	0.05	0.2236	85	81	0.73	521
a5	0.17	0.4123	111	107	2.99	530	0.09	0.3000	85	79	1.35	548	0.05	0.2236	84	82	0.73	519
a6	0.17	0.4123	111	106	2.99	535	0.15	0.3873	85	80	2.25	538	0.07	0.2646	83	82	1.03	522
a7	0.10	0.3162	109	103	1.74	531	0.14	0.3742	88	80	2.08	523	0.12	0.3464	84	82	1.76	524
a8	0.08	0.2828	111	105	1.41	528	0.15	0.3873	87	81	2.26	521	0.11	0.3317	88	83	1.63	527
a9	0.07	0.2646	112	105	1.23	528	0.15	0.3873	88	81	2.26	519	0.10	0.3162	88	83	1.48	526
a10	0.06	0.2449	112	106	1.05	528	0.15	0.3873	88	81	2.26	519	0.10	0.3162	89	84	1.48	523
a11	0.05	0.2236	112	106	0.87	527	0.16	0.4000	89	81	2.37	519	0.10	0.3162	90	85	1.48	523
a12	0.05	0.2236	111	106	0.87	516	0.13	0.3606	90	82	1.93	515	0.09	0.3000	91	85	1.35	519
b1	0.10	0.3162	105	103	1.74	510	0.10	0.3162	85	79	1.47	523	0.05	0.2236	86	85	0.74	515
b2	0.10	0.3162	109	106	1.76	517	0.08	0.2828	85	80	1.19	516	0.05	0.2236	88	85	0.74	518
b3	0.10	0.3162	110	105	1.76	522	0.07	0.2646	83	79	1.03	517	0.06	0.2449	87	85	0.89	520
b4	0.12	0.3464	110	105	2.11	526	0.06	0.2449	83	79	0.88	517	0.06	0.2449	86	84	0.89	522
b5	0.13	0.3606	111	105	2.29	538	0.05	0.2236	82	79	0.73	519	0.07	0.2646	87	84	1.04	520
b6	0.12	0.3464	109	103	2.09	526	0.07	0.2646	81	78	1.03	521	0.10	0.3162	87	84	1.48	526
b7	0.06	0.2449	104	101	1.05	520	0.13	0.3606	82	77	1.91	520	0.14	0.3742	89	85	2.08	527
b8	0.04	0.2000	100	98	0.69	520	0.12	0.3464	85	78	1.76	524	0.13	0.3606	90	85	1.95	523
b9	0.05	0.2236	97	96	0.86	519	0.11	0.3317	85	78	1.62	520	0.15	0.3873	90	85	2.25	526
b10	0.06	0.2449	95	93	1.03	516	0.10	0.3162	85	79	1.47	520	0.09	0.3000	90	85	1.35	526
b11	0.07	0.2646	93	91	1.19	517	0.10	0.3162	84	78	1.47	518	0.13	0.3606	88	84	1.93	490
b12	0.08	0.2828	94	91	1.37	518	0.09	0.3000	83	79	1.32	503	0.08	0.2828	89	84	1.20	497
AVG	0.10	0.3095	104		1.88	525	0.10	0.3184	82		1.55	523	0.09	0.2906	85		1.29	519

EPA STACK METHODS – TEST FIELD DATA SHEET

TEST PARAMETER: DIOXINS M23

Project No: 6354-001-200
PLANT: CPM | VT
DATE: 7/18/96
TEST LOCATION: Boiler Roof
RUN NUMBER: 1
Stack Diameter – inches: 96"
Duct Diameter – in. x in.: —
START TIME: 15:58
STOP TIME: 20:26
OPERATOR: P. KOHAN

Site Elevation:
BAROMETRIC PRESSURE: 29.96
STATIC PRESSURE (+/-): -.16
Probe Number: M5-5'-D
Pitot Coefficient: .84
Pitot Number: M5-5'-D
Meter Box Number: 80611
Orifice Coefficient (Y) = 1.0033
Delta H @ = 2.000
NOZZLE NUMBER & SIZE: .500 1.910

LEAK CHECKS:
INITIAL VAC. 15 in. CFM 0.016
FINAL VAC. 18 in. CFM 0.006
INIT. PITOT ✓✓ FINAL PITOT ✓✓

FILTER DATA

NUMBER	TARE	FINAL WT.
NA	—	

IMPINGER VOL. INIT.	IMPINGER VOL. FINAL	RINSE
0	415	
100	95	
100	98	
0	0	
NET Gain	408	

SILICA GEL	
349.4	381.4
NET Gain	32.0

> FOR MOISTURE CALC.

TOTAL NET GAIN: 440 ml.

ORSAT DATA

TIME	CO2	O2	CO
	12.0	5.5	
	12.5	5.5	
AVG	12.25	5.5	

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD Delta P in. H2O	ORIFICE METER VOL. Delta H. in. H2O	GAS METER VOLUME cu. ft.	TEMPERATURE Degrees F: STACK	PROBE	OVEN	ORGANIC MODULE	IMPINGER	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	SQ. ROOT Delta P	COMMENTS
A1	0	.15	5.73	423.362	539	244	242	65	49	103	104	17		
1	~~105~~			429.395						~~104~~	~~103~~ (104)			Stop 16:03
	5	.15	2.62	429.605	527	245	241	64	50	104	103	11		Start 16:23
2	10	.14	2.44	434.0	529	252	245	63	53	105	104	10		TO CHANGE
3	20	.18	3.14	442.5	534	241	239	52	46	108	105	12		NOZZLES
4	30	.16	2.81	451.9	528	245	239	53	47	111	107	11.5		leak check
5	40	.17	2.99	461.0	530	243	242	55	49	111	107	11.5		.25 in CFM 0.015
6	50	.17	2.99	470.3	535	249	242	60	53	111	106	11.5		second nozzle .1910
7	60	.10	1.74	480.1	531	248	239	65	53	109	103	9.5		
8	70	.08	1.41	487.3	528	248	241	64	51	111	105	8.5		
9	80	.07	1.23	494.1	528	250	242	64	52	112	105	8.0		
10	90	.06	1.05	500.4	528	243	240	65	50	112	106	7.5		
11	100	.05	0.87	506.3	527	248	241	66	51	112	106	6.0		
12	110	.05	0.87	511.6	516	245	239	60	53	111	106	6.0		
STOP	120			516.808						10				Stop 18:18
B1	120	.10	1.74	516.808	510	244	236	58	57	105	103	10.0		Start 18:26
2	130	.10	1.76	524.1	517	245	238	57	56	109	106	10.0		
3	140	.10	1.76	531.4	522	252	236	60	48	110	105	10.0		
4	150	.12	2.11	538.7	526	240	238	50	49	110	105	10.5		
5	160	.13	2.29	546.6	538	242	240	52	50	111	105	11.0		
6	170	.12	2.09	554.7	526	238	243	55	51	109	103	11.0		
7	180	.06	1.05	562.8	520	242	239	51	47	104	101	7.5		
8	190	.04	0.69	568.6	520	240	235	49	48	100	98	6.0		
9	200	.05	0.86	573.5	519	245	238	60	49	97	96	6.5		
10	210	.06	1.03	578.5	516	242	237	59	51	95	93	7.0		
11	220	.07	1.19	584.1	517	241	236	55	50	93	91	8.0		
12	230	.08	1.37	589.9	518	240	239	57	51	94	91	8.5		
STOP	240			596.195										
TOTALS										AVG TEMP:				

EPA STACK METHODS - TEST FIELD DATA SHEET

TEST PARAMETER: M23 DIOXINS

Project No: 6354-001-200 | PLANT: C&M | VT | DATE: 7/18/96 & 7/19/96 | TEST LOCATION: Baker Road | RUN NUMBER: 2 | Stack Diameter - inches: 46" | Duct Diameter - in. x in.: — | START TIME: 21:30 | STOP TIME: 01:34 | OPERATOR: P. Kottan

Site Elevation: — | BAROMETRIC PRESSURE: 29.84 | STATIC PRESSURE (+/-): -.16 | Probe Number: M5-5-D | Pitot Coefficient: .84 | Pitot Number: M5-5-D | Meter Box Number: 80611 | Orifice Coefficient (Y) = 1.0033 | Delta H @ = 2.0001 | NOZZLE NUMBER & SIZE: .410 I

LEAK CHECKS:
INITIAL VAC. 15 in. CFM 0.005
FINAL VAC. 12 in. CFM 0.005
INIT. PITOT ✓✓ FINAL PITOT ✓✓

FILTER DATA

NUMBER	TARE	FINAL WT.
NA	—	

IMPINGER VOL.

INIT.	FINAL	RINSE
0	395	
100	95	
100	98	
0	0	
NET Gain	388	
SILICA GEL		
297.5	328.0	
NET Gain	30.5	> FOR MOISTURE CALC.

ORSAT DATA

TIME	CO2	O2	CO
	11.5	5.0	
	11.5	5.0	
AVG	11.5	5.0	

TOTAL NET GAIN: 418.5 ml.

