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Oriented Strand Board Emission Test Report

Georgia Pacific
Skippers, Virginia



TEST REPORT

VOLUME I.

**METHOD DEVELOPMENT AND TESTING FOR
ORIENTED STRAND BOARD PLANT EMISSIONS**

**GEORGIA-PACIFIC ORIENTED STRAND BOARD PLANT
SKIPPERS, VIRGINIA**

EPA Project No. 91-WAF-01

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TABLE OF CONTENTS

1.0	INTRODUCTION	
1.1	Summary of Test Program	1
1.2	Key Personnel.....	2
2.0	PLANT AND SAMPLING LOCATION DESCRIPTIONS	
2.1	Process Description and Operation	3
2.2	Wet Electrostatic Precipitator Description.....	3
2.3	Flue Gas Sampling Locations	3
2.4	ESP Cleaning Cycle.....	8
3.0	SUMMARY OF TEST RESULTS AND DISCUSSION	
3.1	Objectives and Test Matrix	9
3.2	Volumetric Flow Rates.....	9
3.3	Emissions and Process Data.....	12
3.4	Emission Factors.....	12
3.5	Relationship Between Methods 25 and 25A.....	16
3.6	ODEQ Method 7 versus M202	16
3.7	Semi-Volatile Data.....	16
4.0	SAMPLING AND ANALYTICAL PROCEDURES	
4.1	Test Methods.....	19
4.2	Particulate Matter/Condensable Particulate Matter...	19
4.3	Modified Method 5.....	19
4.4	Other Test Methods.....	26
5.0	QA/QC ACTIVITIES.....	37
5.1	QC Procedures.....	37
5.2	Sample Volume and Percent Isokinetics.....	37
APPENDIX A. Method M0011 Data Summary		
APPENDIX B. Method 5/202 Data Summary		
APPENDIX C. Modified Method 5 Data Summary		
APPENDIX D. Method 25 Data Summary		
APPENDIX E. CEMS Data Summary - O ₂ , CO ₂ , CO, NO _x , and THC		

LIST OF TABLES

	<u>Page</u>
3-1 Sampling Matrix	10
3-2 Volumetric Flow Rate Data	11
3-3 Summary of ESP Emissions	13
3-4 Wet ESP Collection Efficiencies	14
3-5 Summary of Process and Control Equipment Operating Conditions	14
3-6 Summary of Emission Factors Based on Dry Wood Flakes	15
3-7 Semi-Volatile Organic Compounds	17
3-8 Semi-Volatile Organic Compounds	18
4-1 Sampling and Analytical Methods for Georgia Pacific	20

LIST OF FIGURES

	<u>Page</u>
2-1. Oriented Strand Board (OSB) process flow diagram	4
2-2. Lower and upper wet ESP sampling locations	5
2-3. ESP outlet sampling locations	6
4-1. Method 202 sampling train with out-of-stack filter	21
4-2. Method 202 sampling train with Method 5 filter and backup filter	22
4-3. Sample recovery scheme for particulate/condensibles samples	23
4-4. Analytical scheme for particulate/condensibles samples	24
4-5. Modified Method 5 sampling train	25
4-6. Modified Method 5 sample recovery scheme	27
4-7. Organic field blank analysis flow scheme	28
4-8. Integrated gas sampling train for Method 3	29
4-9. Formaldehyde (Method 0011) sampling train	30
4-10. Sample recovery scheme for Method 0011 samples	31
4-11. Method 0011A. Formaldehyde by high performance liquid chromatography (HPLC)	32
4-12. Method 25 sampling train	34
4-13. Instrumental measurement system for outlet stack location	35
4-14. Instrumental measurement system for inlet location	36

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

The U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards (OAQPS), Emission Inventory Branch (EIB) is responsible for developing and maintaining air pollution emission factors for industrial processes. EIB, in collaboration with the National Council for Air and Stream Improvement (NCASI), is presently studying the wood products industry. The purpose of this study is to develop emission factors for oriented strand board (OSB) production facilities. The Emission Measurement Branch (EMB) of OAQPS coordinated the emission measurement activities at this plant. Entropy Environmentalists, Inc. (Entropy) and NCASI conducted the emission measurements.

EPA/EIB, EPA/EMB, and NCASI considered the Georgia-Pacific facility in Skippers, Virginia to be one of four facilities that represent the diversity in wood species and dryer control devices. This test, the first of the four, was conducted on June 25-26, 1991. Simultaneous measurements were conducted at the inlet and outlet of the wet electrostatic precipitator (ESP) for the wood flake dryer exhaust. Pollutants measured were: particulate matter (PM), condensible particulate matter (CPM), carbon monoxide (CO), nitrogen oxides (NO_x), hydrocarbons (THC), formaldehyde, other aldehydes, and ketones, and semivolatile organic compounds (SVOC).

Current data for wood flake dryer exhausts for particulate and VOC emissions have been obtained using various test methods and often lack sufficient documentation for developing emission factors. Therefore, one objective of this test was to standardize the test methods. This test also served as a compliance test to the State of Virginia under consent order.

1.2 KEY PERSONNEL

The key personnel who coordinated the test program and their telephone numbers are:

- Mr. Dallas Safriet
Technical Coordinator, EIB 919/541-5371
- Mr. Dennis Holzschuh
Field Test Coordinator, EMB 919/541-5239
- Mr. Bill Kirk
Field Test Director, Entropy 919/781-3551
- Mr. Chuck Vaught
Process Engineer, MRI 919/677-0249
- Mr. Larson Harsey
Georgia-Pacific Representative 404/527-0220
- David Rovell-Rixx
NCASI Representative 904/377-4708

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION AND OPERATION

The basic processing steps for OSB production are:

- Logs are cut into shorter lengths, debarked, slashed into blocks, and sliced into thin wood flakes.
- The wood flakes are dried, classified on a rotary screen, blended and mixed with resin, oriented, and formed into a mat.
- The formed mats are separated into desired lengths, heated, and pressed to activate the resin and bond the wood flakes into a solid sheet.
- Sheets are trimmed, edge treated, and packaged for shipping.

The wood mix for the Georgia-Pacific plant at Skippers, Virginia is about 40 percent pine and 60 percent soft hardwoods. About 17-20 tons/hr of wet wood flakes are sent to each of four dryers with an inlet temperature of about 1000-1200°F to maintain an exit temperature of about 250°F. At this point in the process, the moisture content of the wood flakes ranges from 3 to 6 percent, wet basis. Figure 2-1 presents a generalized OSB process flow diagram; the figure does not reflect exactly all the activities at the Skippers plant.

2.2 WET ELECTROSTATIC PRECIPITATOR DESCRIPTION

Particulate matter from the wood flake dryers are controlled by cyclones and a wet ESP manufactured by United-McGill. An ESP relies on three basic process steps for particulate removal: (1) electrical charging of the particles, (2) particle collection on the electrodes, and (3) removal of the collected particulate. The United-McGill wet ESP has an intermittent travelling header system equipped with multiple high-pressure spray nozzles to remove the collected particulate. The Skippers plant also has a prequencher to cool and condense the gas stream before it enters the ESP. The prequencher cools the gas by spraying water into the incoming gas stream. The cooling and condensation increases the capture of the sticky resins released from the wood flake drying process.

2.3 FLUE GAS SAMPLING LOCATIONS

Emission samples were collected at the wet ESP outlet stack and two separate inlet locations. Figures 2-2 and 2-3 are

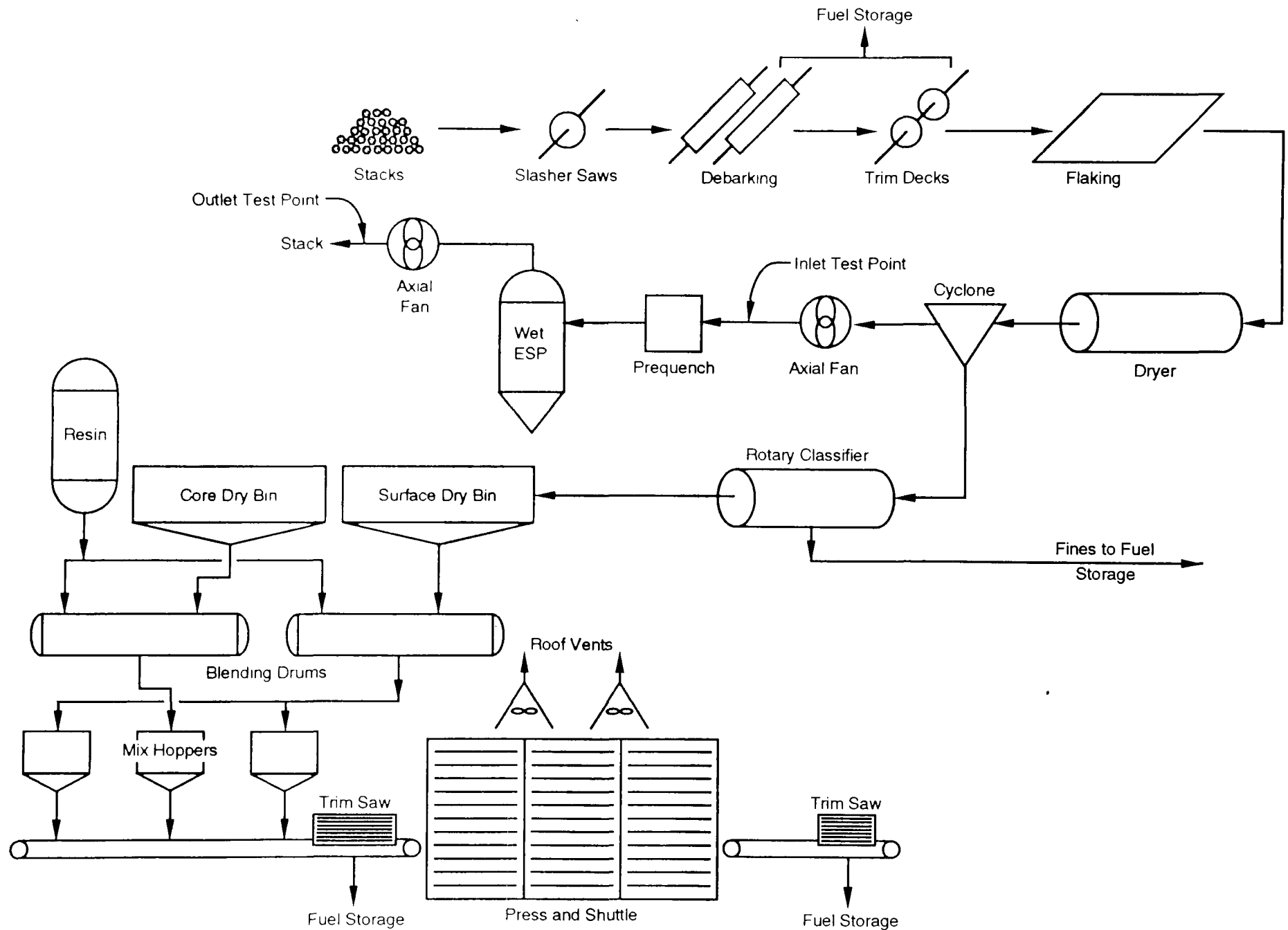


Figure 2-1. Generalized Oriented Strand Board (OSB) process flow diagram.

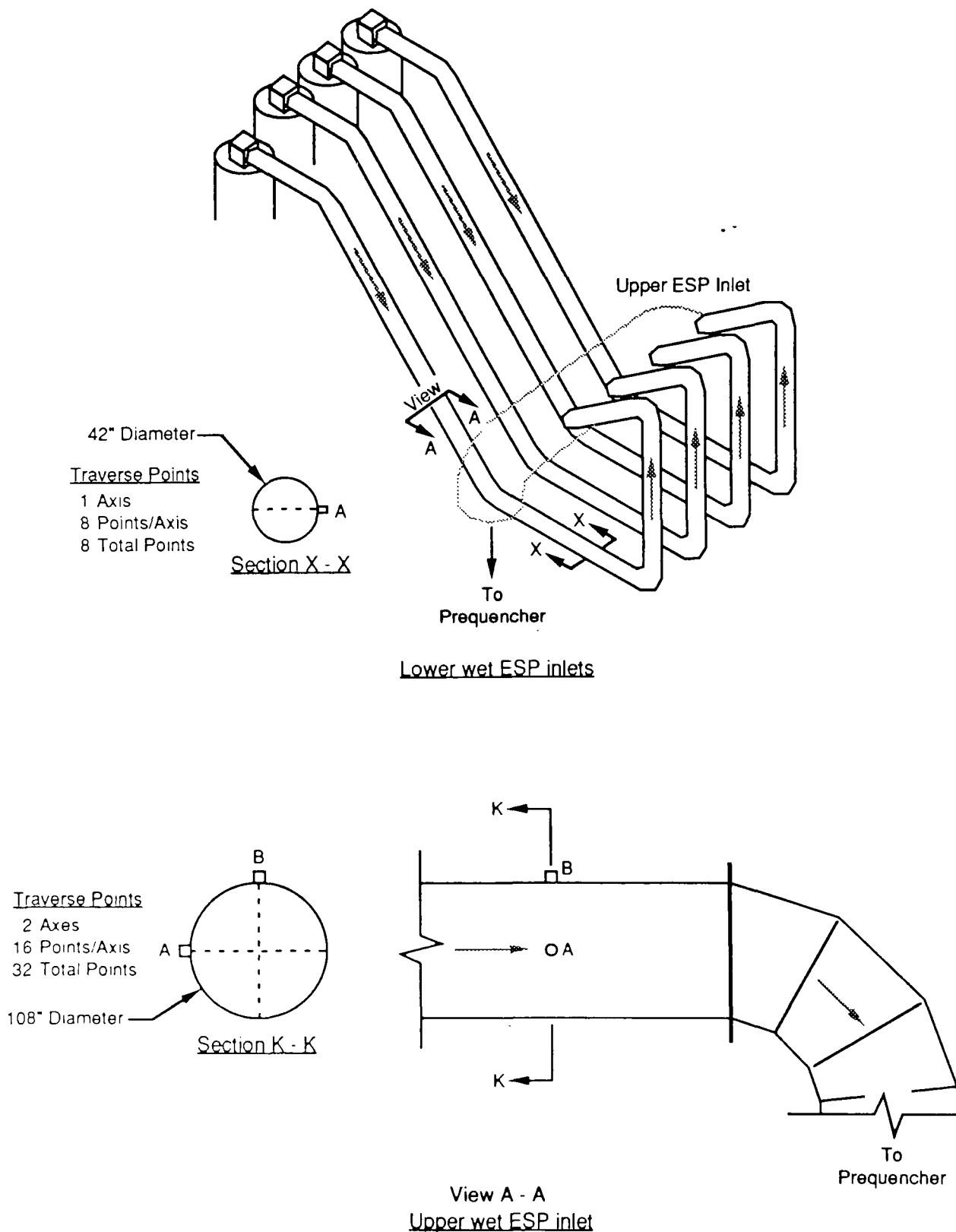


Figure 2-2. Lower and upper wet ESP sampling locations.

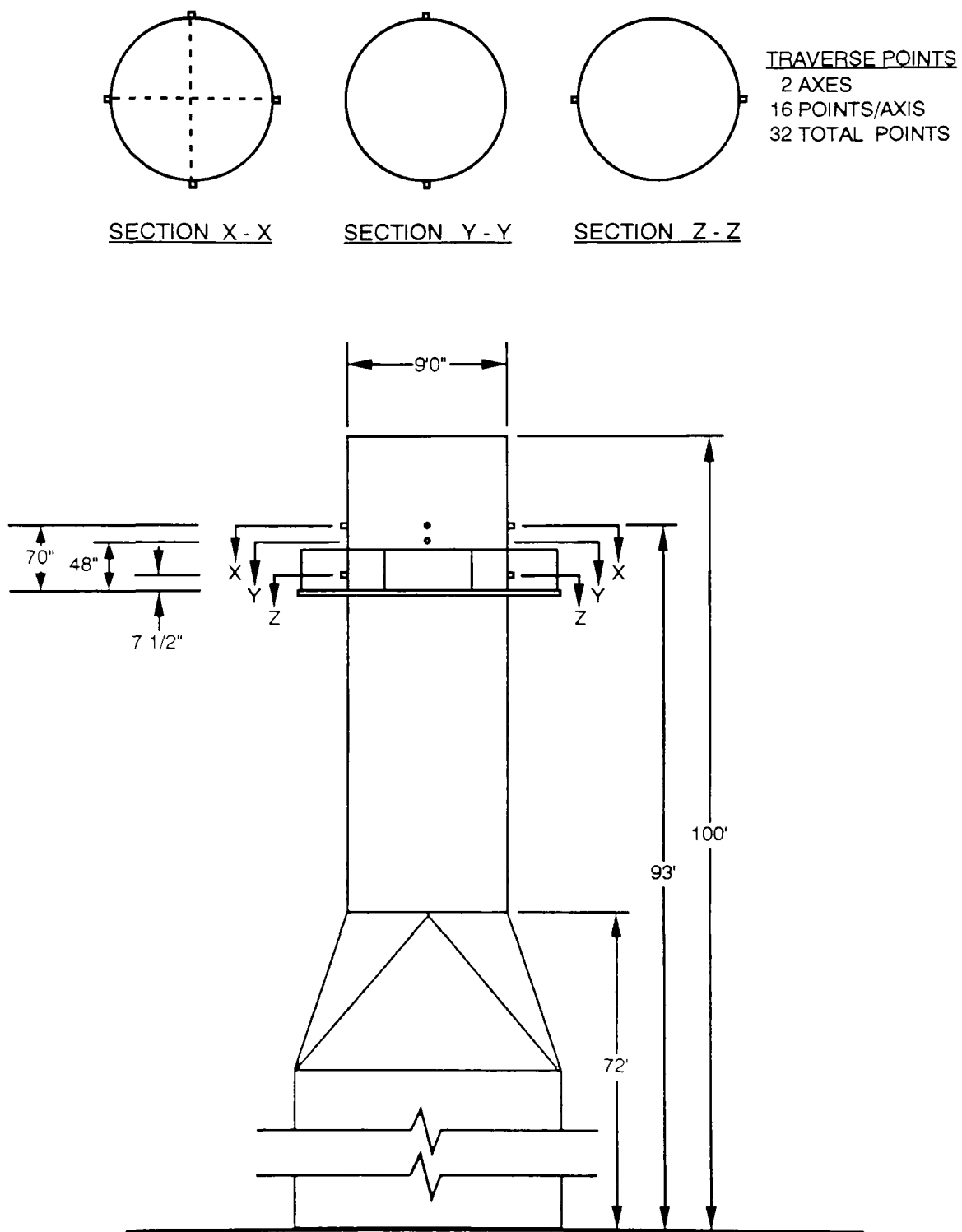


Figure 2-3. ESP outlet sampling locations.

schematics of the sampling locations. The exhausts from four dryers are combined upstream of the prequencher that leads to the wet ESP.