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD Delta P in. H2O	ORIFICE METER VOL. Delta H. in. H2O	GAS METER VOLUME cu. ft.	TEMPERATURE Degrees F: STACK	PROBE	OVEN	ORGANIC MODULE	IMPINGER	GAS METER: IN	GAS METER: OUT	PUMP VACUUM in. Hg	SQ. ROOT Delta P	COMMENTS
A1	0	0.06	0.88	596.967	517	224	239	66	65	78	77	6.5		
2	10	0.07	1.03	601.4	525	240	238	49	44	78	78	7.0		
3	20	0.07	1.03	606.9	528	239	238	45	46	80	78	7.0		
4	30	0.10	1.50	612.6	553	241	239	49	47	82	79	8.0		
5	40	0.09	1.35	618.9	548	243	240	47	48	85	79	7.5		
6	50	0.15	2.25	625.3	538	242	238	46	49	85	80	10.0		
7	60	0.14	2.08	633.2	523	242	239	46	50	88	80	10.0		
8	70	0.15	2.26	640.7	521	241	240	47	50	87	81	10.0		
9	80	0.15	2.26	648.6	519	242	239	46	52	88	81	10.0		
10	90	0.15	2.26	656.1	519	244	240	47	52	88	81	10.0		
11	100	0.16	2.37	664.1	519	243	240	49	54	89	81	11.0		
12	110	0.13	1.93	672.2	515	244	240	49	55	90	82	10.0		
STOP	120			679.850										stop 23:30
B1	130	0.10	1.47	679.850	523	243	240	50	58	85	79	9.0		start 23:34
2	140	0.08	1.19	686.4	516	242	240	49	51	85	80	8.5		
3	150	0.07	1.03	692.8	517	240	237	45	49	83	79	8.5		
4	160	0.06	0.88	698.4	517	240	238	46	49	83	79	7.0		
5	170	0.05	0.73	703.5	519	242	238	46	49	82	79	7.0		
6	180	0.07	1.03	708.5	521	240	238	43	46	81	78	7.5		
7	180	0.13	1.91	713.9	520	240	238	43	47	82	77	10.5		
8	190	0.12	1.76	721.4	524	242	238	44	47	85	78	10.5		
9	200	0.11	1.62	728.2	520	243	238	46	49	85	78	10.0		
10	210	0.10	1.47	735.2	520	244	239	46	51	85	79	9.5		
11	220	0.10	1.47	741.9	518	249	239	47	51	89	78	9.5		
12	230	0.09	1.32	748.4	503	249	238	49	52	83	79	9.5		
STOP	240			754.715										
TOTALS									AVG. TEMP:					

EPA STACK METHODS – TEST [illegible]D DATA SHEET

TEST PAR[illegible]TER [illegible]

LEA[illegible] CHECKS:

Project No: [illegible] Site Elevation [illegible]

PLANT CRMIVI

DATE 7/10 96

TEST LOCATION Boiler Roof

RUN NUMBER 3

Stack Diameter – inches 46"

Duct Diameter – in. x in. –

START TIME 12:32

STOP TIME 16:36

OPERATOR R. KorTAN

BAROMETRIC PRESSURE 29.99

STATIC PRESSURE (+/-) -.15

Probe Number MS-5'-D

Pilot Coefficient .84

Pilot Number MS 5'-D

Meter Box Number 80611

Orifice Coefficient (Y) = 1.0033

Delta H @ = 2.0001

NOZZLE NUMBER & SIZE .910 1

INITIAL VAC. 15 in. CFM 0004

FINAL VAC. 14 in. CFM 0.006

INIT. PITOT ✓ FINAL PITOT ✓

FILTER DATA

NUMBER	TARE	FINAL WT.
N/A	–	

IMPINGER VOL.			RSAT DATA		
INIT.	FINAL	RINSE	CO2	O2	CO
0	388		11.0	5.0	
100	101				
100	95		11.5	5.0	
0	0				
NET Gain	384		AVG	11.25	5.0
SILICA GEL					
341.2	371.2				
NET Gain	30.0	> FOR MOISTURE CALC.			

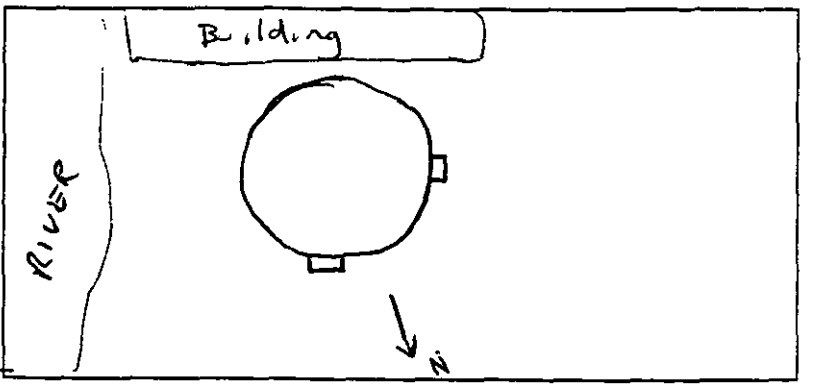
TOTAL NET GAIN: 414.0 ml.

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD Delta P in. H2O	ORIFICE METER VOL. Delta H. in. H2O	GAS METER VOLUME cu. ft.	TEMPERATURE Degrees F: STACK	PROBE	OVEN	ORGANIC MODULE	IMPINGER	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	SQ. ROOT Delta P	COMMENTS
B1	0	0.07	1.03	757.932	513	242	240	56	61	78	78	7.0		
2	10	0.07	1.03	763.4	515	245	247	55	44	79	79	8.0		
3	20	0.05	0.73	769.2	518	249	248	53	46	83	80	7.0		
4	30	0.05	0.73	774.1	521	241	245	54	47	85	81	7.0		
5	40	0.05	0.73	779.0	519	249	246	54	52	84	82	7.0		
6	50	0.07	1.03	783.9	522	245	244	52	48	83	82	8.5		
7	60	0.12	1.76	789.6	524	246	242	54	48	84	82	10.0		
8	70	0.11	1.63	796.6	527	247	240	54	49	88	83	10.0		
9	80	0.10	1.48	803.7	526	242	242	54	51	88	83	10.0		
10	90	0.10	1.48	810.5	523	242	238	56	51	89	84	10.0		
11	100	0.10	1.48	817.3	523	240	240	57	52	90	85	10.0		
12	110	0.09	1.35	824.1	519	238	240	56	53	91	85	9.5		
STOP	120			830.584										Stop 14:32
A1	120	0.05	0.74	830.584	515	235	236	59	58	86	85	7.0		Start 14:36
2	130	0.05	0.74	835.5	518	240	238	58	56	88	85	7.0		
3	140	0.06	0.89	840.5	520	243	240	59	52	87	85	7.5		
4	150	0.06	0.89	845.9	522	244	240	59	52	86	84	7.5		
5	160	0.07	1.04	851.0	52[illegible]	243	240	59	52	87	84	8.5		
6	170	0.10	1.48	856.7	526	240	238	55	50	87	84	9.0		
7	180	0.14	2.08	863.1	527	242	242	56	51	89	85	11.0		
8	190	0.13	1.95	871.0	523	238	240	55	51	90	85	11.0		
9	200	0.15	2.25	878.4	526	231	238	55	47	90	85	12.0		
10	210	0.09	1.35	886.7	526	235	239	56	48	90	85	10.0		
11	220	0.13	1.93	893.5	490	242	239	56	50	88	84	11.0		
12	230	0.08	1.20	901.0	497	240	240	58	51	89	84	9.0		
STOP	240			907.550										
TOTALS									AVG. TEMP:					

ENSR

Method 2 Gas Velocity and Volume Data Sheet

Plant: CPM
Date: 7/17/96
Run No. 1
Stack Diameter (in): 46"
Barometric Pressure ("Hg): _____
Static Pressure in Stack (Ps)("Hg): .19" H_2O
Operators: P. Kolman, D. Caron
Cp: 0.84



SCHEMATIC OF STACK CROSS SECTION

FIELD DATA Port Nipple 3 3/4"

Traverse Point Number	Position (Inches)	Velocity Head (Δ Ps) ("H2O)	Stack Temp. (°F)	Cyclonic Flow Determination: Angle ( ) which yields a null Δ P	Sq. rt. of Δ P
A 1	2.1	.07	520	20	
2	6.7	.05	529	21	
3	11.8	.06	549	24	
4	17.7	.06	552	22	
5	25	.08	560	18	
6	35.6	.09	559	12	
7	64.4	.16	560	1	
8	75.0	.15	562	-2	
9	82.3	.15	561	-5	
10	88.2	.16	560	-6	
11	93.3	.16	554	-12	
12	97.9	.15	550	-18	
		1.34	6616		

Average Angle ( ): _____

A:5144-660

ENSR

Method 2 Gas Velocity and Volume Data Sheet

Plant: CPM
Date: 7/17/96
Run No. 1
Stack Diameter (in): 46"
Barometric Pressure ("Hg):
Static Pressure in Stack (Ps)("Hg): -.19" H_2O
Operators: P. KOHAN, D. CARON
Cp: .84

see sheet 1

SCHEMATIC OF STACK CROSS SECTION

FIELD DATA

Traverse Point Number	Position (Inches)	Velocity Head (▵Ps) ("H2O)	Stack Temp. (°F)	Cyclonic Flow Determination: Angle ( ) which yields a null ▵P	Sq. rt. of ▵P
B1		.07	515	+20	
2		.08	538	+18	
3		.10	550	+19	
4		.11	552	+20	
5		.11	549	+18	
6		.11	547	+17	
7		.06	547	+7	
8		.05	547	-12	
9		.05	545	-21	
10		.06	541	-26	
11		.06	538	-30	
12		.08	538	-36	

Average Angle ( ):

A:5144-660

Avg. 0.095 547

ENSR™

ISOKINETIC SAMPLING PROGRAM
PRELIMINARY SAMPLE TRAIN RECOVERY DATA SHEET
FOR MOISTURE DETERMINATION

Sample Train : M23 - Dioxins				***Recovered by :*** F. Sonquedolce			
Run No. 1	***Date :*** 07/18/96			***Run No.*** 2	***Date :*** 07/18/96		
XAD Module No. :				***XAD Module No. :***			
Filter No. : N/A				***Filter No. :*** N/A			
Impinger No.	Initial Volume (mL)	Final Volume (mL)	Rinse Volume (mL)	Impinger No.	Initial Volume (mL)	Final Volume (mL)	Rinse Volume (mL)
1	0	415		1	0	395	
2	100	95		2	100	95	
3	100	98		3	100	98	
4	0	0		4	0	0	
5				5			
6				6			
7				7			
			DIFF :				DIFF :
Totals	200	608	408	Totals	200	588	388
	Initial Weight (g)	Final Weight (g)	DIFF :		Initial Weight (g)	Final Weight (g)	DIFF :
Silica Gel Impinger	349.4	381.4	32.0	Silica Gel Impinger	297.5	328.0	30.5
Net H_2O Gain, mL	440			Net H_2O Gain, mL	418.5		

ENSR™

ISOKINETIC SAMPLING PROGRAM
PRELIMINARY SAMPLE TRAIN RECOVERY DATA SHEET
FOR MOISTURE DETERMINATION

Sample Train : M23 - Dioxins				***Recovered by :*** F. Sanguedolce			
Run No. 3 ***Date :*** 07/18/96				***Run No.*** ***Date :***			
XAD Module No. :				***XAD Module No. :***			
Filter No. : N/A				***Filter No. :***			
Impinger No.	Initial Volume (mL)	Final Volume (mL)	Rinse Volume (mL)	Impinger No.	Initial Volume (mL)	Final Volume (mL)	Rinse Volume (mL)
1	0	388		1			
2	100	101		2			
3	100	95		3			
4	0	0		4			
5				5			
6				6			
7				7			
			DIFF :				DIFF :
Totals	200	584	384	Totals			
	Initial Weight (g)	Final Weight (g)	DIFF :		Initial Weight (g)	Final Weight (g)	DIFF :
Silica Gel Impinger	341.2	371.2	30.0	Silica Gel Impinger			
Net H_2O Gain, mL	414.0			Net H_2O Gain, mL			

ENSR Consulting and Engineering

DRY GAS METER ANNUAL CALIBRATION

Meter Box No. : **80611**

Operator : Katie Meschede
Date : 13-Mar-96
Barometric Pressure : **29.26 in. Hg**
Wet Test Meter
Calibration Coefficient : **1.0000**

Pretest Leak Checks :

	Allowed	Actual
Positive	0	0
(at 5 - 7 in. H_2O)	in. H_2O per min.	
Negative	0.005	0
(at 3 in. Hg)	cfm	cfm

ΔH	Vw	Vm	Tw	Ti	To	Tm	ϕ	γ	ΔHα
Orifice Pressure ΔH (in. H_2O)	Volume: Wet Meter (ft^3)	Volume: Dry Meter (ft^3)	Meter Temperature Readings: Wet Meter (°F)	Dry Meter: In (°F)	Dry Meter: Out (°F)	Dry Meter: Avg (°F)	Time ϕ (min.)	Calib. Coeff. γ —	ΔHα (in. H_2O)
0.50	5.0	5.261	68.5	90	87.5	88.8	13.33	0.9856	1.9766
1.00	5.0	5.225	69.0	92	88.5	90.3	9.28	0.9929	1.9161
1.50	10.0	10.402	69.0	95	90.0	92.5	15.69	1.0003	2.0483
2.00	10.0	10.367	69.0	98	91.5	94.8	13.54	1.0065	2.0284
3.00	10.0	10.246	69.5	99.5	92.5	96.0	11.07	1.0172	2.0339
4.00	10.0	10.238	70.0	102	93.5	97.8	9.5	1.0177	1.9974
							AVGS:	**1.0033**	**2.0001**

γ = Ratio of reading of wet test meter to dry test meter (dimensionless); tolerance for individual values is ± 0.02 from the average.

ΔHα = Orifice pressure differential (in. H_2O) that equates to 0.75 cfm of air at 68°F and 29.92 in. Hg; tolerance for individual values is ± 0.20 from the average.

Potentiometer Calibration :		
Low	0° F	
Mid	450° F	
High	950° F	

Dry Gas Meter Thermocouple Calibration

		Inlet ID# :		Outlet ID# :	
Ref	Ref, ° F	Inlet, ° F	Δ	Outlet, ° F	Δ
Amb. Air	33.0	35.0	0.0	35.0	-2.0
Hot Water	210.0	211.0	-1.0	211.0	-1.0

Note : Hot Water to be in the range of 104 - 122 ° F.
Tolerance allowed for all individual readings : ± 5.4 ° F

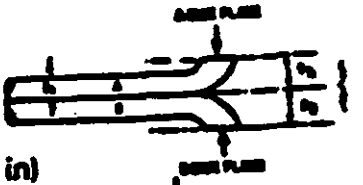
CRITERIA FOR ASSIGNING A BASELINE COEFFICIENT VALUE OF 0.84 (Cp) TO AN "S" TYPE PITOT TUBE SAMPLING APPARATUS

DATE: 03/11/96 PROBE # (Pitot \ Thermocouple) MS-5'-D

MEASUREMENTS AND OBSERVATIONS BY : P. Khan

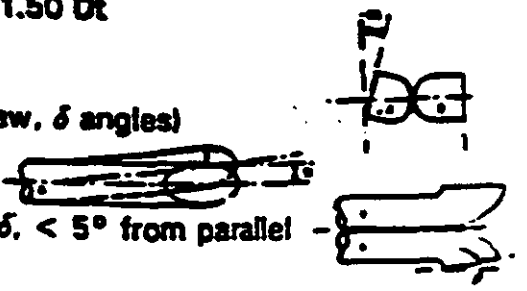
1) ***All construction criteria for an isolated "S" type pitot are within given tolerances prescribed in Federal Register, Vol. 42, # 160 of Thursday, August 18, 1977 and Code of Federal Regulations Title 40, Part 60, Appendix A, Method 2***

REQUIRED MEASUREMENTS



(a) External tubing diameter (pitot tube)
Dt = .375 in
Tolerance Dt: ≥ 0.48 ≤ 0.95 cm (3/16 to 3/8 in)

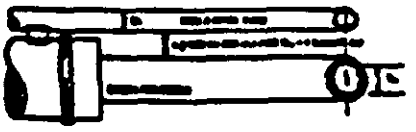
(b) Base to opening plane distance
Pa = .50 =Pb
P = 1.055
Tolerance P, Pa = Pb and 1.05Dt to 1.50 Dt



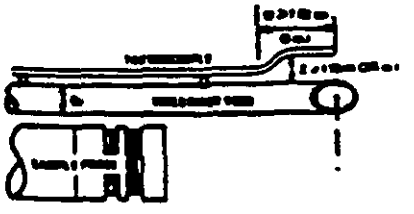
(c) Face opening planes alignment (yaw, δ angles)
W = 0
δ = 1°
Tolerance W, < 1/32 in; Tolerance δ, < 5° from parallel

2) ***All Assembly criteria to prevent aerodynamic interference for a sampling apparatus of a "S" type pitot, nozzle, and thermocouple, are within given tolerances prescribed in Federal Register, Vol. 42, No. 160 - Thursday, August 18, 1977.***

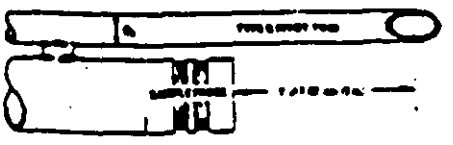
REQUIRED MEASUREMENTS



(a) Pitot to nozzle separation
Dn = .500 in
X = .800 in
Tolerance X, ≥ 1.9 cm (3/4 in) with 1.3 cm (1/2 in) Dn



(b) Thermocouple to pitot separation
Z = 1.1 in
Tolerance Z, ≥ 1.9 cm (3/4 in)



(c) Pitot end to probe sheath distance
Y = 3.1 in
Tolerance Y, ≥ 7.62 cm (3.0 in)

Date 03/11/96 Thermocouple number MS-5'-D

Ambient temperature _____ °F Barometric pressure _____ in. Hg

Calibrator P. Kohan Reference: mercury-in-glass ASTM

other _____

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
32°	ICE WATER	32°	32°	—
212°	BOILING WATER	212°	211°	.15%
—	TUBE FURNACE	608°	603°	.47%

[a] Type of calibration system used.

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

Figure 2.5 Stack temperature sensor calibration data form.

NOZZLE CALIBRATION

Date 07/17/96 CPM-VT Calibrated By: F. Sanguedolce

Nozzle Identification Number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	$D_{AVERAGE}$
Q-.393	0.393	0.393	0.394	0.001	0.393
Q-.500	0.502	0.500	0.499	0.003	0.500
Q-.410	0.409	0.410	0.410	0.001	0.410

Where:

$D_{1,2,3}$ = Nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = Maximum difference in any two measurements, in. Tolerance = 0.004 in.

$D_{AVERAGE}$ = Average of D1, D2, and D3

Alternative Method 5 Post-Test Calibration

INTRODUCTION AND BACKGROUND

EPA Method 5 requires the calibration of the metering system after each field use. Because the post-test calibration requires the use of a spirometer or wet test meter, the calibration is often conducted in the laboratory. However, a field calibration procedure is highly desirable for two reasons: (1) it eliminates questions about the possibility of the damage to the metering system occurring during transport and (2) it eliminates travel costs for a retest if the metering system fails the post-test calibration.

The alternative post-test calibration procedure described below is based on the principles of the optional pretest orifice meter coefficient check in Section 4.4.1 of Method 5. Since the orifice meter coefficient check will not detect leakages between the inlet of the metering system and the dry gas meter, the alternative procedure includes two additional steps: (1) a leak check from either the inlet of the sampling train or the inlet of the metering system and (2) a leak check of that portion of the sampling train from the pump to the orifice meter.

PROCEDURE

The alternative to the post-test calibration in Section 5.3.2 of Method 5 is as follows:

After each test run, do the following:

1. Ensure that the metering system has passed the post-test leak-check. If not, conduct a leak-check of the metering system from its inlet.

2. Conduct the leak-check of that portion of the train from the pump to the orifice meter as described in Section 5.6 of Method 5.

3. Calculate Y_{qa} for each test run using the following equation:

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319\,T_m}{\Delta H_@\left(P_b + \Delta\frac{H_{avg}}{13.6}\right)}\frac{29}{M_d}}\;(\sqrt{\Delta H})_{avg}$$

Prepared by Michael K. Ciolek, EMB
Technical Support Division, OAQPS

EMTIC GD-26
June 21, 1994

where:

Y_{qa} = dry gas meter calibration check value, dimensionless.
θ = total run time, min.
V_m = total sample volume measured by dry gas meter, dcf.
T_m = absolute average dry gas meter temp., °R.
P_b = barometric pressure, in. Hg.
0.0319 = $(29.92/528)(0.75)^2$ (in. Hg/°/R) cfm^2.