2.3.1 Lower Wet ESP Inlet Sampling Location

The lower wet ESP inlet consists of four identical 42-inch diameter horizontal ducts upstream of four fans and bypass stacks. A manual damper is located approximately one duct diameter upstream from the 4-inch sampling port, and a square access door is located 32 inches (0.75 duct diameters) downstream from the sampling port in each of the ducts. This access would be considered a minor disturbance. The distance between the damper and the fans is 178 inches (4.2 diameters). The plant installed additional ports approximately two diameters downstream from the original locations. Since the flow profiles at both locations were similar and because of the cramped conditions at the additional locations, the original locations were chosen for the test.

Each of the four ducts had different flow profiles. The manual dampers were set independently to balance the system for production.

The sample traverse consisted of one axis only with 8 traverse points per duct (32 total) at 2 1/2 minutes per point, for a total sampling time of 80 minutes. Method 5/202 for PM and CPM and SW-846 Method 0011 for formaldehyde, aldehydes, and ketones were performed at this location.

2.3.2 Upper Wet ESP Inlet Sampling Location

The upper wet ESP inlet sampling location, at which the four dryer exhaust ducts are combined, is downstream of the lower inlet location. This location in the 108-inch horizontal duct has two 4-inch ports. One port is on the horizontal axis and the other is on the vertical axis. The distance from the sampling ports downstream to the 90-degree elbow leading to the prequencher is less than a duct diameter. The horizontal sampling port is located directly across from one of the four (54-inch) ducts that tangentially tie into the 108-inch duct. Methods 25 and 25A were performed at this location.

2.3.3 Wet ESP Stack Outlet Sampling Location

The outlet stack for the wet ESP had a total of eight sampling ports located on three different planes in the 108-inch diameter vertical duct. Figure 2-3 shows the stack sampling locations. The ports are 0.78 duct diameter upstream from the stack exit and 2.3 duct diameters downstream from a disturbance.

2.4 ESP CLEANING CYCLE

The wet ESP goes through an automatically controlled 16-minute wash cycle to purge the collection plates of accumulated particulate matter. Within each of the 80-minute test runs, one of the four (20-minute) isokinetic sampling traverses conducted at one of the lower four inlet ducts was timed to take place during the wash cycle. Simultaneous measurements were taken at the ESP outlet to include the effect (if any) of the wash cycle on the outlet emissions.

3.0 SUMMARY OF TEST RESULTS AND DISCUSSION

3.1 OBJECTIVES AND TEST MATRIX

The purpose of the test program was to develop emission factors for OSB production facilities from the wood products industry.

Table 3-1 presents the sampling and analytical matrix and summarizes all the measurements being made at each test location.

The specific objectives were:

- Measure the emissions of PM, CPM, CO, NO_x, THC, formaldehyde, other aldehydes, and ketones at the wood flake dryer wet ESP inlet and outlet locations, and semi-volatile organics at the outlet.
- Determine the relationship between Method 25 and Method 25A for THC, and between Method 5/202 and the Oregon Department of Environmental Quality (ODEQ) Method 7 for particulates (PM and CPM).
- Assess the suitability of deriving a correction factor for Method 25A.
- Obtain dryer production rates, feed inlet and outlet moisture content, inlet and outlet dryer temperatures, inlet and outlet ESP temperatures, ESP field voltages and currents, and wash cycle time, ESP water rate, and wood mix.

3.2 VOLUMETRIC FLOW RATES

To determine mass emission rates and wet ESP collection efficiency, flow rate is an important component. During this test program, three separate trains provided simultaneous measurements of velocities, temperatures, and moisture contents. M5/202 and M0011 were run simultaneously at the ESP inlet (lower); M5/202, M0011, and MM5 were run simultaneously at the ESP outlet and concurrently with M5/202 and M0011 at the ESP inlet. Table 3-2 summarizes the flow rate data. Method 3 data for O₂ and CO₂ are added to this table.

The following observations are made:

- The temperature measurements of the ESP inlet were within $\pm 6^{\circ}\text{F}$ and at the outlet, the temperatures were within $\pm 2^{\circ}\text{F}$. The $\pm 6^{\circ}\text{F}$ is a variation of less than ± 1 percent in volume measurements.

TABLE 3-1. SAMPLING MATRIX - GEORGIA PACIFIC

RUN NO. DATE	SAMPLE TYPE	TEST METHOD	LOCATION/CLOCK TIME ¹		
			ESP INLET (Lower)	ESP INLET (Upper)	ESP OUTLET
1 6/25/91	PM/CPM	M5/202	1015-1340		1014-1342
	O ₂ /CO ₂	M3		1014-1404	1014-1404
	F/A/K	M0011	1014-1340		1014-1342
	SVOC	MM5			1014-1342
	TGNMO	M25		1019-1340	1010-1340
	THC	M25A		1014-1404	1014-1404
	NO _x	M7E		1014-1404	1014-1404
	CO	M10		1014-1404	1014-1404
2 6/25/91	PM/CPM	M5/202	1753-2007		1753-2005
	O ₂ /CO ₂	M3		1754-2005	1754-2005
	F/A/K	M0011	1715-2015		1753-2005
	SVOC	MM5			1753-2005
	TGNMO	M25		1754-2006	1753-2005
	THC	M25A		1754-2005	1754-2005
	NO _x	M7E		1754-2005	1754-2005
	CO	M10		1754-2005	1754-2005
3 6/26/91	PM/CPM	M5/202	0930-1141		0930-1141
	O ₂ /CO ₂	M3		0930-1141	0930-1141
	F/A/K	M0011	0930-1141		0930-1143
	SVOC	MM5			0930-1143
	TGNMO	M25		0930-1144	0930-1144
	THC	M25A		0930-1141	0930-1141
	NO _x	M7E		0930-1141	0930-1141
	CO	M10		0930-1141	0930-1141

¹ All sampling times were 80 minutes in length.

Note: Mercury Labs analyzed M0011 samples for F/A/K.
Triangle Labs analyzed MM5 samples for semivolatiles.
NCASI collected and analyzed the M25 samples.
Entropy collected and analyzed all other samples.

TABLE 3-2. VOLUMETRIC FLOW RATE DATA - GEORGIA PACIFIC

RUN NO.	FLOW RATE, dscmh				TEMPERATURE, °F			MOISTURE, %H ₂ O			ORSAT	
	M5/202	M0011	MM5	Average	M5/202	M0011	MM5	M5/202	M0011	MM5	O ₂	CO ₂
I-1	189,250	203,546 ^a		196,398	198	203		22.0	22.0 ^b		17.1	3.6
I-2	193,739	193,785		193,762	188	200		23.0	22.1		18.3 ^c	2.6 ^c
I-3	192,821	187,712		190,767	200	208		23.6	21.3		16.8	3.9
Avg	192,270	195,014 ^a			195	204		22.9	21.7 ^b		17.0	3.7
S-1	182,515	200,225	182,094	188,278	143	144	144	22.4	21.4	22.0	17.2	3.5
S-2	191,038	191,916	186,164	189,706	144	146	147	21.8	22.3	23.2	16.9	3.6
S-3	199,861	194,423	183,328	192,537	145	148	147	22.4	22.8	23.8	17.2	3.5
Avg	191,138	195,521	183,862		144	146	146	22.2	22.2	23.0	17.1	3.5

^aThis volumetric flow rate is based on 22% moisture. See notation (b). Originally, the value was 215,499 dscmh.

^bActual value was 16.5% moisture. The value from M5/202 was substituted.

^cThese values indicate that the sample bag might have had a leak. Therefore, they were excluded from the average.

- Run I-1, M0011 had a moisture content of 16.5 percent. When this value was compared with the moisture contents of M5/202, Runs I-2 and I-3 of M0011, and the ESP outlet moisture contents of the M5/202, M0011, and MM5 trains, 16.5 percent was obviously an outlier. Therefore, 16.5 percent was replaced with the moisture content from the M5/202 train, which was run simultaneously with the M0011 train. When this was done, moisture contents at the inlet were within ± 1.2 percent of each other. At the outlet of the ESP, the moisture contents were within ± 0.7 percent of each other.
- The O_2/CO_2 data for Run I-2 appear to be out of line when compared to the rest of the data, especially the outlet. The higher O_2 and lower CO_2 values than the rest of the data indicate probable leakage into the sample bag. Therefore, these data should be discarded.
- All flow rates were within ± 6.3 percent of the respective averages. Considering that the flow rates at the inlet were summations of the four individual ducts, the agreement was well within the experimental error.

Based on these observations, the moisture content of 16.5 percent from M0011 Run I-1 was discarded and replaced with 22.0 percent. The emission concentrations and flow rates were recalculated and are presented in Table 3-2. These average flow rates were considered to provide the best data, and therefore, were used to calculate the mass emission rates.

3.3 EMISSIONS AND PROCESS DATA

Tables 3-3, 3-4, and 3-5 summarize the emissions, ESP collection efficiencies, and process data, respectively. The aldehyde/ketone data from M0011 are not included in the tables, but are found in Appendix A. The data, however, should not be used since subsequent tests at other plants indicated a problem with collection efficiencies. If sampling problems are resolved later, EPA plans to return to the plant to determine the emissions of aldehydes and ketones.

3.4 EMISSION FACTORS

Table 3-6 presents the emission factors in terms of tons of dry wood flakes processed by the dryer.

TABLE 3-3. SUMMARY OF WET ESP EMISSIONS - GEORGIA PACIFIC

METHOD/ COMPONENT	UNITS	WET ESP INLET				WET ESP OUTLET			
		RUN 1	RUN 2	RUN 3	AVG	RUN 1	RUN 2	RUN 3	AVG
M202: Filterable PM	mg/dscm	248	333	366	316	20.2	36.6	30.0	28.9
Inorganic CPM	mg/dscm	51	70	87	69	13.2	20.1	20.0	17.8
Organic CPM	mg/dscm	14	23	36	24	10.2	16.1	12.4	12.9
Total	mg/dscm	313	426	489	409	43.6	72.8	62.4	59.6
Filterable PM	lb/hr ^a	107.4	142.3	153.9	134.5	8.4	15.3	12.7	12.1
Inorganic CPM	lb/hr	22.1	29.9	36.6	29.5	5.5	8.4	8.5	7.5
Organic CPM	lb/hr	6.1	9.8	15.1	10.3	4.2	6.7	5.3	5.4
Total	lb/hr	135.5	182.0	205.7	174.4	18.1	30.4	26.5	25.0
25A THC	ppm C	396	1013	445	618	346	836	403	528
	mg/dscm	198	506	222	309	173	418	201	264
THC	lb/hr ^a	85.7	216.2	93.5	131.8	71.8	174.7	85.5	110.6
M25: TGMNO	ppm C	343	1296	538	726	373	1189	413	658
Condensable Organics	ppm C	343	1296	538	726	373	1189	413	658
NMO (Noncondensibles)	ppm C	0	0	0	0	0	0	0	0
TGMNO	mg/dscm	171	648	269	363	186	594	206	329
	lb/hr ^a	74.2	276.6	113.1	154.6	77.4	248.5	87.6	137.8
M10 CO	ppm					95.6	139.8	199.4	145
	lb/hr ^a					46.2	68.1	98.6	70.9
M7E NO _x	ppm					32	20	21	24
As NO ₂	lb/hr ^a					25.4	16.0	17.0	19.5

^a Emission rates are based on average flow rates determined from the simultaneous runs.

TABLE 3-4. WET ESP COLLECTION EFFICIENCIES

METHOD/COMPONENT	RUN NO. 1	RUN NO. 2	RUN NO. 3	AVERAGE
<u>Method 5/202</u>				
Filterable PM	92.2	89.2	91.7	91.0
CPM	65.5	61.9	73.4	67.7
Inorganic	75.2	71.9	76.8	74.7
Organic	30.2	31.5	65.2	47.7
Total	86.7	83.3	87.1	85.7
<u>Method 25</u> TGNMO	-4.3 ¹	10.2	22.5	10.9
<u>Method 25A</u> THC	16.3	19.2	8.6	16.1

¹ Negative efficiencies result primarily from the almost equal inlet and outlet concentrations and the precision of the test methods.

**TABLE 3-5. SUMMARY OF PROCESS AND CONTROL EQUIPMENT
OPERATING CONDITIONS**

PARAMETERS	UNITS	RUN 1	RUN 2	RUN 3	AVG
Dryer Production Rate	Ton/hr*	35.4	38.8	38.7	37.6
Feed Moisture	%	46.8	47.7	47.1	47.2
Exit Moisture	%	2.9	3.7	2.5	3.0
Dryer Entrance Temp	°F	1084	1134	1137	1118
Dryer Exit Temp	°F	248	236	246	243
ESP Temp, Inlet	°F	214	208	220	214
ESP Temp, Outlet	°F	143	146	146	145
ESP Field 1 Voltage,	Kv	26.2	28.2	27.7	27.4
ESP Field 1 Amperage,	mA	42	35	30	36
ESP Field 2 Voltage,	Kv	38.5	42.5	42.0	41.0
ESP Field 2 Amperage,	mA	221	297	274	264
ESP Field 3 Voltage,	Kv	41.0	40.2	42.1	41.1
ESP Field 3 Amperage,	mA	316	300	316	311
Wash Cycle Start,	Time	1016	1755	1016	
Wash Cycle Stop,	Time	1033	1812	1033	
Cycle Time	min	17	17	17	
Average Wood Mix	%	58	58	58	58
Hardwood					
South Pine	%	42	42	42	42
ESP Water	gpm	362	361	361	361

* Based on dry tons/hr, 0% moisture content

TABLE 3-6. SUMMARY OF EMISSION FACTORS BASED ON PRODUCTION OF DRY WOOD FLAKES

METHOD/ COMPONENT	UNITS	WET ESP INLET				WET ESP OUTLET			
		RUN 1	RUN 2	RUN 3	AVG	RUN 1	RUN 2	RUN 3	AVG
<u>M202</u>									
Filterable PM	lb/ton	3.03	3.67	3.98	3.56	0.24	0.39	0.33	0.32
CPM	lb/ton	0.80	1.02	1.34	1.05	0.27	0.39	0.36	0.34
Inorganic CPM	lb/ton	0.62	0.77	0.95	0.78	0.15	0.22	0.22	0.20
Organic CPM	lb/ton	0.17	0.25	0.39	0.27	0.12	0.17	0.14	0.14
Total	lb/ton	3.83	4.69	5.31	4.61	0.51	0.78	0.68	0.66
<u>M25A</u> THC	lb/ton	2.42	5.57	2.42	3.47	2.03	4.50	2.21	2.91
<u>Method 25</u> TGNMO	lb/ton	2.10	7.13	2.92	4.05	2.19	6.40	2.26	3.62
CO	lb/ton					1.31	1.75	2.55	1.87
NO _x as NO ₂	lb/ton					0.72	0.41	0.44	0.52

3.5 RELATIONSHIP BETWEEN METHODS 25 AND 25A

The data for the relationship between Methods 25 and 25A are shown in Table 3-7.

The Method 25A concentrations are the averages over the entire elapsed time of the test, while the Method 25 sample was stopped and started to correspond with the particulate matter sample. Therefore, the Method 25A concentrations were recalculated to correspond to the times that Method 25 was obtaining samples. The data show some consistency between the two methods at both the inlet and outlet of the ESP. Before any conclusions are made, data from all other tests should be evaluated.

3.6 ODEQ METHOD 7 VERSUS M202

NCASI analyzed the back-up filter and verbally reported that the back-up filters had no particulate mass weights. Therefore, it was concluded that the two methods were equivalent.