ΔH_{avg} = average orifice meter differential, in. H_2O.
$\Delta H@$ = orifice meter calibration coefficient, in. H_2O.
M_d = dry molecular weight of stack gas, lb/lb-mole.
29 = dry molecular weight of air, lb/lb-mole.
13.6 = specific gravity of mercury.

After each test run series, do the following:

4. Average the three or more Y_{qa}'s obtained from the test run series and compare this average Y_{qa} with the dry gas meter calibration factor, Y. The average Y_{qa} must be within 5 percent of Y.

5. If the average Y_{qa} does not meet the ±5 percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

REFERENCE

Roger T. Shigehara, P.G. Royals, and E.W. Steward, "Alternative Method 5 Post-Test Calibration", Entropy, Inc, contained in the EMTIC TSAR Library.

APPENDIX B

Laboratory Analysis Reports

ALTA

July 11, 1996

Mr. Doug Roeck
ENSR Consulting and Engineering, Inc.
35 Nagog Park
Acton, MA 01720

Dear Mr. Roeck,

Enclosed are six cleaned and pre-spiked resin cartridges for the analysis of polychlorinated-dibenzo dioxins and furans (PCDD/F) by USEPA Method 23 by HRMS. Also enclosed are seven 110mm cleaned filters and six cleaned petri-dish sets.

For best analytical results we recommend that acetone and toluene be used for glassware rinsing. We also recommend that the contents of each bottle are noted on the label.

If you should have any questions, please do not hesitate to call me at (916)-933-1640.

Sincerely,

Melanee Schuld

Melanee Schuld
Associate Scientist

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
FAX (916) 933-0940
(916) 933-1640

ALTA

7/24/96

Mr. Doug Roeck
ENSR Consulting and Engineering
35 Nagog Park
Acton, MA 01720
USA

Dear Mr. Roeck,

The samples listed in the sample inventory were received by Alta Analytical Laboratory on 7/23/96. Attached is a copy of the chain-of-custody (C-O-C) or other documentation for your records. Please refer to ALTA's terms and conditions on the reverse side of this document.

Analytical results are scheduled to be reported to you on or about 8/13/96. All sample containers and their contents will be disposed of 90 days subsequent to issuance of a final written report.

Please contact me if you have any questions regarding the status of the work associated with these samples at (916) 933-1640.

For rapid telephone assistance, please refer to the Laboratory Identification Number **2696** when requesting information.

Sincerely,

Robert S. Mitzel
Alta Analytical Laboratory

sclist1

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
FAX (916) 933-0940
(916) 933-1640

ALTA

Sample Inventory Report

Project No.: 2696 **Project Name:** GENERAL ANALYTICAL PROGRAM
Date Rec.: 7/23/96

Lab. Sample ID	Client Sample ID	SGI Component Type
0001	BLNK-FILTER	Filter#1
0001	BLK-TOLUENE	Solvent#1
0001	BLK-XAD	XAD#1
0002	RUN1-FILTER	Filter#1
0002	RUN1-TOLUENE	Solvent#1
0002	RUN1-XAD	XAD#1
0003	RUN2-FILTER	Filter#1
0003	RUN2-TOLUENE	Solvent#1
0003	RUN2-XAD	XAD#1
0004	RUN3-FILTER	Filter#1
0004	RUN3-TOLUENE	Solvent#1
0004	RUN3-XAD	XAD#1

ENSR

SAMPLE TRACEABILITY LIST

Site of Program :	VT/CPM, Inc.	**Sample Date :**	**Project Location**	**Laboratory**	**Lab BOA / WO#'s.**
Type of Program :	boiler emission test program	**Date Shipped :**	EAST RYGATE , VT	**ALTA Analytical**	**#91163**
Project No. :	6354-001-200	**Cooler No. :**			
Program Office :	ACTON	**Sampler (print name) :**	COC # :		
Program Contact :	Doug Roeck	Signature :	Airbill No. :		

Item	Sample ID Code	Sample Matrix	Sample Description	Analytical Parameters	Analytical Laboratory	Special Instructions
1	M23-PF-R1	Solid / Filter	Method 23 Particulate Filter, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
2	M23-XAD-R1	XAD2 Resin	Method 23 XAD Resin Trap, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
3	M23-AC/TOL-R1	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
4	M23-PF-R2	Solid / Filter	Method 23 Particulate Filter, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
5	M23-XAD-R2	XAD2 Resin	Method 23 XAD Resin Trap, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
6	M23-AC/TOL-R2	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
7	M23-PF-R3	Solid / Filter	Method 23 Particulate Filter, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
8	M23-XAD-R3	XAD2 Resin	Method 23 XAD Resin Trap, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
9	M23-AC/TOL-R3	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
10						
11						
12	M23-PF-BLNK	Solid / Filter	Method 23 Particulate Filter, Field Blank#1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
13	M23-XAD-BLNK	XAD2 Resin	Method 23 XAD Resin Trap, Field Blank#1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
14	M23-ACE/TOL-BLNK	Acetone and Toluene	Method 23 Acetone and Toluene, Field Blank #1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
15						
16						
17						
18						

Field Notes / Comments:

A. Please return this form with analytical results.

B. Please return any DOT Shipping boxes inside other plain packaging.

Relinquished by : FRED SANGUEDOLCE	Date: 07/22/96	Received by :	Date :
Signature: Fred Sanguedolce	Time: 1530	Signature:	Time :
Relinquished by :	Date:	Received by :	Date :
Signature:	Time:	Signature:	Time :

Analytical Laboratory (Destination):
Alta Analytical Laboratory, Inc.
5070 Robert J. Matthews Pkway Suite 2
El Dorado Hills, CA 95630 Attn: Bob Mitzel

Received by @ Lab : KEN FITT Date : 7-23-96

Signature: ALTA Time : 1000

ALTA

August 13, 1996

Alta Batch I.D.: 2696

Mr. Doug Roeck
ENSR Consulting and Engineering
35 Nagog Park
Acton, MA 01720

Dear Mr. Roeck,

Enclosed are the results for the four M23 trains received at Alta Analytical Laboratory on July 23, 1996. This work was authorized under your Work Order #91163 52. These trains were analyzed using EPA Method 23 for tetra to octa chlorinated dioxins and furans. A standard turnaround time was requested for this work.

The following report consists of a Sample Inventory (Section I), Analytical Results (Section II) and the Appendix. The Appendix contains a copy of the chain-of-custody, a list of data qualifiers and abbreviations and copies of the raw data (if requested).

If you have any questions regarding this report please feel free to contact me.

Sincerely,

Robert S. Mitzel
Director of Air Toxics

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
FAX (916) 933-0940
(916) 933-1640

ALTA

Sample Inventory Report

Project No.: 2696 **Project Name:** GENERAL ANALYTICAL PROGRAM
Date Rec.: 7/23/96

Lab. Sample ID	Client Sample ID	SGI Component Type
0001	BLNK-FILTER	Filter#1
0001	BLK-TOLUENE	Solvent#1
0001	BLK-XAD	XAD#1
0002	RUN1-FILTER	Filter#1
0002	RUN1-TOLUENE	Solvent#1
0002	RUN1-XAD	XAD#1
0003	RUN2-FILTER	Filter#1
0003	RUN2-TOLUENE	Solvent#1
0003	RUN2-XAD	XAD#1
0004	RUN3-FILTER	Filter#1
0004	RUN3-TOLUENE	Solvent#1
0004	RUN3-XAD	XAD#1

SECTION II.

ALTA

PCDD & PCDF
EPA METHOD 23

METHOD BLANK
Lab ID: 2696-0001-MB
Matrix: M23

Date Received: NA
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: pg/sample

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.74			
Total TCDD	ND	0.92			
1,2,3,7,8-PeCDD	ND	0.65			
Total PeCDD	ND	0.65			
1,2,3,4,7,8-HxCDD	ND	1.6			
1,2,3,6,7,8-HxCDD	ND	1.5			
1,2,3,7,8,9-HxCDD	ND	1.5			
Total HxCDD	ND	1.6			
1,2,3,4,6,7,8-HpCDD	ND	2.4			
Total HpCDD	ND	2.4			
OCDD	ND	6.8			
2,3,7,8-TCDF	ND	3.0			
Total TCDF	ND	3.2			
1,2,3,7,8-PeCDF	ND	1.3			
2,3,4,7,8-PeCDF	ND	1.2			
Total PeCDF	ND	1.3			
1,2,3,4,7,8-HxCDF	ND	0.90			
1,2,3,6,7,8-HxCDF	ND	0.78			
2,3,4,6,7,8-HxCDF	ND	0.88			
1,2,3,7,8,9-HxCDF	ND	1.2			
Total HxCDF	ND	1.2			
1,2,3,4,6,7,8-HpCDF	ND	0.90			
1,2,3,4,7,8,9-HpCDF	ND	1.1			
Total HpCDF	ND	1.1			
OCDF	ND	2.6			

Analyst: [signature]

Reviewer: [signature]

ALTA

PCDD & PCDF
EPA METHOD 23

METHOD BLANK
Lab ID: 2696-0001-MB

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	104	0.77	
^{13}C-1,2,3,7,8-PeCDD	98	1.55	
^{13}C-1,2,3,6,7,8-HxCDD	103	1.21	
^{13}C-1,2,3,4,6,7,8-HpCDD	90	1.05	
^{13}C-OCDD	92	0.90	
^{13}C-2,3,7,8-TCDF	98	0.79	
^{13}C-1,2,3,7,8-PeCDF	107	1.58	
^{13}C-1,2,3,6,7,8-HxCDF	78	0.53	
^{13}C-1,2,3,4,6,7,8-HpCDF	92	0.46	
Pre-spike Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	NA	NA	
^{13}C-2,3,4,7,8-PeCDF	NA	NA	
^{13}C-1,2,3,4,7,8-HxCDD	NA	NA	
^{13}C-1,2,3,4,7,8-HxCDF	NA	NA	
^{13}C-1,2,3,4,7,8,9-HpCDF	NA	NA	
Alternate Recovery Standard:			
^{13}C-1,2,3,7,8,9-HxCDF	110	0.52	

Dates Analyzed:

DB-5: 8/12/96 **DB-225:** NA **SP-2331:** NA

Analyst: _____ **Reviewer:** _____

ALTA

PCDD & PCDF
EPA METHOD 23

LCS RESULTS
Lab ID: 2696-LCS1/LCS2
Matrix: M23

Date Received: NA
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: NA

Compound	LCS1 % R	LCS2 % R	RPD %
2,3,7,8-TCDD	94	93	1.1
1,2,3,7,8-PeCDD	102	105	2.9
1,2,3,4,7,8-HxCDD	97	89	8.6
1,2,3,6,7,8-HxCDD	101	103	2.0
1,2,3,7,8,9-HxCDD	92	92	0.0
1,2,3,4,6,7,8-HpCDD	105	107	1.9
OCDD	108	110	1.8
2,3,7,8-TCDF	96	101	5.1
1,2,3,7,8-PeCDF	108	109	0.92
2,3,4,7,8-PeCDF	85	97	13
1,2,3,4,7,8-HxCDF	113	118	4.3
1,2,3,6,7,8-HxCDF	109	110	0.91
2,3,4,6,7,8-HxCDF	100	107	6.8
1,2,3,7,8,9-HxCDF	126	130	3.1
1,2,3,4,6,7,8-HpCDF	107	111	3.7
1,2,3,4,7,8,9-HpCDF	139	147	5.6
OCDF	111	109	1.8

Analyst: [signature]

Reviewer: [signature]

ALTA

PCDD & PCDF
EPA METHOD 23

LCS RESULTS
Lab ID: 2696-LCS1/LCS2

Isotopic Recovery Results

Internal Standard:	LCS1 % R	LCS2 % R
^{13}C-2,3,7,8-TCDD	95	125
^{13}C-1,2,3,7,8-PeCDD	122	131
^{13}C-1,2,3,6,7,8-HxCDD	86	101
^{13}C-1,2,3,4,6,7,8-HpCDD	82	87
^{13}C-OCDD	73	94
^{13}C-2,3,7,8-TCDF	84	99
^{13}C-1,2,3,7,8-PeCDF	134	129
^{13}C-1,2,3,6,7,8-HxCDF	64	66
^{13}C-1,2,3,4,6,7,8-HpCDF	75	86

Dates Analyzed:

DB-5: 8/13/96 **DB-225:** NA **SP-2331:** NA

Analyst: _____ **Reviewer:** _____

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Blank
Lab ID: 2696-0001-SA
Matrix: M23

Date Received: 7/23/96
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: pg/sample

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	1.0			
Total TCDD	ND	1.0			
1,2,3,7,8-PeCDD	ND	1.5			
Total PeCDD	ND	1.5			
1,2,3,4,7,8-HxCDD	ND	1.8			
1,2,3,6,7,8-HxCDD	ND	1.6			
1,2,3,7,8,9-HxCDD	ND	1.6			
Total HxCDD	ND	1.8			
1,2,3,4,6,7,8-HpCDD	ND	3.1			
Total HpCDD	ND	3.1			
OCDD	20		0.80	>10:1	A
2,3,7,8-TCDF	ND	1.1			
Total TCDF	ND	1.1			
1,2,3,7,8-PeCDF	ND	1.6			
2,3,4,7,8-PeCDF	ND	1.5			
Total PeCDF	ND	1.6			
1,2,3,4,7,8-HxCDF	ND	1.6			
1,2,3,6,7,8-HxCDF	ND	1.4			
2,3,4,6,7,8-HxCDF	ND	1.5			
1,2,3,7,8,9-HxCDF	ND	1.8			
Total HxCDF	ND	1.8			
1,2,3,4,6,7,8-HpCDF	ND	2.0			
1,2,3,4,7,8,9-HpCDF	ND	2.0			
Total HpCDF	ND	2.0			
OCDF	5.6		0.90	8:1	A

Analyst: SVG

Reviewer: [illegible]

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Blank
Lab ID: 2696-0001-SA

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	98	0.77	
^{13}C-1,2,3,7,8-PeCDD	87	1.54	
^{13}C-1,2,3,6,7,8-HxCDD	98	1.22	
^{13}C-1,2,3,4,6,7,8-HpCDD	87	1.06	
^{13}C-OCDD	86	0.88	
^{13}C-2,3,7,8-TCDF	92	0.80	
^{13}C-1,2,3,7,8-PeCDF	93	1.58	
^{13}C-1,2,3,6,7,8-HxCDF	74	0.52	
^{13}C-1,2,3,4,6,7,8-HpCDF	85	0.44	
Pre-spike Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	97	NA	
^{13}C-2,3,4,7,8-PeCDF	89	1.59	
^{13}C-1,2,3,4,7,8-HxCDD	73	1.24	
^{13}C-1,2,3,4,7,8-HxCDF	99	0.53	
^{13}C-1,2,3,4,7,8,9-HpCDF	126	0.45	
Alternate Recovery Standard:			
^{13}C-1,2,3,7,8,9-HxCDF	114	0.52	

Dates Analyzed:

DB-5: 8/12/96 **DB-225:** NA **SP-2331:** NA

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 1
Lab ID: 2696-0002-SA
Matrix: M23

Date Received: 7/23/96
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: pg/sample

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	1.6			
Total TCDD	22		0.81	>10:1	
1,2,3,7,8-PeCDD	ND	1.2			
Total PeCDD	9.2		1.47	>10:1	A
1,2,3,4,7,8-HxCDD	1.7		1.20	3:1	A
1,2,3,6,7,8-HxCDD	3.5		1.35	5:1	A
1,2,3,7,8,9-HxCDD	2.5		1.31	3:1	A
Total HxCDD	29		1.20	>10:1	A
1,2,3,4,6,7,8-HpCDD	16		0.98	>10:1	A
Total HpCDD	30		1.03	>10:1	A
OCDD	58		0.90	>10:1	A
2,3,7,8-TCDF	4.4		0.72	8:1	A
Total TCDF	73		0.70	>10:1	
1,2,3,7,8-PeCDF	4.3		1.51	4:1	A
2,3,4,7,8-PeCDF	3.4		1.52	5:1	A
Total PeCDF	44		1.55	>10:1	A
1,2,3,4,7,8-HxCDF	6.0		1.25	>10:1	A
1,2,3,6,7,8-HxCDF	5.7		1.22	>10:1	A
2,3,4,6,7,8-HxCDF	5.0		1.17	>10:1	A
1,2,3,7,8,9-HxCDF	ND	2.2			
Total HxCDF	40		1.31	>10:1	A
1,2,3,4,6,7,8-HpCDF	29		1.05	>10:1	A
1,2,3,4,7,8,9-HpCDF	6.0		1.11	>10:1	A
Total HpCDF	49		1.05	>10:1	A
OCDF	33		0.85	>10:1	A

Analyst: [signature]

Reviewer: [signature]

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 1
Lab ID: 2696-0002-SA

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	114	0.77	
^{13}C-1,2,3,7,8-PeCDD	102	1.55	
^{13}C-1,2,3,6,7,8-HxCDD	89	1.21	
^{13}C-1,2,3,4,6,7,8-HpCDD	83	1.05	
^{13}C-OCDD	88	0.89	
^{13}C-2,3,7,8-TCDF	92	0.80	
^{13}C-1,2,3,7,8-PeCDF	117	1.58	
^{13}C-1,2,3,6,7,8-HxCDF	86	0.52	
^{13}C-1,2,3,4,6,7,8-HpCDF	82	0.45	
Pre-spike Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	91	NA	
^{13}C-2,3,4,7,8-PeCDF	77	1.57	
^{13}C-1,2,3,4,7,8-HxCDD	93	1.21	
^{13}C-1,2,3,4,7,8-HxCDF	95	0.53	
^{13}C-1,2,3,4,7,8,9-HpCDF	118	0.45	
Alternate Recovery Standard:			
^{13}C-1,2,3,7,8,9-HxCDF	89	0.53	

Dates Analyzed:

DB-5: 8/12/96 **DB-225:** NA **SP-2331:** NA

Analyst: _____ **Reviewer:** _____

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 2
Lab ID: 2696-0003-SA
Matrix: M23

Date Received: 7/23/96
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: pg/sample

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	1.1			
Total TCDD	14		0.66	>10:1	
1,2,3,7,8-PeCDD	ND	1.7			
Total PeCDD	5.2		1.75	4:1	A
1,2,3,4,7,8-HxCDD	2.2		1.15	3:1	A
1,2,3,6,7,8-HxCDD	4.7		1.41	4:1	A
1,2,3,7,8,9-HxCDD	3.2		1.28	3:1	A
Total HxCDD	32		1.25	>10:1	A
1,2,3,4,6,7,8-HpCDD	41		0.99	>10:1	A
Total HpCDD	68		1.02	>10:1	
OCDD	120		0.89	>10:1	
2,3,7,8-TCDF	4.2		0.77	9:1	A
Total TCDF	38		0.71	>10:1	
1,2,3,7,8-PeCDF	5.1		1.41	9:1	A
2,3,4,7,8-PeCDF	2.8		1.67	4:1	A
Total PeCDF	31		1.75	>10:1	A
1,2,3,4,7,8-HxCDF	8.3		1.30	>10:1	A
1,2,3,6,7,8-HxCDF	7.5		1.14	>10:1	A
2,3,4,6,7,8-HxCDF	8.6		1.24	>10:1	A
1,2,3,7,8,9-HxCDF	5.3		1.20	4:1	A
Total HxCDF	61		1.41	>10:1	A
1,2,3,4,6,7,8-HpCDF	49		1.05	>10:1	A
1,2,3,4,7,8,9-HpCDF	18		1.07	>10:1	A
Total HpCDF	110		1.05	>10:1	
OCDF	95		0.89	>10:1	A

Analyst: LAy

Reviewer: [signature]