3.7 SEMI-VOLATILE DATA

Table 3-8 presents the data for the semi-volatile organic compounds. A table showing detection limits is included in Appendix C. This test was conducted basically for screening purposes. Further discussion of these data will be done under a separate report.

TABLE 3-7. METHOD 25 VERSUS METHOD 25A

<u>RUN</u>	<u>THC</u> lb/hr	<u>TGNMO</u> lb/hr	<u>RATIO</u> TGNMO/THC
I-1	85.8	74.2	0.86
I-2	209.7	276.6	1.32
I-3	94.7	113.1	1.19
Avg			1.13
S-1	70.2	77.4	1.10
S-2	174.4	248.5	1.42
S-3	86.7	87.6	1.01
Avg			1.18

TABLE 3-8. SEMIVOLATILE ORGANIC COMPOUNDS

NAME	MM5-1	MM5-2	MM5-3	AVG.
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Naphthalene	---	---	524	175
Diethylphthalate	14.1	4.5	6.1	8.2
Di-n-butylphthalate	6.6	7.5	5.7	6.6
Butylbenzylphthalate	4.8	4.8	20.2	9.9
bis(2-Ethylhexyl)phthalate	55	54	58	56
Di-n-octylphthalate	5.1	8.2	41	18
Total	85.6	79.0	655.0	273.7
lb/hr	0.036	0.033	0.278	0.115

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

Table 4-1 summarizes the analytes and test methods used for sampling and analysis. The schematics of all sampling trains, flow diagrams of sample recovery and sample analysis, and descriptions of any modifications to the test methods are also included in this section.

4.2 PARTICULATE MATTER/CONDENSIBLE PARTICULATE MATTER

Method 5/202 was used at the inlet and outlet of the wet ESP to measure PM/CPM. NCASI desired to compare Method 202 with ODEQ Method 7, which is identical to Method 202 except for the following:

- A second filter is placed just before the silica gel impinger.
- Acetone rather than methylene chloride is used in the final rinse of the impingers and connecting glassware.
- An optional out-of-stack filter is used before the impingers.

Because of space limitations, NCASI decided to make this comparison by inserting a second filter in the Method 202 train in the same position as that in the ODEQ Method 7 and using the out-of-stack filter. The back-up filter was transmitted to NCASI, which analyzed the filter gravimetrically according to ODEQ Method 7.

Figures 4-1 and 4-2 illustrate the modifications to the Method 202 sampling train. Figures 4-3 and 4-4 illustrate the sample recovery procedure and analysis schemes, respectively.

4.3 MODIFIED METHOD 5

The standard MM5 sampling train of SW-846 Method 0010 shown in Figure 4-5 was used to collect the semivolatile organic screening samples at the outlet location.

Standard MM5 pre-cleanup requirements included several unique preparation steps to ensure the sampling train components were not contaminated with organics that could have interfered with the analysis. The glassware, glass fiber filters, and XAD adsorbing resin were precleaned using strict protocols. For this particular study, the impinger water fraction was analyzed for oxygenated organics as well as the semivolatile organics. Therefore, the acetone pre-rinse of the train was detected.

TABLE 4-1. SAMPLING AND ANALYTICAL METHODS FOR GEORGIA-PACIFIC

Analyte	Sampling Method	Analytical Method
Particulate Matter (PM)	EPA Method 202 w/ Method 5 filter	EPA Method 5 (Gravimetric)
	ODEQ Method 7	ODEQ Method 7 (Gravimetric)
Condensable Particulate Matter (CPM)	EPA Method 202 w/ Method 5 filter	EPA Method 202 (Extraction/ Gravimetric)
	ODEQ Method 7	ODEQ Method 7 (Extraction/ Gravimetric)
Carbon Monoxide (CO)	EPA Method 10	EPA Method 10 (NDIR)
Nitrogen Oxides (NO _x)	EPA Method 7E	EPA Method 7E (Chemiluminescence)
Oxygen (O ₂), Carbon Dioxide (CO ₂)	EPA Method 3	EPA Method 3 (Orsat)
Formaldehyde, Aldehydes, Ketones	SW-846 Method 0011	SW-846 Method 0011 (HPLC)
VOC as propane	EPA Method 25A	EPA Method 25A (FID)
VOC as carbon	EPA Method 25	EPA Method 25 (Catalysis, GC/FID)
Organics Screening	SW-846 Method 0010 (MM5)	SW-846 Method 8270 (HPLC)

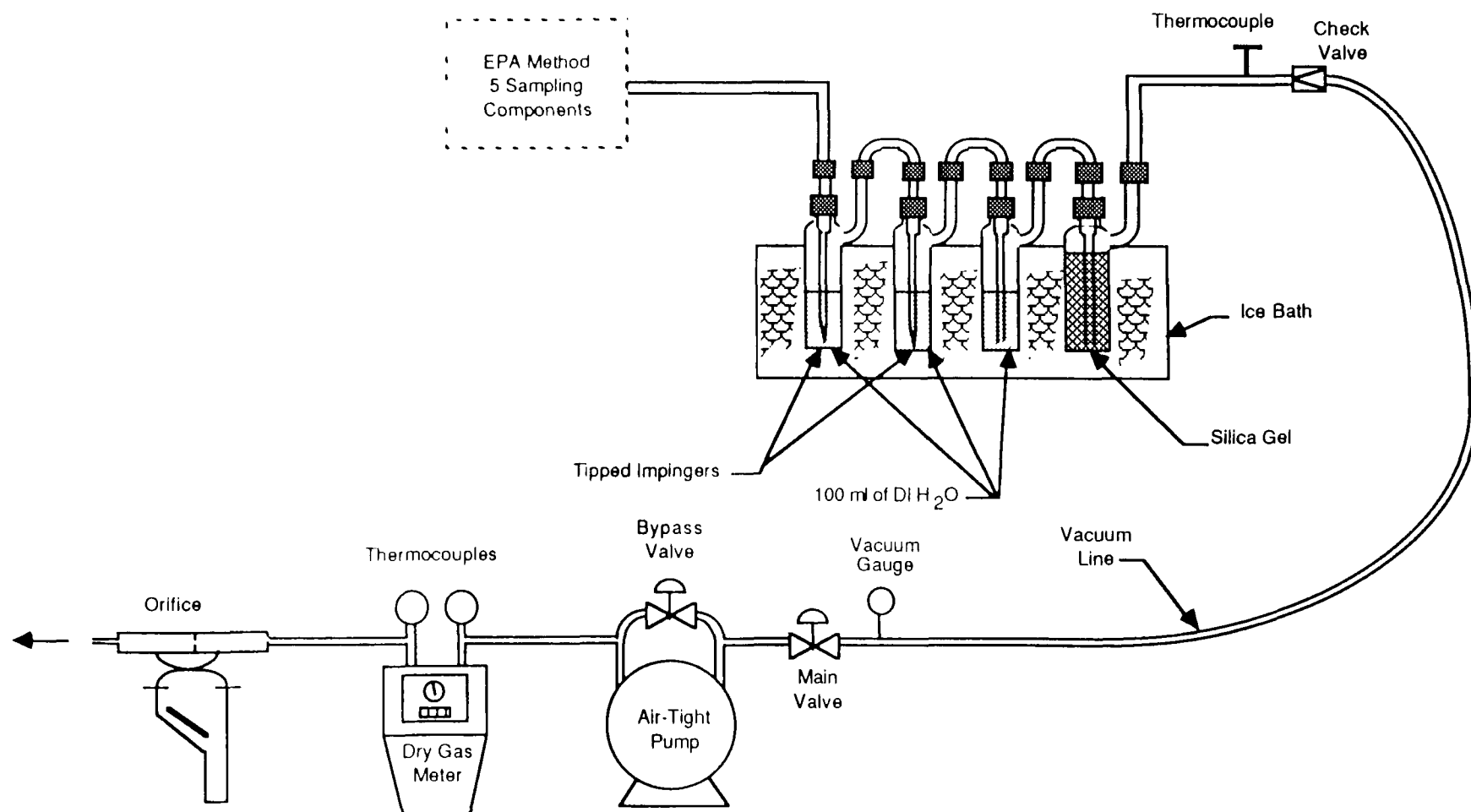


Figure 4-1. Method 202 sampling train with out-of-stack filter.

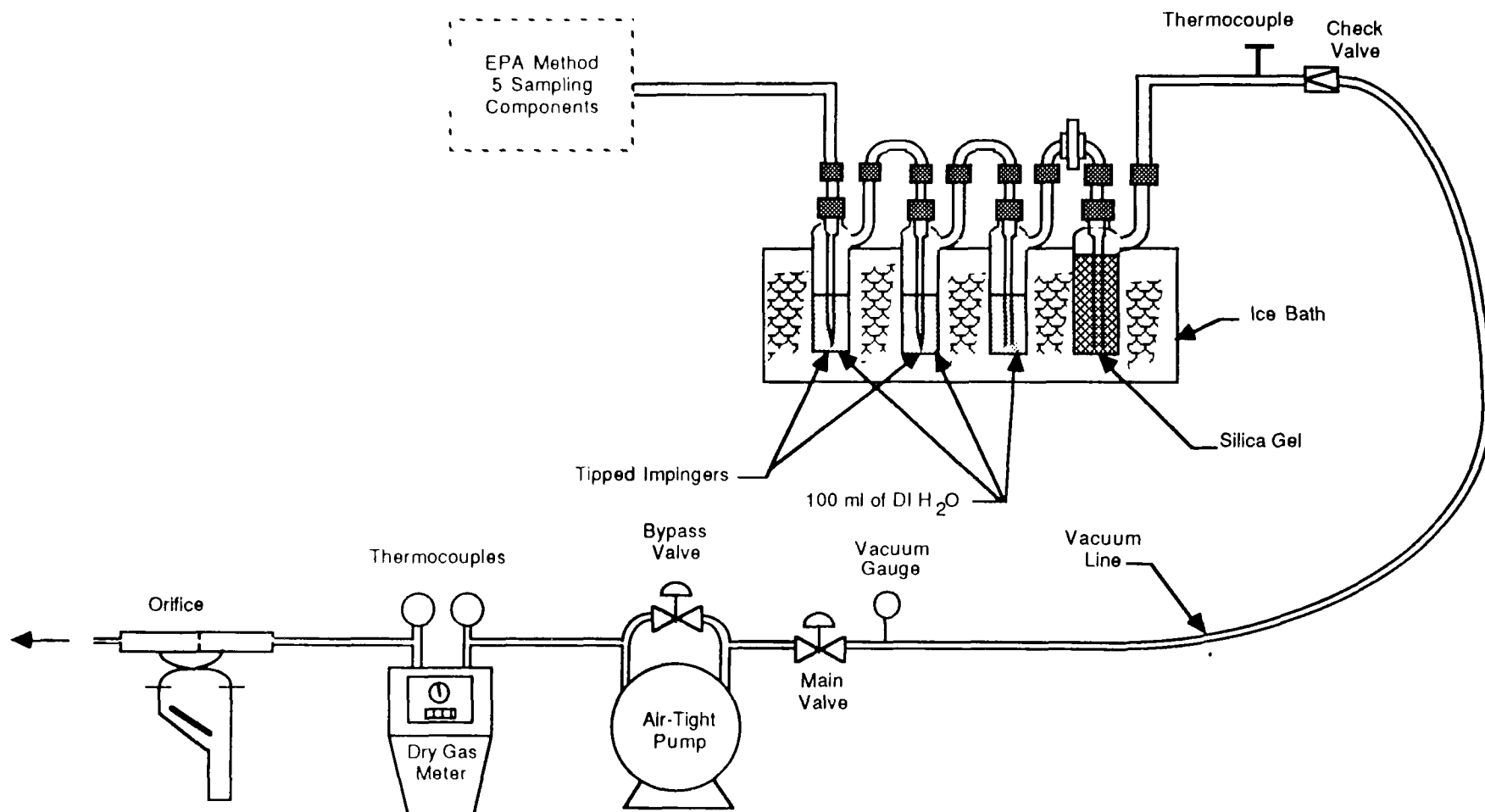
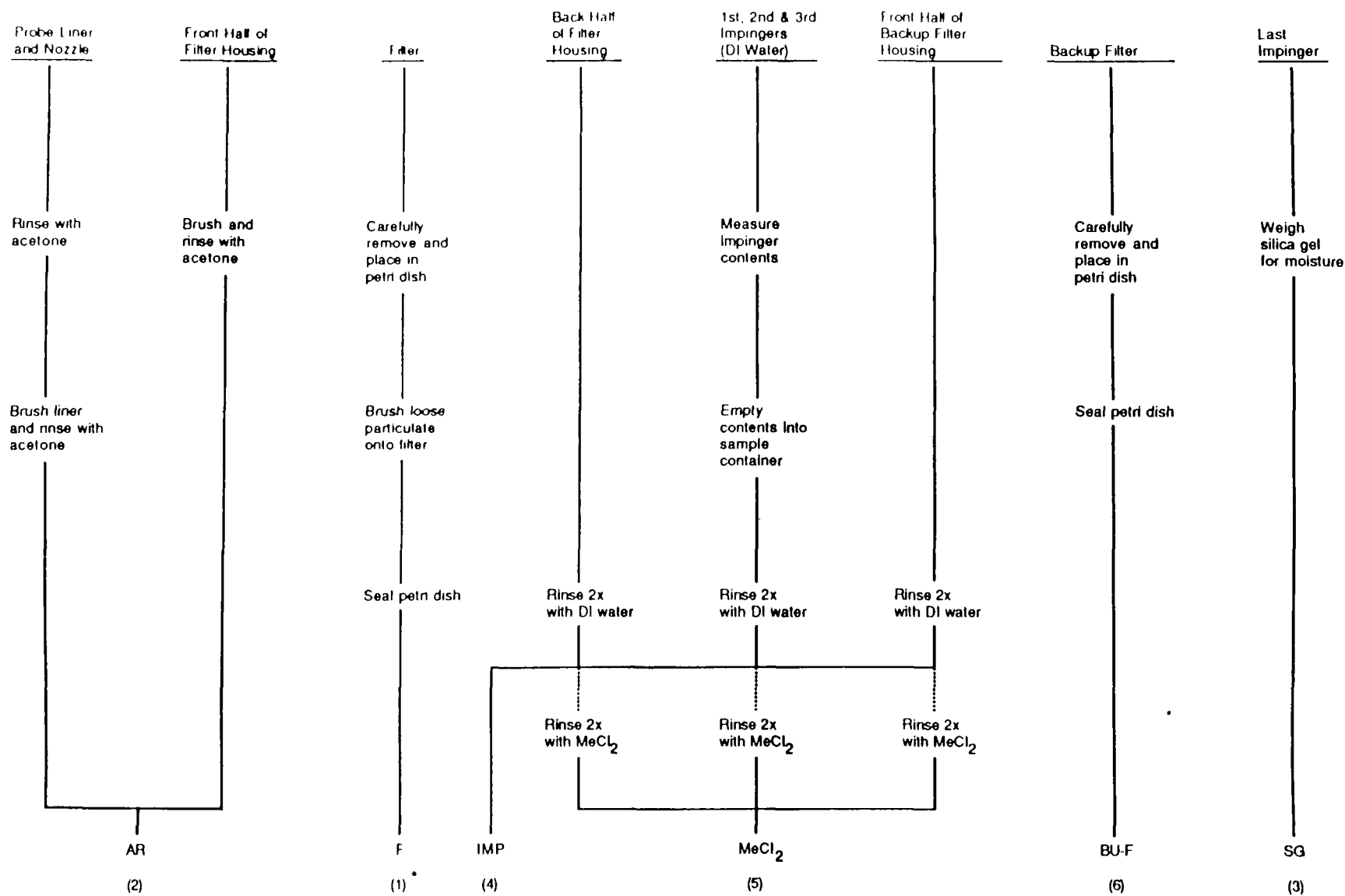


Figure 4-2 Method 202 sampling train with Method 5 filter and backup filter.



* Sample container number.

Figure 4-3. Sample recovery scheme for particulate/condensibles samples.

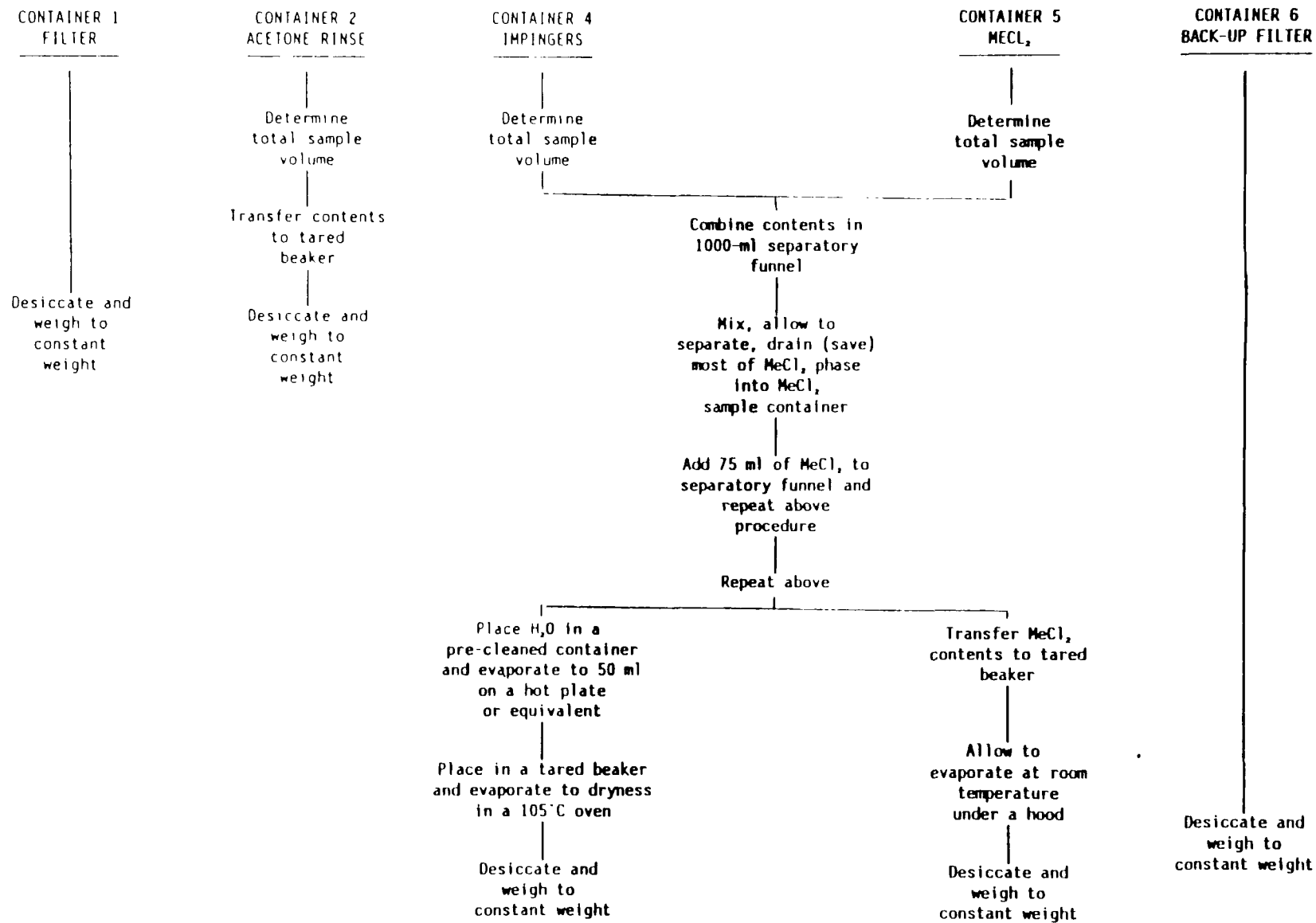


Figure 4-4. Analytical scheme for particulate/condensibles samples.

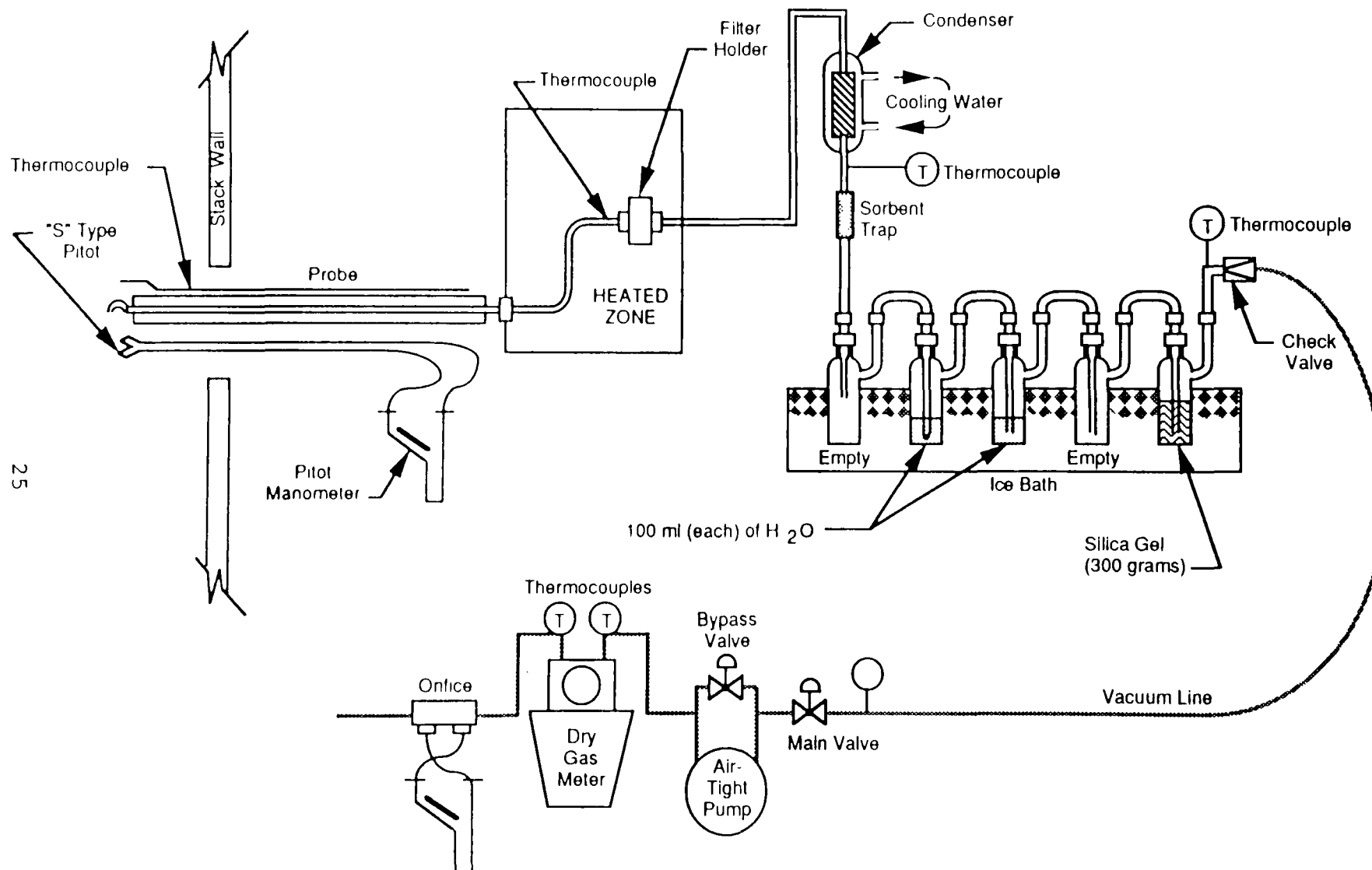
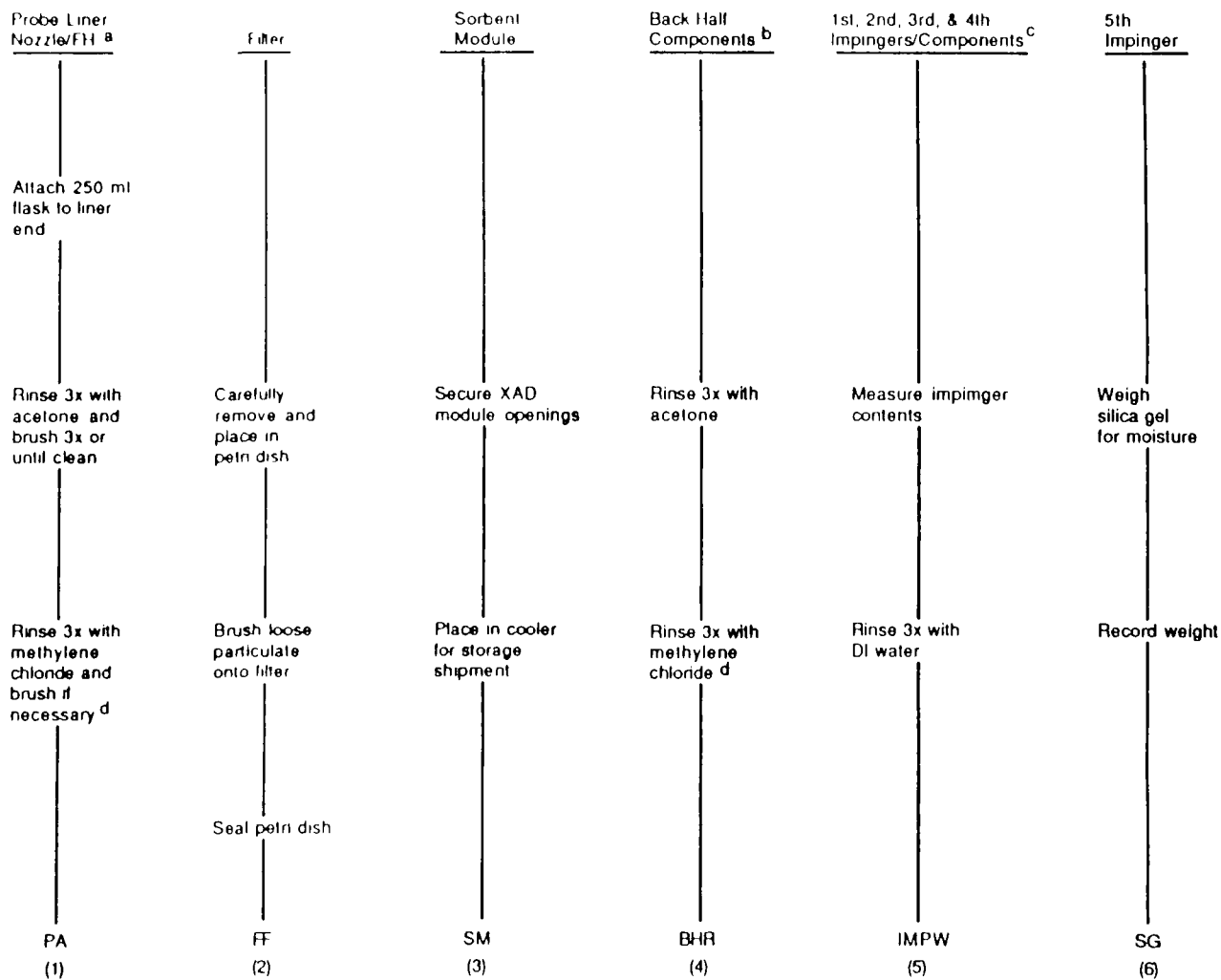


Figure 4-5. Modified Method 5 sampling train.

Figures 4-6 and 4-7 show the sample recovery and analysis schemes.

4.4 OTHER TEST METHODS

Figures 4-8 through 4-14 show the sampling train schematic and sample recovery and analysis schemes for the rest of the test methods used in this test program.



^a FH = Front half includes connecting glassware from probe to filter housing and front half filter housing.

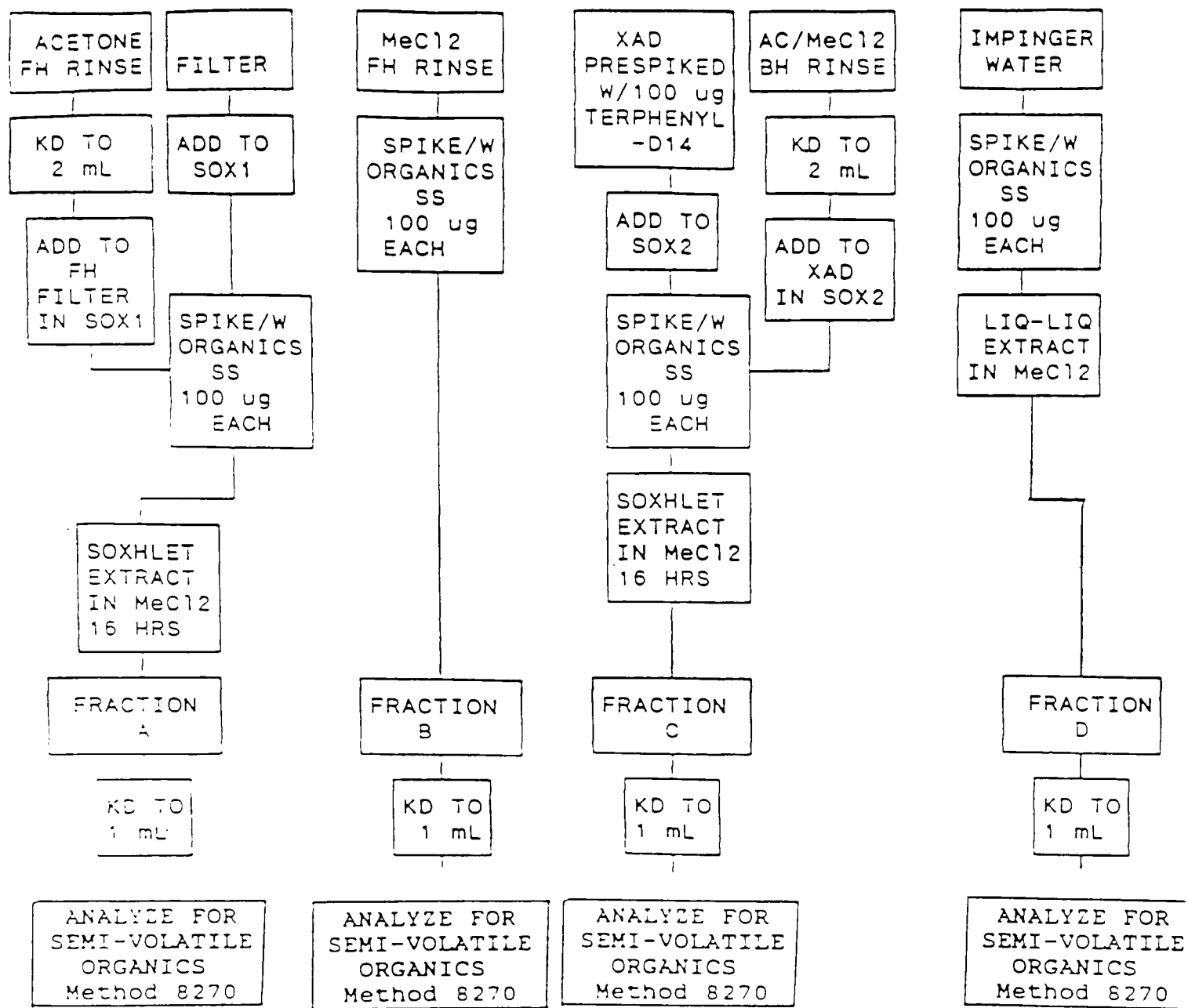
^b BHR = Back half components - Includes connecting glassware from front filter housing through condenser coil, front filter support, back half of front filter housing, condenser coil, impingers and connecting glassware

^c 1st, 2nd, 3rd, and 4th Impinger Components - Includes impingers and connecting glassware

^d Methylene chloride rinse will only be used if results from first OSB test indicate that it is necessary.

Figure 4-6. Modified Method 5 sample recovery scheme.

Figure 4-7. Organic field blank analysis flow scheme.



ORGANICS SS SPIKE:

D5-PHENOL	100 ug
1,4-DIBROMOBENZENE	100 ug
D5-NITROBENZENE	100 ug
2-FLUOROBIPHENYL	100 ug
1,3,5-TRICHLOROBENZENE-D3	100 ug
2,4,6-TRIBROMOPHENOL	100 ug
ANTHRACENE-D10	100 ug
PYRENE-D10	100 ug

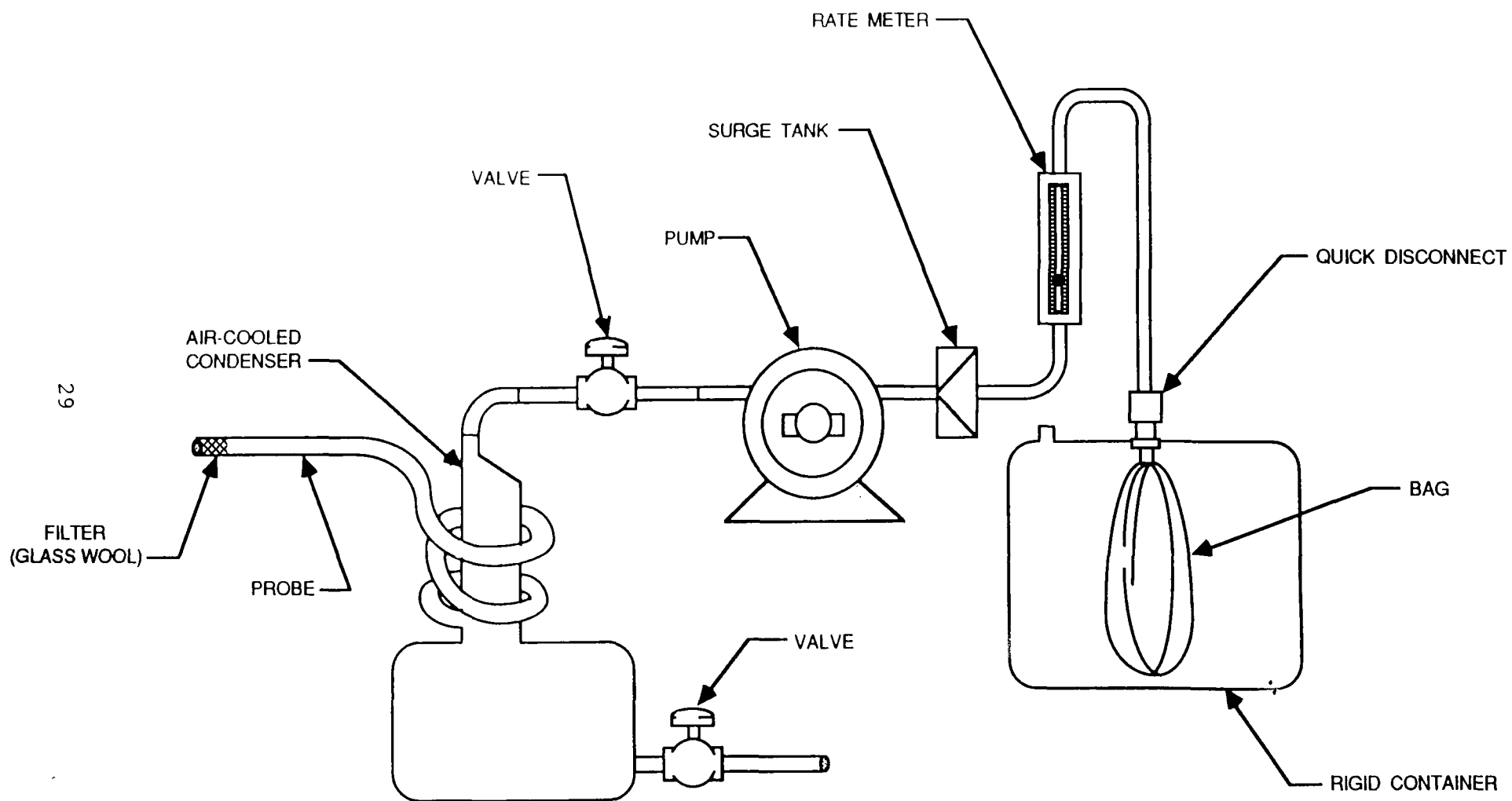


Figure 4-8. Integrated gas sampling train for Method 3.