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 2
Lab ID: 2696-0003-SA

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	101	0.77	
^{13}C-1,2,3,7,8-PeCDD	101	1.55	
^{13}C-1,2,3,6,7,8-HxCDD	95	1.20	
^{13}C-1,2,3,4,6,7,8-HpCDD	92	1.05	
^{13}C-OCDD	98	0.89	
^{13}C-2,3,7,8-TCDF	106	0.79	
^{13}C-1,2,3,7,8-PeCDF	95	1.57	
^{13}C-1,2,3,6,7,8-HxCDF	89	0.52	
^{13}C-1,2,3,4,6,7,8-HpCDF	91	0.44	
Pre-spike Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	94	NA	
^{13}C-2,3,4,7,8-PeCDF	93	1.58	
^{13}C-1,2,3,4,7,8-HxCDD	82	1.20	
^{13}C-1,2,3,4,7,8-HxCDF	94	0.52	
^{13}C-1,2,3,4,7,8,9-HpCDF	123	0.45	
Alternate Recovery Standard:			
^{13}C-1,2,3,7,8,9-HxCDF	100	0.53	

Dates Analyzed:

DB-5: 8/12/96 **DB-225:** NA **SP-2331:** NA

Analyst: _____ **Reviewer:** _____

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 3
Lab ID: 2696-0004-SA
Matrix: M23

Date Received: 7/23/96
Date Extracted: 8/6/96
Sample Amount: Sample

ICAL ID: ICARB
QC Lot: LC0806M
Units: pg/sample

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	2.6			
Total TCDD	110		0.75	>10:1	
1,2,3,7,8-PeCDD	ND	1.3			
Total PeCDD	7.0		1.48	6:1	A
1,2,3,4,7,8-HxCDD	ND	1.9			
1,2,3,6,7,8-HxCDD	3.1		1.21	4:1	A
1,2,3,7,8,9-HxCDD	ND	1.7			
Total HxCDD	16		1.27	>10:1	A
1,2,3,4,6,7,8-HpCDD	17		1.01	>10:1	A
Total HpCDD	31		1.07	>10:1	A
OCDD	120		0.87	>10:1	
2,3,7,8-TCDF	4.1		0.89	7:1	A
Total TCDF	39		0.87	>10:1	
1,2,3,7,8-PeCDF	3.1		1.40	5:1	A
2,3,4,7,8-PeCDF	2.1		1.56	3:1	A
Total PeCDF	24		1.50	8:1	A
1,2,3,4,7,8-HxCDF	5.0		1.11	6:1	A
1,2,3,6,7,8-HxCDF	4.9		1.36	6:1	A
2,3,4,6,7,8-HxCDF	4.5		1.24	6:1	A
1,2,3,7,8,9-HxCDF	ND	2.3			
Total HxCDF	32		1.33	>10:1	A
1,2,3,4,6,7,8-HpCDF	30		1.07	>10:1	A
1,2,3,4,7,8,9-HpCDF	6.4		1.19	>10:1	A
Total HpCDF	52		1.07	>10:1	
OCDF	36		0.88	>10:1	A

Analyst: _____

Reviewer: _____

ALTA

PCDD & PCDF
EPA METHOD 23

Sample ID: Run 3
Lab ID: 2696-0004-SA

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	86	0.77	
^{13}C-1,2,3,7,8-PeCDD	91	1.69	
^{13}C-1,2,3,6,7,8-HxCDD	97	1.21	
^{13}C-1,2,3,4,6,7,8-HpCDD	103	1.05	
^{13}C-OCDD	103	0.89	
^{13}C-2,3,7,8-TCDF	108	0.79	
^{13}C-1,2,3,7,8-PeCDF	88	1.58	
^{13}C-1,2,3,6,7,8-HxCDF	83	0.53	
^{13}C-1,2,3,4,6,7,8-HpCDF	95	0.44	
Pre-spike Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	95	NA	
^{13}C-2,3,4,7,8-PeCDF	103	1.57	
^{13}C-1,2,3,4,7,8-HxCDD	82	1.20	
^{13}C-1,2,3,4,7,8-HxCDF	98	0.53	
^{13}C-1,2,3,4,7,8,9-HpCDF	120	0.44	
Alternate Recovery Standard:			
^{13}C-1,2,3,7,8,9-HxCDF	98	0.52	

Dates Analyzed:

DB-5: 8/13/96 **DB-225:** NA **SP-2331:** NA

Analyst: [signature]

Reviewer: [signature]

APPENDIX

DATA QUALIFIERS & ABBREVIATIONS

A	**The amount detected is below the Method Calibration Limit.**
B	**This compound was also detected in the blank.**
C	**The amount detected is less than five times the Method Quantitation Limit.**
D	**The amount reported is the maximum possible concentration.**
E	**The detection limit was raised above the Method Quantitation Limit due to chemical interferences.**
F	**This result has been confirmed on a DB-225 column.**
G	**This result has been confirmed on a SP-2331 column.**
H	**The signal-to-noise ratio is greater than 10:1.**
I	**Chemical Interference**

Conc.	**Concentration**
D.L.	**Detection Limit**
NA	**Not applicable**
S/N	**Signal-to-noise**
*****	**See Cover Letter**
ND	**Not Detected**
MPC	**Maximum Possible Concentration**

ENSR

SAMPLE TRACEABILITY LIST

Site of Program :	VT/CPM, Inc.	**Sample Date :**	**Project Location**	**Laboratory**	**Lab BOA / WO#'s.**
Type of Program :	boiler emission test program	**Date Shipped :**	EAST RYGATE , VT	**ALTA Analytical**	**#91163**
Project No. :	6354-001-200	**Cooler No. :**			
Program Office :	ACTON	**Sampler (print name) :**	COC # :		
Program Contact :	Doug Roeck	Signature :	Airbill No. :		

Item	Sample ID Code	Sample Matrix	Sample Description	Analytical Parameters	Analytical Laboratory	Special Instructions
1	M23-PF-R1	Solid / Filter	Method 23 Particulate Filter, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
2	M23-XAD-R1	XAD2 Resin	Method 23 XAD Resin Trap, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
3	M23-AC/TOL-R1	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
4	M23-PF-R2	Solid / Filter	Method 23 Particulate Filter, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
5	M23-XAD-R2	XAD2 Resin	Method 23 XAD Resin Trap, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
6	M23-AC/TOL-R2	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 2	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
7	M23-PF-R3	Solid / Filter	Method 23 Particulate Filter, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
8	M23-XAD-R3	XAD2 Resin	Method 23 XAD Resin Trap, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
9	M23-AC/TOL-R3	Acetone and Toluene	Method 23 Aceton and Toluene Rinse, Run 3	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
10						
11						
12	M23-PF-BLNK	Solid / Filter	Method 23 Particulate Filter, Field Blank#1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
13	M23-XAD-BLNK	XAD2 Resin	Method 23 XAD Resin Trap, Field Blank#1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
14	M23-ACE/TOL-BLNK	Acetone and Toluene	Method 23 Acetone and Toluene, Field Blank #1	PCDDs/PCDFs	ALTA, El Dorado Hills, CA	
15						
16						
17						
18						

Field Notes / Comments:

A. Please return this form with analytical results.

B. Please return any DOT Shipping boxes inside other plain packaging.

Relinquished by : FRED SANGUEDOLCE	Date: 07/22/96	Received by :	Date :	**Analytical Laboratory (Destination):** **Alta Analytical Laboratory, Inc.** **5070 Robert J. Matthews Pkway Suite 2** **El Dorado Hills, CA 95630 Attn: Bob Mitzel**
Signature: Fred Sanguedolce	Time: 1530	Signature:	Time :	
Relinquished by :	Date:	Received by :	Date :	Received by @ Lab : KEN FOTT Date : 7-23-96
Signature:	Time:	Signature:	Time :	Signature: ALTA Time : 1000

ALTA Analytical Laboratory

Project No.: 7696

Sample Log-In Checklist	Yes	No
1. Date Samples Arrived: 7-23-96 Initials: SJ		
2. Samples Arrived By: (circle one) Airborne Express Federal Express UPS Emery Freezer Truck Company Courier Other Airborne		
3. Shipping Documentation Present? (circle one) Shipping Label Airbill Tracking Number 6975480 175	X	
4. Shipping Container(s) Intact? If no, describe condition below.	X	
5. Custody Seals Present and Intact? If not intact, describe condition below. No. of Seals _____ or Seal No. _____ Type:(circle) Bottle or Container		X
6. Sample Container Intact? If no, indicate sample condition below.	X	
7. Shipping Preservation: (circle) Ice / Blue Ice / Dry Ice / Ambient / None Temp(°C) 8°		
8. Chain of Custody (COC) or other Sample Documentation Present?	X	
9. COC/Documentation Acceptable? If no, complete COC Anomaly Form.	X	
10. Shipping Container: (circle) ALTA or Client / Return or Retain		
11. Container and/or Bottles Requested?		X
12. Sample Control Check In/Out Log Completed?	X	
*13. Drinking Water Sample? If yes, Acceptable Preservation? (circle) Y or N		X

*Required for HRMS

Name: _____ Date Samples Reconciled: _____
(Signature Required for LCMS Only)

Comments:

INDUSTRIAL TESTING LABORATORIES inc.

2350 S. Seventh Street • St. Louis, Missouri 63104-4296

Chemical Analysis
Materials Testing
Environmental Evaluation

314/771-7111
314/771-9573 FAX

Report No. 96-07-02718

August 30, 1996
(Revised Report 11/27/96)

Examination of three (3) fuel oil samples submitted 7/23/96.

ENSR Consulting
35 Nagog Park
Acton, MA 01720

BOA #91342 WO #35
Attn: Mr. Doug Roeck

TEST REPORT

Sample Description: No. 6 Fuel Oil
Project No.: 6354-001-250
Project Location: East Rygate, VT
Project Name: CPM, Inc., Oiler Emissions Test Program

TEST	Run #1	Run #2	Run #3	TEST METHOD
ULTIMATE ANAL.				
Nitrogen, % by wt.	0.44	0.46	0.46	(1)
Hydrogen, % by wt.	10.10	9.97	10.31	(1)
Carbon, % by wt.	85.47	85.69	85.03	(1)
Oxygen, % by wt.	2.08	2.18	2.49	By difference
Chlorine, % by wt.	0.09	0.05	0.04	
Ash, % by wt.	0.14	<0.1	<0.1	ASTM D-482
PROXIMATE ANAL.				
Heat of Combustion, Btu/lb.	18,398	18,497	18,346	ASTM D-240
Density @ 60°F, lb./gal.	8.24	8.23	8.23	
Density @ 210°F	7.78	7.77	7.77	
Specific Gravity @ 60°F	0.988	0.987	0.987	
Specific Gravity @ 210°F	0.933	0.932	0.932	
Moisture, % by wt.	0.39	0.37	0.35	ASTM D-95

**Results to follow
(1) High Temperature Combustion/Thermal Conductivity Detector.

Method Reference: Annual Book of ASTM Standards

Respectfully Submitted,

INDUSTRIAL TESTING LABORATORIES, INC.

By:

William A. Rorie

Faxed: 8/23/96

LN - 272430 - 432
LB - 68445-47; 68452, 67
MD/kg

Inv. #87608

Report No. 96-07-02718 Page 2

Sample ID: Run #1

Q. C. Data

Sample Description:	No. 6 Fuel Oil
Project No.:	6354-001-250
Project Location:	East Rygate, VT
Project Name:	CPM, Inc., Oiler Emissions Test Program

Parameter	Results (Trial 1)	(Trial 2)
Sulfur	1.68%	1.60%
Nitrogen	0.44%	0.43%
Ash	0.14%	0.11%
Moisture	0.39%	0.40%
Heat of Combustion	18,398 Btu/lb.	18,350 Btu/lb.

INDUSTRIAL TESTING LABORATORIES inc.

2350 S. Seventh Street • St. Louis, Missouri 63104-4296

Chemical Analysis
Materials Testing
Environmental Evaluation

314/771-7111
314/771-9573 FAX

Report No. 96-07-02718

August 30, 1996
(Revised Report 11/27/96)

Examination of three (3) fuel oil samples submitted 7/23/96.

ENSR Consulting
35 Nagog Park
Acton, MA 01720

BOA #91342 WO #35
Attn: Mr. Doug Roeck

TEST REPORT

Sample Description:	No. 6 Fuel Oil
Project No.:	6354-001-250
Project Location:	East Rygate, VT
Project Name:	CPM, Inc., Oiler Emissions Test Program

Sample Identification	Sulfur, % by wt.
Run #1	1.68
Run #2	1.56
Run #3	1.61

Test Method: ASTM D-129

Method Reference: Annual Book of ASTM Standards

Respectfully Submitted,

INDUSTRIAL TESTING LABORATORIES, INC.

By:

William A. Rorie

Faxed: 12/4/96

LN - 272430 - 432
LB - 68447
MD/kg

Inv. #87608

APPENDIX C

Facility Process Data

Facility Operating Data
Page 1 of 3

Run Time/ Date	Time of Reading	Stack Temp. °F	Oxygen %	Oil Meter Reading gals.	Steam Flow 1000 lbs	Steam Press. psi	Oil Temp. at Tanks °F	Oil Temp. at Burners °F	Feed Water Temp. °F	Oil Pump Press. psi
Run 1 07/18/96 15:58-20:26	15:55	597	2.8	2127822	132191.4	225	134	202	210	98
	16:10	605	2.9	2127886	132197.2	225	132	210	210	93
	16:25	605	2.8	2127953	132203.3	225	132	212	210	92
	16:40	604	2.9	2128009	132208.4	225	132	212	210	90
	16:55	598	2.8	2128071	132214.3	225	134	212	210	86
	17:10	602	2.9	2128130	132219.8	225	134	212	210	94
	17:25	598	2.8	2128189	132225.2	225	136	212	210	92
	17:40	597	2.8	2128247	132230.7	225	136	212	210	90
	17:55	598	3.0	2128305	132236.1	225	136	212	210	93
	18:10	607	2.6	2128367	132241.8	225	136	210	205	93
	18:25	596	3.0	2128427	132247.4	225	138	210	210	88
	18:40	594	2.9	2128483	132252.7	225	140	210	210	87
	18:55	598	2.9	2128542	132258.3	225	138	210	210	96
	19:10	607	3.1	2128603	132263.9	225	138	210	210	90
	19:25	590	3.0	2128661	132269.4	225	138	210	210	86
	19:40	589	3.0	2128720	132274.9	225	140	210	210	84
	19:55	592	2.9	2128779	132280.4	225	140	210	210	86
	20:10	596	3.0	2128840	132286.0	225	140	210	210	92
	20:25	605	2.8	2128894	132291.1	225	140	210	215	94
Avgs / Totals		**599**	**2.9**	**1,072**	**99.7**	**225**	**137**	**210**	**210**	**91**

Oil Burned - gal/hr	**238.222**		
Steam Produced - lbs/hr		**22,156**	
Boiler Heat Input - Btu/hr	**34,098,281**		

Fuel Oil Analysis :	**lb/gal =**	**7.78**
	Btu/lb =	**18,398**

Facility Operating Data
Page 2 of 3

Run Time/ Date	Time of Reading	Stack Temp. °F	Oxygen %	Oil Meter Reading gals.	Steam Flow 1000 lbs	Steam Press. psi	Oil Temp. at Tanks °F	Oil Temp. at Burners °F	Feed Water Temp. °F	Oil Pump Press. psi
Run 2 07/18/96 21:30-01:30	21:25	592	3.2	2129134	132313.2	225	140	210	220	86
	21:40	601	2.9	2129192	132318.5	225	140	210	220	94
	21:55	640	2.4	2129261	132324.8	225	140	208	225	110
	22:10	611	3.0	2129342	132332.4	225	140	210	225	94
	22:25	595	3.3	2129390	132336.9	225	140	210	225	86
	22:40	589	2.9	2129440	132341.6	225	140	210	225	86
	22:55	588	2.9	2129505	132347.8	225	140	210	225	88
	23:10	588	2.9	2129557	132352.6	225	140	212	225	92
	23:25	589	2.9	2129612	132357.7	225	140	210	225	86
	23:40	594	2.9	2129673	132363.4	225	140	210	230	84
	23:55	588	2.9	2129728	132368.5	225	140	210	230	90
	00:10	596	3.1	2129796	132374.9	225	140	210	230	88
	00:25	589	2.9	2129844	132379.4	225	140	210	230	90
	00:40	588	3.2	2129898	132384.5	225	140	210	230	90
	00:55	590	3.3	2129959	132390.1	225	140	210	230	92
	01:10	590	2.8	2130032	132397.0	225	140	210	230	90
	01:25	590	3.2	2130075	132401.0	225	140	210	230	112
Averages / Totals		**595**	**3.0**	**941**	**87.8**	**225**	**140**	**210**	**227**	**92**
Oil Burned - gal/hr				**235.250**		**Fuel Oil Analysis :**		**lb/gal =**	**7.77**	
Steam Produced - lbs/hr					**21,950**			**Btu/lb =**	**18,497**	
Boiler Heat Input - Btu/hr				**33,810,528**						

Facility Operating Data
Page 3 of 3

Run Time/ Date	Time of Reading	Stack Temp. °F	Oxygen %	Oil Meter Reading gals.	Steam Flow 1000 lbs	Steam Press. psi	Oil Temp. at Tanks °F	Oil Temp. at Burners °F	Feed Water Temp. °F	Oil Pump Press. psi
Run 3 07/19/96 12:32-16:36	12:30	591	2.8	2132826	132658.7	224	142	206	230	90
	12:45	590	2.6	2132884	132664.2	224	142	208	230	88
	13:00	589	2.7	2132937	132669.3	224	144	206	230	90
	13:15	594	2.6	2132994	132674.7	224	142	206	225	88
	13:30	590	2.6	2133051	132680.2	224	144	208	225	88
	13:45	592	2.9	2133106	132685.5	224	144	208	225	92
	14:00	594	2.4	2133164	132691.1	224	144	208	225	88
	14:15	593	2.8	2133219	132696.3	224	144	208	225	90
	14:30	596	2.8	2133277	132701.8	224	142	206	225	88
	14:45	592	2.6	2133333	132707.1	224	142	208	225	90
	15:00	592	2.9	2133387	132712.4	224	142	208	225	88
	15:15	591	2.6	2133445	132717.9	224	142	208	225	86
	15:30	593	2.6	2133500	132723.2	224	142	208	225	84
	15:45	594	2.6	2133557	132728.5	224	142	208	225	86
	16:00	554	4.3	2133604	132733.2	224	142	204	225	82
	16:15	583	2.6	2133655	132738.1	225	142	204	225	80
	16:30	550	3.1	2133703	132742.8	224	142	208	225	72
Averages / Totals		**587**	**2.8**	**877**	**84.1**	**224**	**143**	**207**	**226**	**86**
Oil Burned - gal/hr				**219.25**		**Fuel Oil Analysis :**		**lb/gal =**	**7.77**	
Steam Produced - lbs/hr					**21,025**			**Btu/lb =**	**18,346**	
Boiler Heat Input - Btu/hr				**31,253,741**						