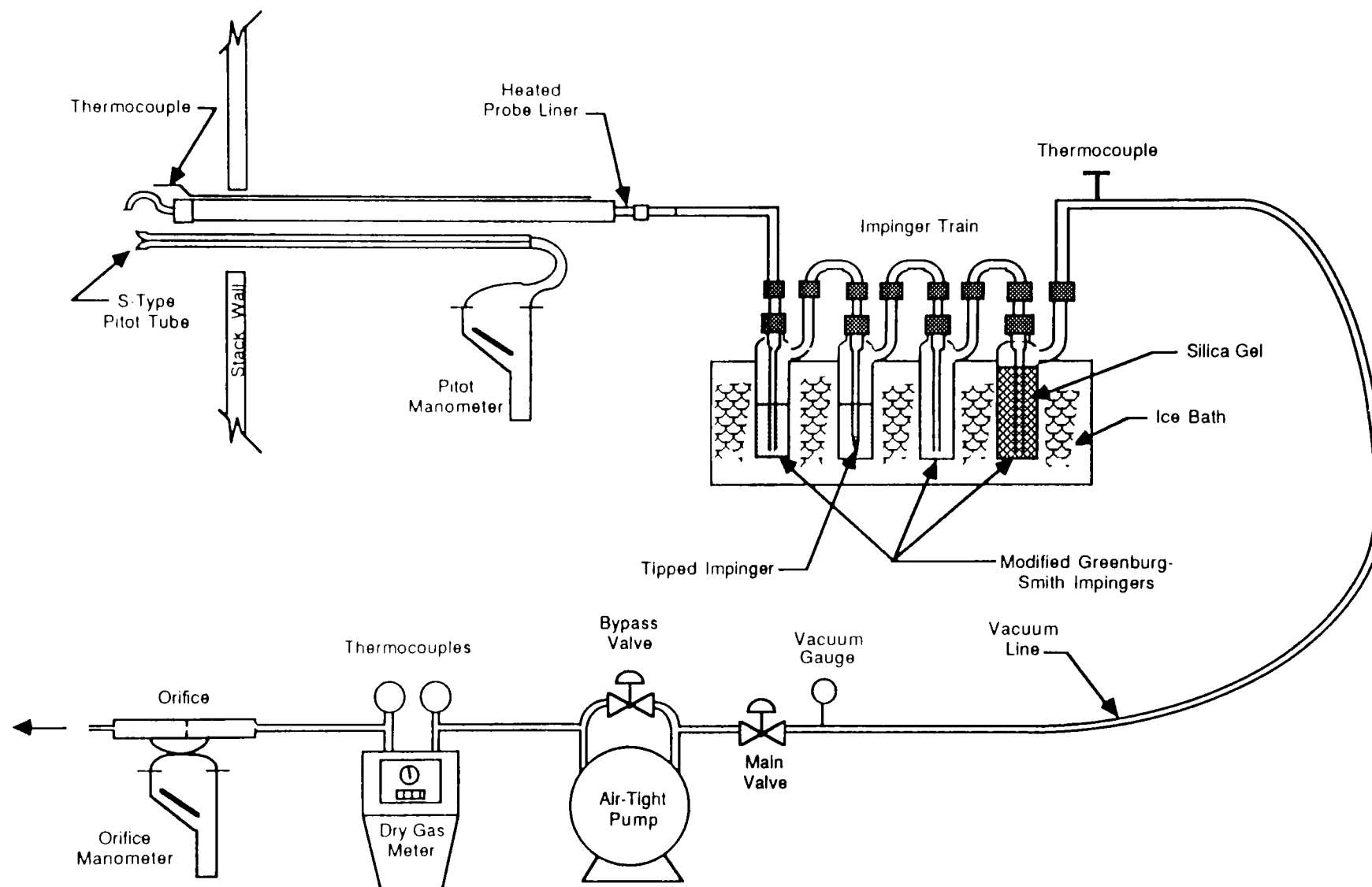


Figure 4-9. Formaldehyde (Method 0011) sampling train.

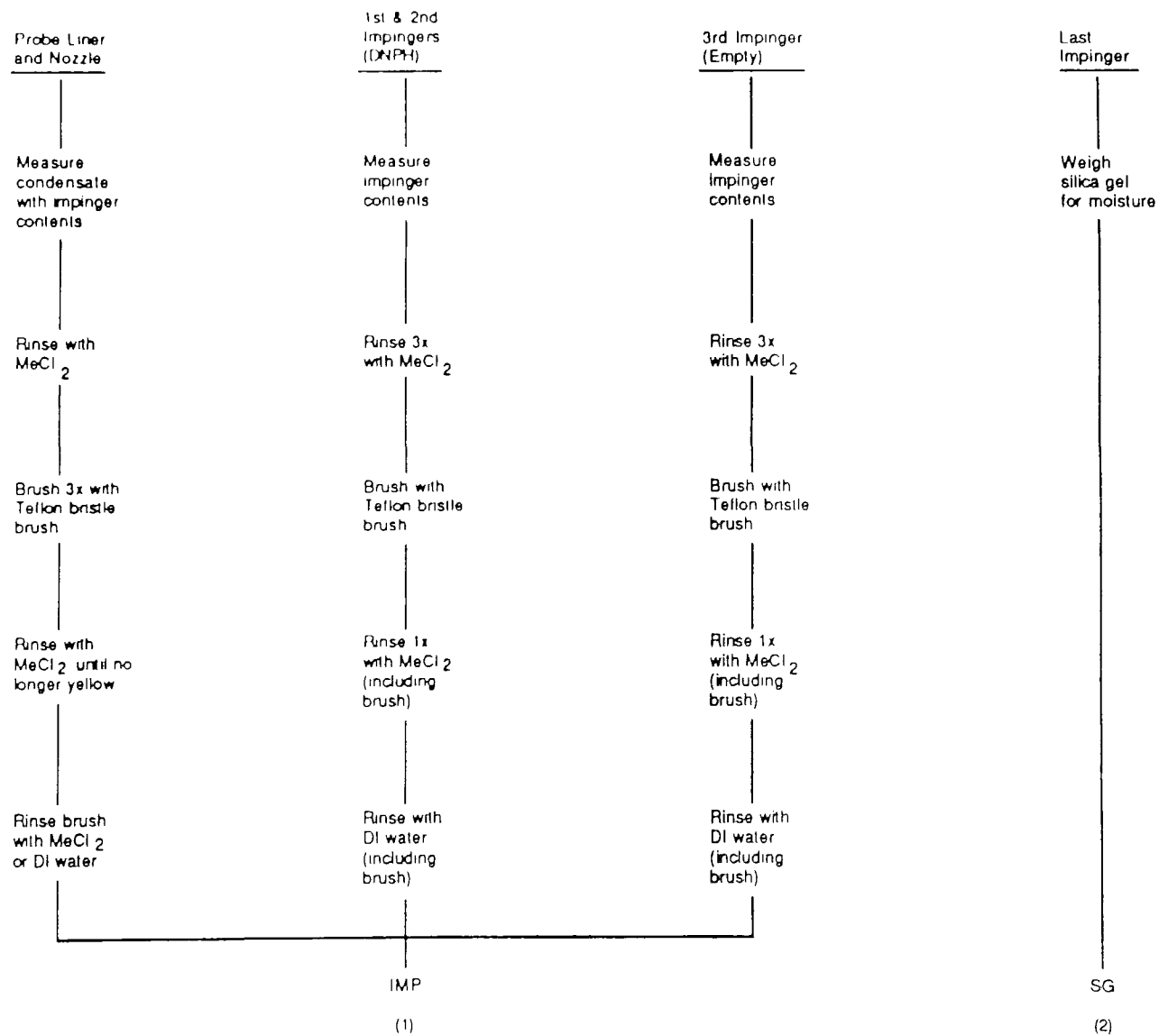


Figure 4-10. Sample recovery scheme for Method 0011 samples.

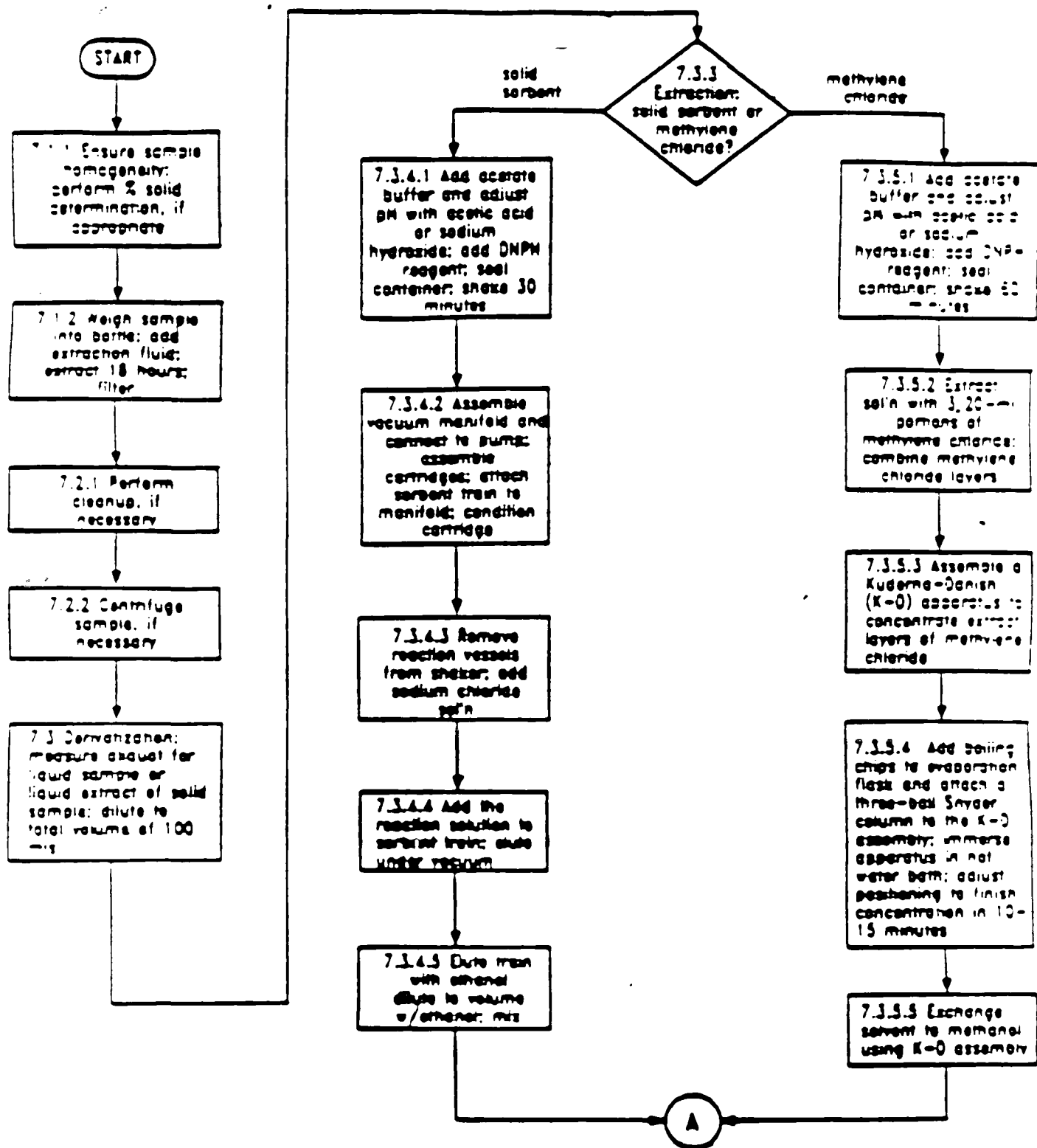


Figure 4-11. Method 0011A. Formaldehyde by high performance liquid chromatography (HPLC).

(continued)

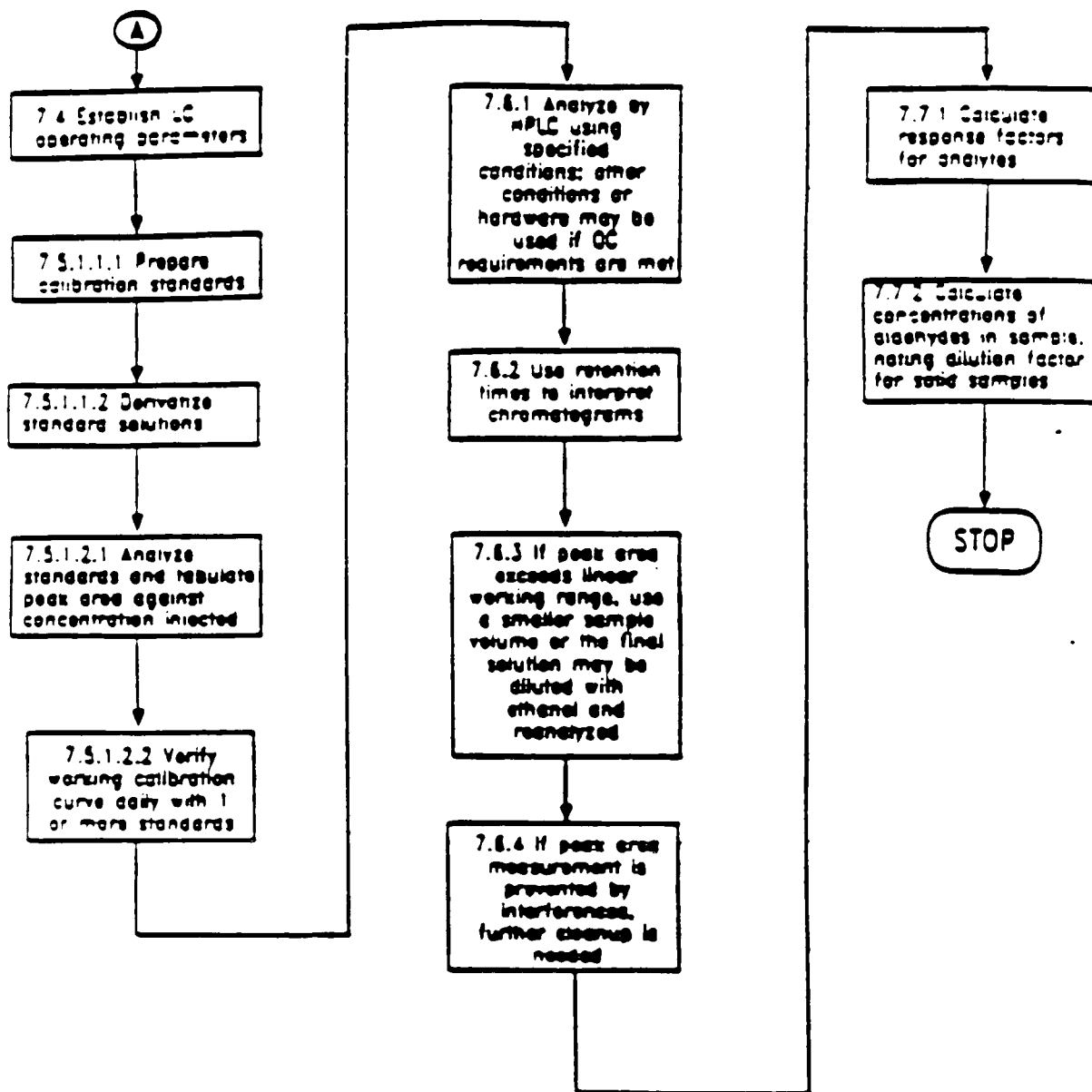


Figure 4-11 (continued)

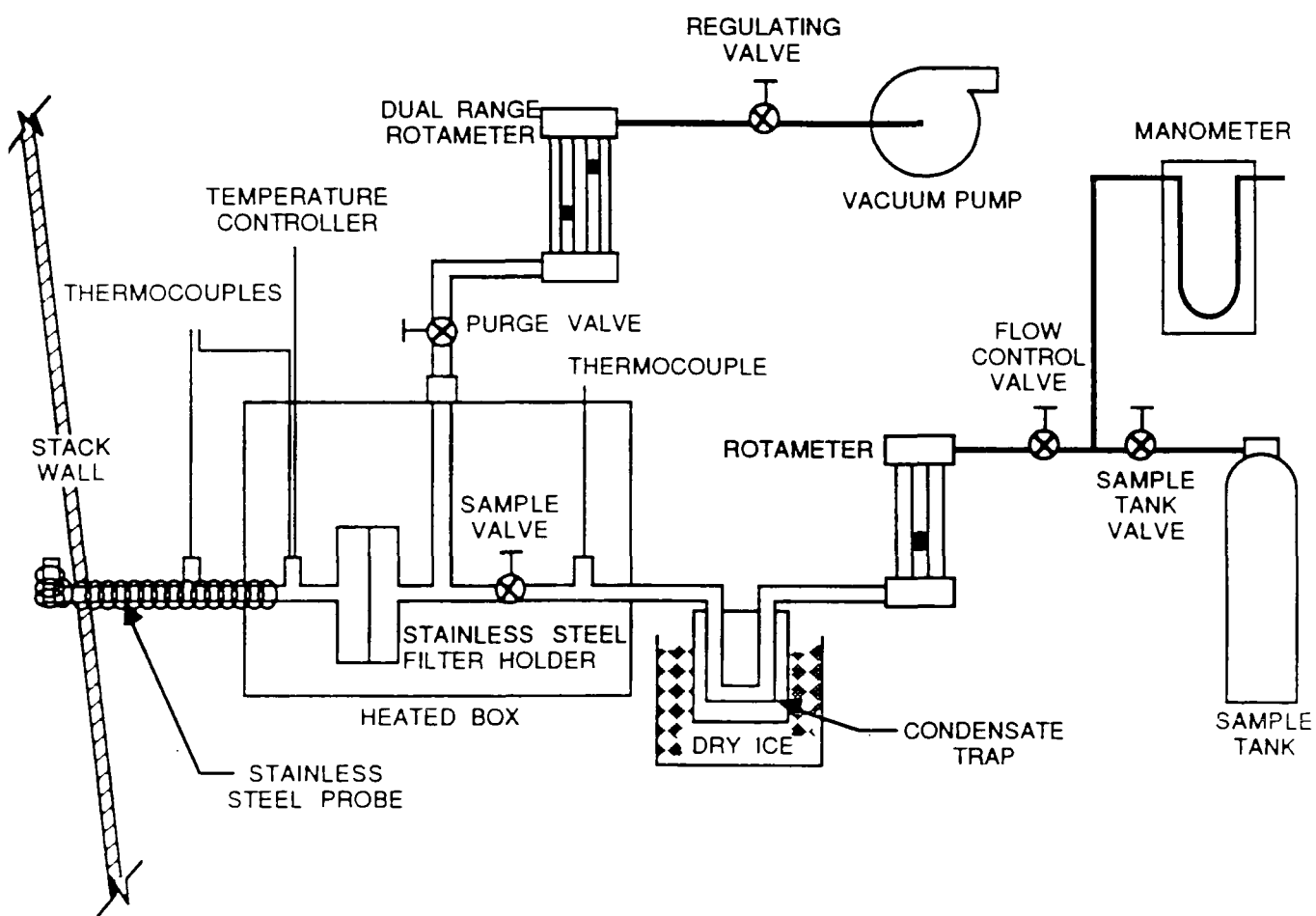


Figure 4-12. Method 25 sampling train.

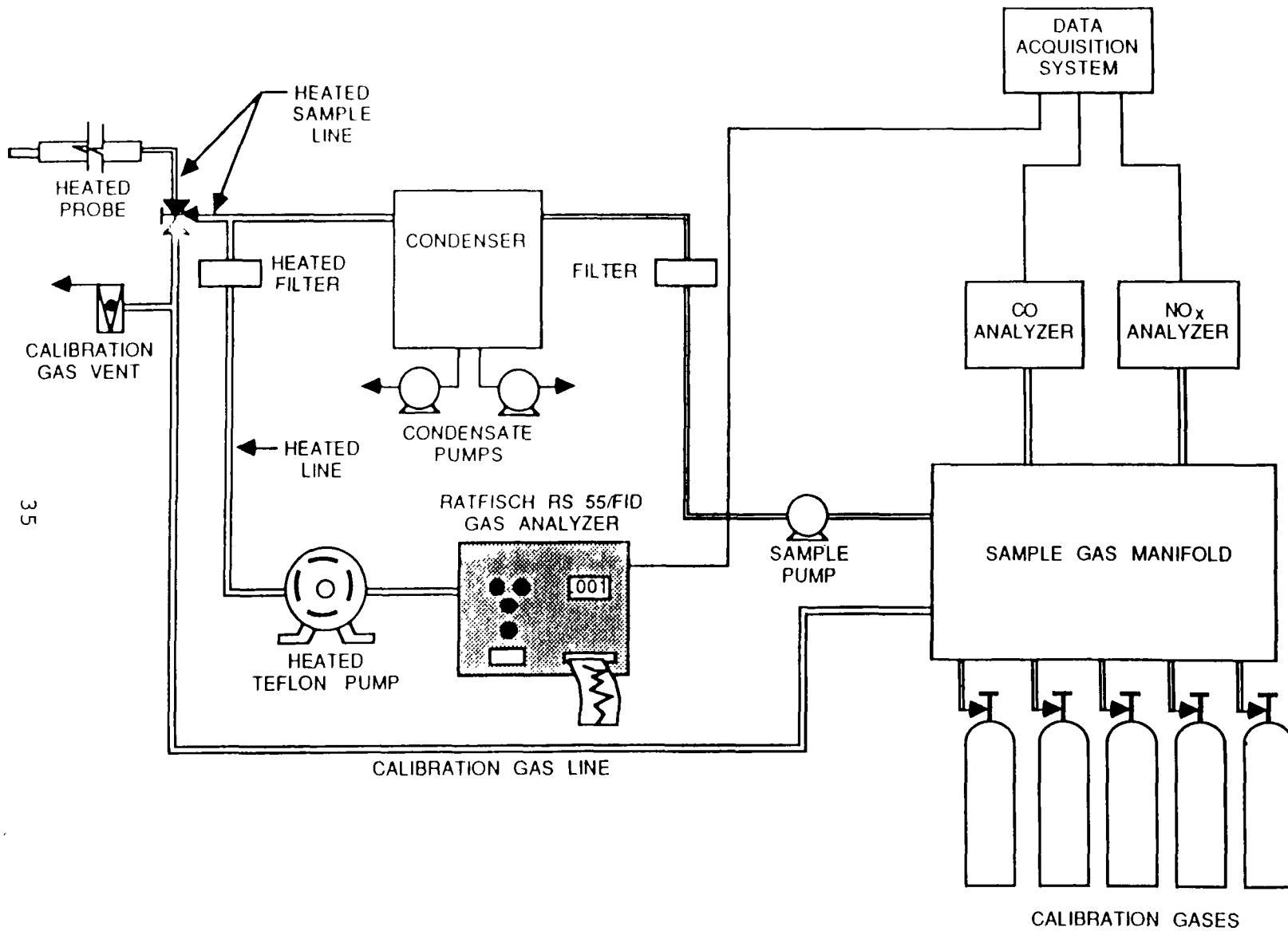


Figure 4-13. Instrumental measurement system for outlet stack location.

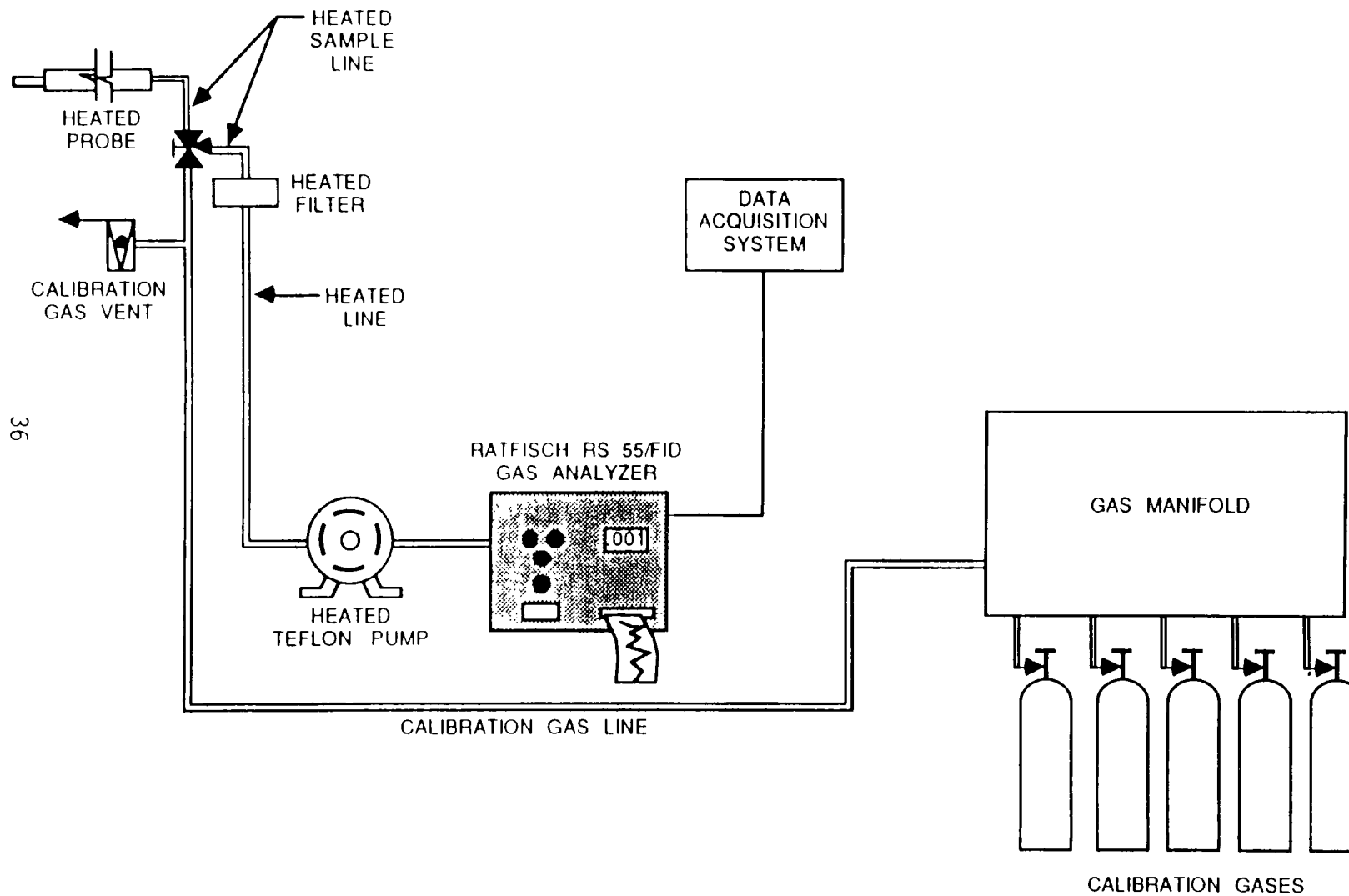


Figure 4-14. Instrumental measurement system for inlet location.

5.0 QA/QC ACTIVITIES

5.1 QC PROCEDURES

One field spike was performed at the EFB outlet location as a check of field handling and recovery procedures. The field spike consisted of introducing 200 μ l of the Field Spike Standard into an impinger containing 200 ml of the DNPH solution and following normal recovery procedures.

The Field Spike Standard was prepared in the field according to the method. Exactly 0.5 ml of 37% by weight of formaldehyde (401 mg/ml) was added to a 50-ml volumetric flask containing approximately 40 ml of methanol and then volumed to 50 ml.

The method specifies a 500- μ l syringe to transfer both the formaldehyde and the field spike solution. A 500- μ l syringe was not available; therefore, a 100- μ l syringe was used.

The results of the field spikes are shown below:

<u>Train</u>	<u>HCOH</u>	
	Added	Analyzed
LI-Train	0.80 mg	0.83 mg
S-Train	0.80 mg	0.20 mg

No explanation or reasons could be found for the great difference in the S-train spike.

5.2 SAMPLE VOLUMES AND PERCENT ISOKINETICS

All sampling rates were within ± 10 percent of isokinetic. The sample volume and percent isokinetics are shown below:

RUN	SAMPLE VOLUME			PERCENT ISOKINETIC		
	M5/202	M0011	MM5	M5/202	M0011	MM5
I-1	61.0	49.8		97.2	100.5	
I-2	45.1	47.7		102.0	101.1	
I-3	44.1	46.2		103.5	101.0	
S-1	49.0	47.1	48.2	103.1	94.8	91.3
S-2	49.8	45.5	49.1	100.2	95.5	95.9
S-3	54.4	46.2	60.0	99.0	95.7	96.3

APPENDIX A. Method M0011 Data Summary

FIELD DATA AND RESULTS TABULATION

(Revised Data for LI-1)

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
		6/25/91	6/25/91	6/26/91
	Test Date			
	Run Start Time	1014	1715	930
	Run Finish Time	1340	2015	1141
	Net Traversing Points	32	32	32
Theta	Net Run Time, Minutes	80.00	80.00	80.00
Dia	Nozzle Diameter, Inches	0.191	0.191	0.191
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0050	1.0050	1.0050
Pbar	Barometric Pressure, Inches Hg	29.90	29.90	29.90
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H2O	1.49	1.33	1.24
Vm	Volume Of Metered Gas Sample, Dry ACF	51.947	49.592	47.933
tm	Dry Gas Meter Temperature, Degrees F	95	93	92
Vmstd	Volume Of Metered Gas Sample, Dry SCF*	49.796	47.691	46.169
Vlc	Total Liquid Collected In Impingers & Silica Gel, grams	NA	287.0	265.0
Vwstd	Volume of Water Vapor, SCF*	NA	13.509	12.474
%H2O	Moisture Content, Percent by Volume	22.0	22.1	21.3
Mfd	Dry Mole Fraction	0.780	0.779	0.787
%CO2	Carbon Dioxide, Percent By Volume, Dry	3.6	2.6	3.9
%O2	Oxygen, Percent By Volume, Dry	17.1	18.3	16.8
%CO+N2	CO + N2, Percent By Volume, Dry	79.3	79.1	79.3
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	29.26	29.15	29.30
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	26.78	26.69	26.89
Pg	Flue Gas Static Pressure, Inches H2O	-15.50	-15.00	-16.00
Ps	Absolute Flue Gas Pressure, Inches Hg	28.76	28.80	28.72
ts	Flue Gas Temperature, Degrees F	203	200	208
Delta-p	Average Velocity Head, Inches H2O	1.7005	1.5298	1.4380
vs	Flue Gas Velocity, Feet/Second	86.88	82.31	80.08
A	Stack/Duct Area, Square Inches	5,542	5,542	5,542
Qsd	Volumetric Air Flow Rate, Dry SCFM*	119,789	114,045	110,471
Qmsd	Volumetric Air Flow Rate, Dry SCM*	203,546	193,785	187,712
Qaw	Volumetric Air Flow Rate, Wet ACFM	200,618	190,070	184,917
Qmaw	Volumetric Air Flow Rate, Wet ACMH	340,890	322,967	314,211
%I	Isokinetic Sampling Rate, Percent	100.5	101.1	101.0
ton/hr	Average Process Feed Rate, ton/hr	35.4	38.8	38.7

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

(Revised Data for LI-1)

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
		-----	-----	-----
<u>Acetaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	44.00	44.00	44.00
mg	Catch Weight, milligrams	8.5	28.0	11.9
mg/DSCM	Concentration, mg/DSCM*	6.03	20.7	9.10
ppmvd	Concentration, ppmvd	3.30	11.3	4.98
ppm@12%CO2	Concentration, ppmvd at 12% CO2	11.0	52.3	15.3
ppm@7%O2	Concentration, ppmvd at 7% O2	11.8	58.8	16.6
lb/hr	Emission Rate, lb/hr	2.70	8.86	3.77
lb/ton	Emission Rate, lb/ton	0.0764	0.228	0.0973
<u>Acetone Results</u>				
fw	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	2.3	11.4	3.1
mg/DSCM	Concentration, mg/DSCM*	1.63	8.44	2.37
ppmvd	Concentration, ppmvd	0.68	3.50	0.98
ppm@12%CO2	Concentration, ppmvd at 12% CO2	2.25	16.2	3.03
ppm@7%O2	Concentration, ppmvd at 7% O2	2.43	18.2	3.28
lb/hr	Emission Rate, lb/hr	0.732	3.61	0.981
lb/ton	Emission Rate, lb/ton	0.0207	0.0929	0.0254
<u>Acrolein Results</u>				
fw	Formula Weight, lb/lb-mole	56.00	56.00	56.00
mg	Catch Weight, milligrams	1.9	7.9	2.7
mg/DSCM	Concentration, mg/DSCM*	1.35	5.85	2.07
ppmvd	Concentration, ppmvd	0.579	2.51	0.887
ppm@12%CO2	Concentration, ppmvd at 12% CO2	1.93	11.6	2.73
ppm@7%O2	Concentration, ppmvd at 7% O2	2.08	13.0	2.96
lb/hr	Emission Rate, lb/hr	0.605	2.50	0.855
lb/ton	Emission Rate, lb/ton	0.0171	0.0644	0.0221