STACK EMISSIONS TEST READINGS TAKEN AT:

cpm RYEGATE

Daily Boiler Log

Date 7-18-96

PAGE: 1 RUNS NO. 1 & 2

ims	TIME OF READING:	STACK TEMP.	% OXYGEN READING	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs Per Hr	Oil Meter Reading	Gallons Burned	Steam Flow Meter Reading	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs Per Hr.	Steam Pressure	Boilers Blown	Tubes Blown	Oil Temp Storage Tanks	Oil Temp at Burners	Feed Water Temp	Oil Pump Press	REMARKS
A.M.	3:55 PM	597	2.8				2127822		132191.4				225			134	202	210	98	RUNS #1&2 DEMICK
A.M.	4:10	605	2.9				2127886		132197.2				225			132	210	210	93	
A.M.	4:25	605	2.8				2127953		132203.3				225			132	212	210	92	
A.M.	4:40	604	2.9				2128009		132208.4				225			132	212	210	90	
A.M.	4:55	598	2.8				2128071		132214.3				225			134	212	210	86	
M.	5:10	602	2.9				2128130		132219.8				225			134	212	210	94	
P.M.	5:25	598	2.8				2128189		132225.2				225			136	212	210	92	
P.M.	5:40	597	2.8				2128247		132230.7				225			136	212	210	90	
P.M.	5:55	598	3.0				2128305		132236.1				225			136	212	210	93	
TALS	6:10	607	2.6				2128367		132241.8				225			136	210	205	93	
P.M.	6:25	596	3.0				2128427		132247.4				225			138	210	210	88	
P.M	6:40	594	2.9				2128483		132252.7				225			140	210	210	87	
P.M	6:55	598	2.9				2128542		132258.3				225			138	210	210	96	
P.M.	7:10	607	3.1				2128603		132263.9				225			138	210	210	90	
P.M.	7:25	590	3.0				2128661		132269.4				225			138	210	210	86	
P.M.	7:40	589	3.0				2128720		132274.9				225			140	210	210	84	
P.M.	7:55	592	2.9				2128779		132280.4				225			140	210	210	86	Begin Run #1
P.M.	8:10	594	3.0				2128840		132286.0				225			140	210	210	92	PM
ALS	8:25	605	2.8				2128894		132291.1				225			140	210	215	94	TEST
M.D	8:40	601	2.9	Soot Blow @ 8:45 PM			2128957		132297.0				225			140	210	215	92	
M	8:55	600	2.8	3 MIN. 15 SEC. DURATION			2129013		132301.5				225			140	212	215	88	
M	9:10	586	3.3				2129079		132307.9				225			140	210	215	86	
M	9:25	592	3.2	SAMPLE # 1 OF RUN # 2 OIL SAMPLE #			2129134		132313.2				225			140	210	220	86	
M	9:40	601	2.9	COMPOSITE TAKEN @ 9:25 PM			2129192		132318.5				225			140	210	220	94	
M.	9:55	640	2.4				2129261		132324.8				225			140	208	225	110	
M.	10:10	611	3.0				2129342		132332.4				225			140	210	225	94	End Run #1
M.	10:25	595	3.3				2129390		132336.9				225			140	210	225	86	
ILS	10:40	589	2.9				2129440		132341.6				225			140	210	225	86	

RUN 1 PCDDs/PCDFs

RUN 1 PCDDs/PCDFs

Start Run 2 PCDDs/PCDFs

SOFTWATER-

TANK-

PUMP-

PULSE METER READING

7 A.M.:

Oil Burned _____ Gallons

Steam Generated _____ Pounds

Pounds of Steam Generated Per Pound of Oil Burned _____

F. & A. 212° Fahrenheit _____

MAKE UP FEED WATER

Time	Meter Reading		%
7 A.M.			ENTEC CPS-1
3 P.M.			ENTEC 733
11 P.M.			ENTEC OM-50
7 A.M.			ENTEC OS-12
TOTAL			CAUSTIC

#2 CONDUCTIVITY

FUEL OIL TANK SOUNDINGS

Tank No.	Feet	Inches	Gallons	Temp.
1				
2				
3				

Total Gallons

Received "

Expended "

Date 7-18-96

cpm RYEGATE

Daily Boiler Log

PAGE: 2 — RUNS NO. 2 & 3

Time	Time Of Reading	Stack Temp	% Oxygen Reading	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs. Per Hr.	Oil Meter Reading	Gallons Burned	Steam Flow Meter Reading	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs. Per Hr.	Steam Pressure	Boilers Blown	Tubes Blown	Oil Temp. Storage Tanks	Oil Temp. at Burners	Feed Water Temp.	Oil Pump Press.	REMARKS
A.M.	10:55 D	588	2.9				2129505		1323428				225			140	210	225	88	
A.M.	11:10	588	2.9				2129557		1323526				225			140	212	225	92	
A.M.	11:25	589	2.9				2129612		1323577				225			140	210	225	86	
A.M.	11:40	594	2.9				2129673		1323634				225			140	210	230	88	
A.M.	11:55	588	2.9				2129725		1323685				225			140	210	230	90	
M.	12:10 N	596	3.1				2129796		1323748				225			140	210	230	88	
P.M.	12:25	589	2.9				2129844		1323784				225			140	210	230	90	
P.M.	12:40	588	3.2	RUN			2129898		1323845				225			140	210	230	90	Begin Run #2
P.M.	12:55	590	3.3				2129959		1323901				225			140	210	230	92	PM Test
A.M.	1:10	590	2.8			End Run 2	2130032		1323970				225			140	210	230	90	
P.M.	1:25	590	3.2				2130075		1324060				225			140	210	230	112	
P.M.	1:40	625	2.8	#		PCDDs/	2130140		1324069				225			140	208	230	104	
P.M.	1:55	598	3.3			PCDFs	2130201		1324127				225			140	210	230	104	
P.M.	2:10	606	3.2	2			2130262		1324183				225			140	210	230	92	
P.M.	2:25	606	2.6				2130325		1324242				225			140	210	235	92	
P.M.	2:40	590	3.0	PM			2130378		1324293				225			140	210	235	86	END Run #2 PM
P.M.																				
P.M.																				
ALS																				
A.D																				
.M.																				
M.																				
M.																				
M.																				
M.																				
M.																				
M.																				
LS																				

SOFTWATER-

TANK-

PUMP-

PULSE METER READING

7 A.M.:

Oil Burned _____ Gallons

Steam Generated _____ Pounds

Pounds of Steam Generated Per Pound of Oil Burned _____

F. & A. 212° Fahrenheit _____

MAKE UP FEED WATER

Time	Meter Reading		%	
7 A.M.			ENTEC CPS-1	
3 P.M.			ENTEC 733	
11 P.M.			ENTEC OM-50	
7 A.M.			ENTEC OS-12	
TOTAL			CAUSTIC	

#2 CONDUCTIVITY

FUEL OIL TANK SOUNDINGS

Tank No	Feet	Inches	Gallons	Temp.
1				
2				
3				

Total Gallons

Received "

Expended "

Date 7-19-96

TAKE READINGS EACH 1/4 HR. FOR DURATION OF STACK TESTS.

cpm RYEGATE

Daily Boiler Log

	1		
	2		
	3		

	NO. 1 BOILER						NO. 2 BOILER													
Time	Oil Meter TIME Reading	Gallons STACK Burned TEMP	Steam Flow Meter Reading 0+	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs Per Hr	Oil Meter Reading	Gallons Burned	Steam Flow Meter Reading	Pounds Steam Generated	Pounds Steam Generated Per Pound Oil	Steam Flow Lbs Per Hr.	Steam Pressure	Boilers Blown	Tubes Blown	Oil Temp Storage Tanks	Oil Temp at Burners	Feed Water Temp.	Oil Pump Press	REMARKS
A.M.	11 Am	600	2.5	OIL SAMPLE @ 11AM		↑	2132489		132626.3				225			140	208	230	90	↑
A.M.	11:15	592	2.9				2132542		132631.4			21200	225			140	206	230	90	THIS IS ONLY A TEST
A.M.	11:30	562	3.8			R	2132599		132636.9			21400	2330			142	208	230	90	
A.M.	11:45	590	3.6			U PM	2132656		132642.5			21000	224.3			144	208	230	86	R
A.M.	12 NOON	589	2.8			n TEST	2132712		132647.8			20900	224.3			142	208	230	86	U
M.	12:15	592	2.3			#	2132768		132653.1			21400	223.9			142	206	230	88	n # PM
P.M.	12:30	591	2.8			3	2132826		132658.7			21600	223.9			142	206	230	90	3 TEST
P.M.	12:45	590	2.6				2132884		132664.2			21300	224.3			142	208	230	88	
P.M.	1:00 PM	589	2.7	OIL SAMPLE @ 1PM		↓	2132937		132669.3			21600	223.7			144	206	230	90	↓
TALS	1.15	594	2.6				2132994		132674.7			21400	224.2			142	206	225	88	
P.M.	1:30	590	2.6			↑	2133051		132680.2			21400	223.9			144	208	225	88	↑
P.M.	1.45	592	2.9			R	2133106		132685.5			21700	223.7			144	208	225	92	R
P.M.	2:00 PM	594	2.4			U PM	2133164		132691.1			21800	224.3			144	208	225	88	U PM
P.M.	2.15	593	2.8			n TEST	2133219		132696.3			21400	223.9			144	208	225	90	n TEST
P.M.	2:30	596	2.8				2133277		132701.8			21700	224			142	206	225	88	#
P.M.	2.45	592	2.6	OIL SAMPLE @ 3PM		#	2133333		132707.1			21300	223.9			142	208	225	90	4
P.M.	3.00 PM	592	2.9			4	2133387		132712.4			20900	224			142	208	225	88	↓
P.M.	3:15	591	2.6				2133445		132717.9			21100	224			142	208	225	86	
ALS	3:30	593	2.6			↓	2133500		132723.2			20600	224			142	208	225	84	
NO	3:45	594	2.6				2133557		132728.5			21500	224			142	208	225	86	
A.M.	4:00 PM	554	4.3	PAPER BREAK			2133604		132733.2			13800	224			142	204	225	82	
A.M.	4.15	503	2.6				2133655		132738.1			22100	225			142	204	225	80	
A.M.	4:30	550	3.1				2133703		132742.8			14700	224			142	206	225	72	
A.M.																				
A.M.																				
A.M.																				
P.M.																				
ALS																				

RUN 3 PCDDs/PCDFs

RUN 3 PCDDs/PCDFs

SOFTWATER-

TANK-

PUMP-

PULSE METER READING

7 A.M.:

Oil Burned _____ Gallons

Steam Generated _____ Pounds

Pounds of Steam Generated Per Pound of Oil Burned _____

F. & A. 212° Fahrenheit _____

MAKE UP FEED WATER

Time	Meter Reading		%
7 A.M.			ENTEC CPS-1
3 P.M.	694000		ENTEC 733
11 P.M.			ENTEC OM-50
7 A.M.			ENTEC OS-12
TOTAL			CAUSTIC

#2 CONDUCTIVITY

FUEL OIL TANK SOUNDINGS

Tank No.	Feet	Inches	Gallons	Temp.
1				
2				
3				

Total Gallons

Received "

Expended "