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

(Revised Data for LI-1)

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
		-----	-----	-----
<u>Benzaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	106.00	106.00	106.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0161	< 0.0168	< 0.0174
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0536	< 0.0776	< 0.0534
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0578	< 0.0871	< 0.0579
lb/hr	Emission Rate, lb/hr	< 0.0318	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000899	< 0.000815	< 0.000818
<u>Butylaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	72.00	72.00	72.00
mg	Catch Weight, milligrams	0.37	1.23	0.14
mg/DSCM	Concentration, mg/DSCM*	0.262	0.911	0.107
ppmvd	Concentration, ppmvd	0.0877	0.304	0.0358
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.292	1.40	0.110
ppm@7%O2	Concentration, ppmvd at 7% O2	0.315	1.58	0.119
lb/hr	Emission Rate, lb/hr	0.118	0.389	0.0443
lb/ton	Emission Rate, lb/ton	0.00333	0.0100	0.00114
<u>Crotonaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	70.00	70.00	70.00
mg	Catch Weight, milligrams	0.66	2.58	0.42
mg/DSCM	Concentration, mg/DSCM*	0.468	1.91	0.321
ppmvd	Concentration, ppmvd	0.161	0.656	0.110
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.536	3.03	0.340
ppm@7%O2	Concentration, ppmvd at 7% O2	0.577	3.40	0.368
lb/hr	Emission Rate, lb/hr	0.210	0.816	0.133
lb/ton	Emission Rate, lb/ton	0.00593	0.0210	0.00343

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

(Revised Data for LI-1)

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

LI-M0011-1 LI-M0011-2 LI-M0011-3

Dimethylbenzaldehyde Results

fwt	Formula Weight, lb/lb-mole	134.00	134.00	134.00
mg	Catch Weight, milligrams	0.65	0.04 <	0.1
mg/DSCM	Concentration, mg/DSCM*	0.461	0.0296 <	0.0765
ppmvd	Concentration, ppmvd	0.0827	0.00532 <	0.0137
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.276	0.0245 <	0.0422
ppm@7%O2	Concentration, ppmvd at 7% O2	0.297	0.0276 <	0.0458
lb/hr	Emission Rate, lb/hr	0.207	0.0127 <	0.0317
lb/ton	Emission Rate, lb/ton	0.00584	0.000326 <	0.000818

Formaldehyde Results

fwt	Formula Weight, lb/lb-mole	30.00	30.00	30.00
mg	Catch Weight, milligrams	27.4	78.0	41.2
mg/DSCM	Concentration, mg/DSCM*	19.4	57.8	31.5
ppmvd	Concentration, ppmvd	15.6	46.3	25.3
ppm@12%CO2	Concentration, ppmvd at 12% CO2	51.9	214	77.7
ppm@7%O2	Concentration, ppmvd at 7% O2	55.9	240	84.2
lb/hr	Emission Rate, lb/hr	8.72	24.7	13.0
lb/ton	Emission Rate, lb/ton	0.246	0.636	0.337

Hexaldehyde Results

fwt	Formula Weight, lb/lb-mole	100.00	100.00	100.00
mg	Catch Weight, milligrams	< 0.1 <	0.1 <	0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709 <	0.0740 <	0.0765
ppmvd	Concentration, ppmvd	< 0.0171 <	0.0178 <	0.0184
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0569 <	0.0822 <	0.0566
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0612 <	0.0924 <	0.0613
lb/hr	Emission Rate, lb/hr	< 0.0318 <	0.0316 <	0.0317
lb/ton	Emission Rate, lb/ton	< 0.000899 <	0.000815 <	0.000818

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

(Revised Data for LI-1)

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

LI-M0011-1 LI-M0011-2 LI-M0011-3

Propionaldehyde Results

fwt	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	0.45	1.7	1.6
mg/DSCM	Concentration, mg/DSCM*	0.319	1.26	1.22
ppmvd	Concentration, ppmvd	0.132	0.522	0.508
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.441	2.41	1.56
ppm@7%O2	Concentration, ppmvd at 7% O2	0.475	2.71	1.69
lb/hr	Emission Rate, lb/hr	0.143	0.538	0.506
lb/ton	Emission Rate, lb/ton	0.00405	0.0139	0.0131

Tolualdehyde Results

fwt	Formula Weight, lb/lb-mole	120.00	120.00	120.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0142	< 0.0148	< 0.0153
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0474	< 0.0685	< 0.0472
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0510	< 0.0770	< 0.0511
lb/hr	Emission Rate, lb/hr	< 0.0318	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000899	< 0.000815	< 0.000818

Valeraldehyde Results

fwt	Formula Weight, lb/lb-mole	86.00	86.00	86.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0198	< 0.0207	< 0.0214
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0661	< 0.0956	< 0.0658
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0712	< 0.1074	< 0.0713
lb/hr	Emission Rate, lb/hr	< 0.0318	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000899	< 0.000815	< 0.000818

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
		6/25/91	6/25/91	6/26/91
	Test Date			
	Run Start Time	1014	1715	930
	Run Finish Time	1340	2015	1141
	Net Traversing Points	32	32	32
Theta	Net Run Time, Minutes	80.00	80.00	80.00
Dia	Nozzle Diameter, Inches	0.191	0.191	0.191
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0050	1.0050	1.0050
Pbar	Barometric Pressure, Inches Hg	29.90	29.90	29.90
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H2O	1.49	1.33	1.24
Vm	Volume Of Metered Gas Sample, Dry ACF	51.947	49.592	47.933
tm	Dry Gas Meter Temperature, Degrees F	95	93	92
Vmstd	Volume Of Metered Gas Sample, Dry SCF*	49.796	47.691	46.169
Vlc	Total Liquid Collected In Impingers & Silica Gel, grams	208.5	287.0	265.0
Vwstd	Volume of Water Vapor, SCF*	9.814	13.509	12.474
%H2O	Moisture Content, Percent by Volume	16.5	22.1	21.3
Mfd	Dry Mole Fraction	0.835	0.779	0.787
%CO2	Carbon Dioxide, Percent By Volume, Dry	3.6	2.6	3.9
%O2	Oxygen, Percent By Volume, Dry	17.1	18.3	16.8
%CO+N2	CO + N2, Percent By Volume, Dry	79.3	79.1	79.3
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	29.26	29.15	29.30
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	27.41	26.69	26.89
Pg	Flue Gas Static Pressure, Inches H2O	-15.50	-15.00	-16.00
Pb	Absolute Flue Gas Pressure, Inches Hg	28.76	28.80	28.72
ts	Flue Gas Temperature, Degrees F	203	200	208
Delta-p	Average Velocity Head, Inches H2O	1.7005	1.5298	1.4380
vs	Flue Gas Velocity, Feet/Second	85.89	82.31	80.08
A	Stack/Duct Area, Square Inches	5,542	5,542	5,542
Qsd	Volumetric Air Flow Rate, Dry SCFM*	126,824	114,045	110,471
Qmsd	Volumetric Air Flow Rate, Dry SCMh*	215,499	193,785	187,712
Qaw	Volumetric Air Flow Rate, Wet ACFM	198,323	190,070	184,917
Qmaw	Volumetric Air Flow Rate, Wet ACMh	336,991	322,967	314,211
%I	Isokinetic Sampling Rate, Percent	94.9	101.1	101.0
ton/hr	Average Process Feed Rate, ton/hr	35.4	38.8	38.7

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
<u>Acetaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	44.00	44.00	44.00
mg	Catch Weight, milligrams	8.5	28.0	11.9
mg/DSCM	Concentration, mg/DSCM*	6.03	20.7	9.10
ppmvd	Concentration, ppmvd	3.30	11.3	4.98
ppm@12%CO2	Concentration, ppmvd at 12% CO2	11.0	52.3	15.3
ppm@7%O2	Concentration, ppmvd at 7% O2	11.8	58.8	16.6
lb/hr	Emission Rate, lb/hr	2.86	8.86	3.77
lb/ton	Emission Rate, lb/ton	0.0809	0.228	0.0973
<u>Acetone Results</u>				
fw	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	2.3	11.4	3.1
mg/DSCM	Concentration, mg/DSCM*	1.63	8.44	2.37
ppmvd	Concentration, ppmvd	0.68	3.50	0.98
ppm@12%CO2	Concentration, ppmvd at 12% CO2	2.25	16.2	3.03
ppm@7%O2	Concentration, ppmvd at 7% O2	2.43	18.2	3.28
lb/hr	Emission Rate, lb/hr	0.775	3.61	0.981
lb/ton	Emission Rate, lb/ton	0.0219	0.0929	0.0254
<u>Acrolein Results</u>				
fw	Formula Weight, lb/lb-mole	56.00	56.00	56.00
mg	Catch Weight, milligrams	1.9	7.9	2.7
mg/DSCM	Concentration, mg/DSCM*	1.35	5.85	2.07
ppmvd	Concentration, ppmvd	0.579	2.51	0.887
ppm@12%CO2	Concentration, ppmvd at 12% CO2	1.93	11.6	2.73
ppm@7%O2	Concentration, ppmvd at 7% O2	2.08	13.0	2.96
lb/hr	Emission Rate, lb/hr	0.640	2.50	0.855
lb/ton	Emission Rate, lb/ton	0.0181	0.0644	0.0221

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
		-----	-----	-----
<u>Benzaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	106.00	106.00	106.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0161	< 0.0168	< 0.0174
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0536	< 0.0776	< 0.0534
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0578	< 0.0871	< 0.0579
lb/hr	Emission Rate, lb/hr	< 0.0337	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000952	< 0.000815	< 0.000818
<u>Butylaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	72.00	72.00	72.00
mg	Catch Weight, milligrams	0.37	1.23	0.14
mg/DSCM	Concentration, mg/DSCM*	0.262	0.911	0.107
ppmvd	Concentration, ppmvd	0.0877	0.304	0.0358
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.292	1.40	0.110
ppm@7%O2	Concentration, ppmvd at 7% O2	0.315	1.58	0.119
lb/hr	Emission Rate, lb/hr	0.125	0.389	0.0443
lb/ton	Emission Rate, lb/ton	0.00352	0.0100	0.00114
<u>Crotonaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	70.00	70.00	70.00
mg	Catch Weight, milligrams	0.66	2.58	0.42
mg/DSCM	Concentration, mg/DSCM*	0.468	1.91	0.321
ppmvd	Concentration, ppmvd	0.161	0.656	0.110
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.536	3.03	0.340
ppm@7%O2	Concentration, ppmvd at 7% O2	0.577	3.40	0.368
lb/hr	Emission Rate, lb/hr	0.222	0.816	0.133
lb/ton	Emission Rate, lb/ton	0.00628	0.0210	0.00343

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
<u>Dimethylbenzaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	134.00	134.00	134.00
mg	Catch Weight, milligrams	0.65	0.04 <	0.1
mg/DSCM	Concentration, mg/DSCM*	0.461	0.0296 <	0.0765
ppmvd	Concentration, ppmvd	0.0827	0.00532 <	0.0137
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.276	0.0245 <	0.0422
ppm@7%O2	Concentration, ppmvd at 7% O2	0.297	0.0276 <	0.0458
lb/hr	Emission Rate, lb/hr	0.219	0.0127 <	0.0317
lb/ton	Emission Rate, lb/ton	0.00619	0.000326 <	0.000818
<u>Formaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	30.00	30.00	30.00
mg	Catch Weight, milligrams	27.4	78.0	41.2
mg/DSCM	Concentration, mg/DSCM*	19.4	57.8	31.5
ppmvd	Concentration, ppmvd	15.6	46.3	25.3
ppm@12%CO2	Concentration, ppmvd at 12% CO2	51.9	214	77.7
ppm@7%O2	Concentration, ppmvd at 7% O2	55.9	240	84.2
lb/hr	Emission Rate, lb/hr	9.23	24.7	13.0
lb/ton	Emission Rate, lb/ton	0.261	0.636	0.337
<u>Hexaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	100.00	100.00	100.00
mg	Catch Weight, milligrams	< 0.1 <	0.1 <	0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709 <	0.0740 <	0.0765
ppmvd	Concentration, ppmvd	< 0.0171 <	0.0178 <	0.0184
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0569 <	0.0822 <	0.0566
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0612 <	0.0924 <	0.0613
lb/hr	Emission Rate, lb/hr	< 0.0337 <	0.0316 <	0.0317
lb/ton	Emission Rate, lb/ton	< 0.000952 <	0.000815 <	0.000818

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M0011-1	LI-M0011-2	LI-M0011-3
<u>Propionaldehyde Results</u>		-----	-----	-----
fw	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	0.45	1.7	1.6
mg/DSCM	Concentration, mg/DSCM*	0.319	1.26	1.22
ppmvd	Concentration, ppmvd	0.132	0.522	0.508
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.441	2.41	1.56
ppm@7%O2	Concentration, ppmvd at 7% O2	0.475	2.71	1.69
lb/hr	Emission Rate, lb/hr	0.152	0.538	0.506
lb/ton	Emission Rate, lb/ton	0.00428	0.0139	0.0131
<u>Tolualdehyde Results</u>				
fw	Formula Weight, lb/lb-mole	120.00	120.00	120.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0142	< 0.0148	< 0.0153
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0474	< 0.0685	< 0.0472
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0510	< 0.0770	< 0.0511
lb/hr	Emission Rate, lb/hr	< 0.0337	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000952	< 0.000815	< 0.000818
<u>Valeraldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	86.00	86.00	86.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0709	< 0.0740	< 0.0765
ppmvd	Concentration, ppmvd	< 0.0198	< 0.0207	< 0.0214
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0661	< 0.0956	< 0.0658
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0712	< 0.1074	< 0.0713
lb/hr	Emission Rate, lb/hr	< 0.0337	< 0.0316	< 0.0317
lb/ton	Emission Rate, lb/ton	< 0.000952	< 0.000815	< 0.000818

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M0011-1	S-M0011-2	S-M0011-3
Test Date		6/25/91	6/25/91	6/26/91
	Run Start Time	1014	1753	930
	Run Finish Time	1342	2005	1143
	Net Traversing Points	32	32	32
Theta	Net Run Time, Minutes	80.00	80.00	80.00
Dia	Nozzle Diameter, Inches	0.248	0.248	0.248
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0055	1.0055	1.0055
Pbar	Barometric Pressure, Inches Hg	29.80	29.80	29.80
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H ₂ O	1.33	1.18	1.25
Vm	Volume Of Metered Gas Sample, Dry ACF	50.395	47.620	49.150
tm	Dry Gas Meter Temperature, Degrees F	107	95	104
Vmstd	Volume Of Metered Gas Sample, Dry SCF*	47.133	45.484	46.204
Vlc	Total Liquid Collected In Impingers & Silica Gel, grams	273.0	277.5	290.5
Vwstd	Volume of Water Vapor, SCF*	12.850	13.062	13.674
%H ₂ O	Moisture Content, Percent by Volume	21.4	22.3	22.8
Mfd	Dry Mole Fraction	0.786	0.777	0.772
%CO ₂	Carbon Dioxide, Percent By Volume, Dry	3.5	3.6	3.5
%O ₂	Oxygen, Percent By Volume, Dry	17.2	16.9	17.2
%CO+N ₂	CO + N ₂ , Percent By Volume, Dry	79.3	79.5	79.3
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	29.25	29.25	29.25
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	26.84	26.74	26.68
Pg	Flue Gas Static Pressure, Inches H ₂ O	0.00	0.00	0.00
Ps	Absolute Flue Gas Pressure, Inches Hg	29.80	29.80	29.80
ts	Flue Gas Temperature, Degrees F	144	146	148
Delta-p	Average Velocity Head, Inches H ₂ O	0.5228	0.4912	0.5115
vs	Flue Gas Velocity, Feet/Second	45.12	43.89	44.91
A	Stack/Duct Area, Square Inches	9,161	9,161	9,161
Qsd	Volumetric Air Flow Rate, Dry SCFM*	117,835	112,945	114,420
Qmsd	Volumetric Air Flow Rate, Dry SCMH*	200,225	191,916	194,423
Qaw	Volumetric Air Flow Rate, Wet ACFM	172,237	167,529	171,437
Qmaw	Volumetric Air Flow Rate, Wet ACMH	292,665	284,665	291,306
%I	Isokinetic Sampling Rate, Percent	94.8	95.5	95.7
ton/hr	Process Feed Rate, ton/hr	35.4	38.8	38.7

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M0011-1	S-M0011-2	S-M0011-3
		-----	-----	-----
<u>Acetaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	44.00	44.00	44.00
mg	Catch Weight, milligrams	8.1	12.2	10.7
mg/DSCM	Concentration, mg/DSCM*	6.07	9.47	8.18
ppmvd	Concentration, ppmvd	3.32	5.18	4.47
ppm@12%CO2	Concentration, ppmvd at 12% CO2	11.4	17.3	15.3
ppm@7%O2	Concentration, ppmvd at 7% O2	12.2	17.7	16.5
lb/hr	Emission Rate, lb/hr	2.68	4.01	3.51
lb/ton	Emission Rate, lb/ton	0.0757	0.103	0.0906
<u>Acetone Results</u>				
fw	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	2.8	4.4	3.7
mg/DSCM	Concentration, mg/DSCM*	2.10	3.42	2.83
ppmvd	Concentration, ppmvd	0.870	1.42	1.17
ppm@12%CO2	Concentration, ppmvd at 12% CO2	2.98	4.72	4.02
ppm@7%O2	Concentration, ppmvd at 7% O2	3.21	4.84	4.32
lb/hr	Emission Rate, lb/hr	0.926	1.45	1.212
lb/ton	Emission Rate, lb/ton	0.0262	0.0372	0.0313
<u>Acrolein Results</u>				
fw	Formula Weight, lb/lb-mole	56.00	56.00	56.00
mg	Catch Weight, milligrams	2.9	4.0	4.0
mg/DSCM	Concentration, mg/DSCM*	2.17	3.11	3.06
ppmvd	Concentration, ppmvd	0.933	1.33	1.31
ppm@12%CO2	Concentration, ppmvd at 12% CO2	3.20	4.45	4.50
ppm@7%O2	Concentration, ppmvd at 7% O2	3.44	4.56	4.84
lb/hr	Emission Rate, lb/hr	0.959	1.31	1.31
lb/ton	Emission Rate, lb/ton	0.0271	0.0339	0.0339

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M0011-1	S-M0011-2	S-M0011-3
		-----	-----	-----
<u>Benzaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	106.00	106.00	106.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0749	< 0.0776	< 0.0764
ppmvd	Concentration, ppmvd	< 0.0170	< 0.0176	< 0.0173
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0583	< 0.0587	< 0.0595
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0626	< 0.0602	< 0.0639
lb/hr	Emission Rate, lb/hr	< 0.0331	< 0.0328	< 0.0328
lb/ton	Emission Rate, lb/ton	< 0.000934	< 0.000847	< 0.000846
<u>Butylaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	72.00	72.00	72.00
mg	Catch Weight, milligrams	0.39	1.83	0.46
mg/DSCM	Concentration, mg/DSCM*	0.292	1.42	0.352
ppmvd	Concentration, ppmvd	0.0976	0.475	0.117
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.335	1.58	0.403
ppm@7%O2	Concentration, ppmvd at 7% O2	0.360	1.62	0.433
lb/hr	Emission Rate, lb/hr	0.129	0.601	0.151
lb/ton	Emission Rate, lb/ton	0.00364	0.0155	0.00389
<u>Crotonaldehyde Results</u>				
fw	Formula Weight, lb/lb-mole	70.00	70.00	70.00
mg	Catch Weight, milligrams	1.38	0.86	1.68
mg/DSCM	Concentration, mg/DSCM*	1.03	0.668	1.28
ppmvd	Concentration, ppmvd	0.355	0.229	0.441
ppm@12%CO2	Concentration, ppmvd at 12% CO2	1.22	0.765	1.51
ppm@7%O2	Concentration, ppmvd at 7% O2	1.31	0.783	1.63
lb/hr	Emission Rate, lb/hr	0.456	0.282	0.550
lb/ton	Emission Rate, lb/ton	0.0129	0.00728	0.0142

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M0011-1	S-M0011-2	S-M0011-3
		-----	-----	-----
<u>Dimethylbenzaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	134.00	134.00	134.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0749	< 0.0776	< 0.0764
ppmvd	Concentration, ppmvd	< 0.0134	< 0.0139	< 0.0137
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0461	< 0.0465	< 0.0470
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0496	< 0.0476	< 0.0505
lb/hr	Emission Rate, lb/hr	< 0.0331	< 0.0328	< 0.0328
lb/ton	Emission Rate, lb/ton	< 0.000934	< 0.000847	< 0.000846
<u>Formaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	30.00	30.00	30.00
mg	Catch Weight, milligrams	32.3	41.4	19.7
mg/DSCM	Concentration, mg/DSCM*	24.2	32.1	15.1
ppmvd	Concentration, ppmvd	19.4	25.8	12.1
ppm@12%CO2	Concentration, ppmvd at 12% CO2	66.5	85.9	41.4
ppm@7%O2	Concentration, ppmvd at 7% O2	71.5	88.0	44.5
lb/hr	Emission Rate, lb/hr	10.7	13.6	6.45
lb/ton	Emission Rate, lb/ton	0.302	0.350	0.167
<u>Hexaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	100.00	100.00	100.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0749	< 0.0776	< 0.0764
ppmvd	Concentration, ppmvd	< 0.0180	< 0.0187	< 0.0184
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0618	< 0.0623	< 0.0630
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0664	< 0.0638	< 0.0677
lb/hr	Emission Rate, lb/hr	< 0.0331	< 0.0328	< 0.0328
lb/ton	Emission Rate, lb/ton	< 0.000934	< 0.000847	< 0.000846

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M0011-1	S-M0011-2	S-M0011-3
		-----	-----	-----
<u>Propionaldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	58.00	58.00	58.00
mg	Catch Weight, milligrams	1.1	0.78	1.28
mg/DSCM	Concentration, mg/DSCM*	0.824	0.606	0.978
ppmvd	Concentration, ppmvd	0.342	0.251	0.406
ppm@12%CO2	Concentration, ppmvd at 12% CO2	1.17	0.837	1.39
ppm@7%O2	Concentration, ppmvd at 7% O2	1.26	0.858	1.49
lb/hr	Emission Rate, lb/hr	0.364	0.256	0.419
lb/ton	Emission Rate, lb/ton	0.0103	0.00660	0.0108
<u>Tolualdehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	120.00	120.00	120.00
mg	Catch Weight, milligrams	< 0.1	< 0.1	< 0.1
mg/DSCM	Concentration, mg/DSCM*	< 0.0749	< 0.0776	< 0.0764
ppmvd	Concentration, ppmvd	< 0.0150	< 0.0156	< 0.0153
ppm@12%CO2	Concentration, ppmvd at 12% CO2	< 0.0515	< 0.0519	< 0.0525
ppm@7%O2	Concentration, ppmvd at 7% O2	< 0.0553	< 0.0531	< 0.0564
lb/hr	Emission Rate, lb/hr	< 0.0331	< 0.0328	< 0.0328
lb/ton	Emission Rate, lb/ton	< 0.000934	< 0.000847	< 0.000846
<u>Valeraldehyde Results</u>				
fwt	Formula Weight, lb/lb-mole	86.00	86.00	86.00
mg	Catch Weight, milligrams	1.13	0.15	1.26
mg/DSCM	Concentration, mg/DSCM*	0.847	0.116	0.963
ppmvd	Concentration, ppmvd	0.237	0.033	0.269
ppm@12%CO2	Concentration, ppmvd at 12% CO2	0.812	0.109	0.924
ppm@7%O2	Concentration, ppmvd at 7% O2	0.872	0.111	0.992
lb/hr	Emission Rate, lb/hr	0.374	0.0493	0.413
lb/ton	Emission Rate, lb/ton	0.0106	0.00127	0.0107

* 68° F (20°C) -- 29.92 Inches of Mercury (Hg)

APPENDIX B. Method 5/202 Data Summary

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M5/202-1	LI-M5/202-2	LI-M5/202-3
Test Date		6/25/91	6/25/91	6/26/91
	Run Start Time	1015	1753	930
	Run Finish Time	1340	2007	1141
	Net Traversing Points	32	32	32
Theta	Net Run Time, Minutes	80.00	80.00	80.00
Dia	Nozzle Diameter, Inches	0.223	0.185	0.182
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0026	1.0026	1.0026
Pbar	Barometric Pressure, Inches Hg	29.90	29.90	29.90
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H ₂ O	2.12	1.06	1.03
Vm	Volume Of Metered Gas Sample, Dry ACF	63.918	47.198	46.231
tm	Dry Gas Meter Temperature, Degrees F	97	95	96
Vmstd	Volume Of Metered Gas Sample, Dry SCF*	61.024	45.106	44.099
Vlc	Total Liquid Collected In Impingers & Silica Gel, grams	365.5	286.5	289.5
Vwstd	Volume of Water Vapor, SCF*	17.204	13.486	13.627
%H ₂ O	Moisture Content, Percent by Volume	22.0	23.0	23.6
Mfd	Dry Mole Fraction	0.780	0.770	0.764
%CO ₂	Carbon Dioxide, Percent By Volume, Dry	3.6	2.6	3.9
%O ₂	Oxygen, Percent By Volume, Dry	17.1	18.3	16.8
%CO+N ₂	CO + N ₂ , Percent By Volume, Dry	79.3	79.1	79.3
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	29.26	29.15	29.30
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	26.78	26.59	26.63
Pg	Flue Gas Static Pressure, Inches H ₂ O	-15.50	-15.50	-15.50
Ps	Absolute Flue Gas Pressure, Inches Hg	28.76	28.76	28.76
ts	Flue Gas Temperature, Degrees F	198	188	200
Delta-p	Average Velocity Head, Inches H ₂ O	1.4588	1.534	1.5744
vs	Flue Gas Velocity, Feet/Second	80.17	81.87	83.65
A	Stack/Duct Area, Square Inches	5,542	5,542	5,542
Qsd	Volumetric Air Flow Rate, Dry SCFM*	111,376	114,018	113,478
Qmsd	Volumetric Air Flow Rate, Dry SCMh*	189,250	193,739	192,821
Qaw	Volumetric Air Flow Rate, Wet ACFM*	185,123	189,059	193,152
Qmaw	Volumetric Air Flow Rate, Wet ACMh*	314,561	321,249	328,204
%I	Isokinetic Sampling Rate, Percent	97.2	102.0	103.5
ton/hr	Process feed rate, ton/hr	35.4	38.8	38.7

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		LI-M5/202-1	LI-M5/202-2	LI-M5/202-3
<u>Particulate Results</u>		-----	-----	-----
Filterable				
mg	Catch Weight, milligrams	427.8	425.8	457.0
mg/DSCM	Concentration, mg/DSCM	248	333	366
gr/DSCF	Concentration, grains/DSCF*	0.108	0.146	0.160
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.361	0.672	0.492
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.388	0.755	0.533
lb/hr	Emission Rate, lb/hr	103	142	156
lb/ton	Emission Rate, lb/ton	2.92	3.67	4.02
Condensable - Organic				
mg	Catch Weight, milligrams	23.7	29.4	44.5
mg/DSCM	Concentration, mg/DSCM*	14	23	36
gr/DSCF	Concentration, grains/DSCF*	0.00599	0.0101	0.0156
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0200	0.0464	0.0479
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0215	0.0522	0.0519
lb/hr	Emission Rate, lb/hr	5.72	9.83	15.1
lb/ton	Emission Rate, lb/ton	0.162	0.253	0.391
Condensable - Inorganic				
mg	Catch Weight, milligrams	88.9	89.3	108.7
mg/DSCM	Concentration, mg/DSCM*	51	70	87
gr/DSCF	Concentration, grains/DSCF*	0.0225	0.0306	0.0380
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0749	0.1410	0.1170
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0807	0.1584	0.1268
lb/hr	Emission Rate, lb/hr	21.5	29.9	37.0
lb/ton	Emission Rate, lb/ton	0.606	0.770	0.956
Backup Filter				
mg	Catch Weight, milligrams	0.0	0.0	0.0
mg/DSCM	Concentration, mg/DSCM*	0	0	0
gr/DSCF	Concentration, grains/DSCF*	0.0	0.0	0.0
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0	0.0	0.0
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0	0.0	0.0
lb/hr	Emission Rate, lb/hr	0.0	0.0	0.0
lb/ton	Emission Rate, lb/ton	0.0	0.0	0.0

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Lower Prequench Inlet

		<u>LI-M5/202-1</u>	<u>LI-M5/202-2</u>	<u>LI-M5/202-3</u>
	Total Particulate			
mg	Catch Weight, milligrams	540.4	544.5	610.2
mg/DSCM	Concentration, mg/DSCM*	313	426	489
gr/DSCF	Concentration, grains/DSCF*	0.137	0.186	0.214
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.456	0.860	0.657
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.491	0.966	0.712
lb/hr	Emission Rate, lb/hr	130	182	208
lb/ton	Emission Rate, lb/ton	3.69	4.69	5.37

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M5/202-1	S-M5/202-2	S-M5/202-3
		6/25/91	6/25/91	6/26/91
	Test Date			
	Run Start Time	1014	1753	930
	Run Finish Time	1342	2005	1141
	Net Traversing Points	32	32	32
Theta	Net Run Time, Minutes	80.00	80.00	80.00
Dia	Nozzle Diameter, Inches	0.254	0.254	0.261
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0114	1.0114	1.0114
Pbar	Barometric Pressure, Inches Hg	29.80	29.80	29.80
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H ₂ O	1.26	1.35	1.63
Vm	Volume Of Metered Gas Sample, Dry ACF	50.537	52.019	56.247
tm	Dry Gas Meter Temperature, Degrees F	90	97	92
Vmstd	Volume Of Metered Gas Sample, Dry SCF*	49.024	49.838	54.415
Vlc	Total Liquid Collected In Impingers & Silica Gel, grams	283.5	307.5	347.0
Vwstd	Volume of Water Vapor, SCF*	13.344	14.474	16.333
%H ₂ O	<u>Moisture Content, Percent by Volume</u> From Measured Water Catch	21.4	22.5	23.1
	Saturation at Flue Gas Temperature	22.4 **	21.8 **	22.1 **
Mfd	Dry Mole Fraction	0.776	0.782	0.776
%CO ₂	Carbon Dioxide, Percent By Volume, Dry	3.5	3.6	3.5
%O ₂	Oxygen, Percent By Volume, Dry	17.2	16.9	17.2
%CO+N ₂	CO + N ₂ , Percent By Volume, Dry	79.3	79.5	79.3
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	29.25	29.25	29.25
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	26.73	26.80	26.73
Pg	Flue Gas Static Pressure, Inches H ₂ O	-20.00	0.00	0.00
Ps	Absolute Flue Gas Pressure, Inches Hg	28.33	29.80	29.80
ts	Flue Gas Temperature, Degrees F	143	144	145
Delta-p	Average Velocity Head, Inches H ₂ O	0.4655	0.4799	0.5324
vs	Flue Gas Velocity, Feet/Second	43.72	43.26	45.66
A	Stack/Duct Area, Square Inches	9,161	9,161	9,161
Qsd	Volumetric Air Flow Rate, Dry SCFM*	107,413	112,428	117,621
Qmsd	Volumetric Air Flow Rate, Dry SCM ^H *	182,515	191,038	199,861
Qaw	Volumetric Air Flow Rate, Wet ACFM	166,881	165,143	174,300
Qmaw	Volumetric Air Flow Rate, Wet ACM ^H	283,565	280,610	296,170

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

** Actual %H₂O used in Calculations

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M5/202-1	S-M5/202-2	S-M5/202-3
		-----	-----	-----
%I	Isokinetic Sampling Rate, Percent	103.1	100.2	99.0
ton/hr	Average Process Feed Rate, ton/hr	35.4	38.8	38.7
<u>Particulate Results</u>				
Filterable				
mg	Catch Weight, milligrams	28.1	51.7	46.3
mg/DSCM	Concentration, mg/DSCM*	20.2	36.6	30.0
gr/DSCF	Concentration, grains/DSCF*	0.00885	0.0160	0.0131
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0303	0.0534	0.0450
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0326	0.0547	0.0484
lb/hr	Emission Rate, lb/hr	8.14	15.4	13.2
lb/ton	Emission Rate, lb/ton	0.230	0.398	0.342
Condensable - Organic				
mg	Catch Weight, milligrams	14.1	22.7	19.1
mg/DSCM	Concentration, mg/DSCM*	10.2	16.1	12.4
gr/DSCF	Concentration, grains/DSCF*	0.00444	0.00703	0.00542
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0152	0.0234	0.0186
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0164	0.0240	0.0200
lb/hr	Emission Rate, lb/hr	4.09	6.77	5.46
lb/ton	Emission Rate, lb/ton	0.115	0.175	0.141
Condensable - Inorganic				
mg	Catch Weight, milligrams	18.3	28.3	30.8
mg/DSCM	Concentration, mg/DSCM*	13.2	20.1	20.0
gr/DSCF	Concentration, grains/DSCF*	0.00576	0.00876	0.00874
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0198	0.0292	0.0299
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0212	0.0299	0.0322
lb/hr	Emission Rate, lb/hr	5.30	8.44	8.81
lb/ton	Emission Rate, lb/ton	0.150	0.218	0.228
Backup Filter				
mg	Catch Weight, milligrams	0.0	0.0	0.0
mg/DSCM	Concentration, mg/DSCM*	0.0	0.0	0.0
gr/DSCF	Concentration, grains/DSCF*	0.0	0.0	0.0
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0	0.0	0.0
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0	0.0	0.0
lb/hr	Emission Rate, lb/hr	0.0	0.0	0.0
lb/ton	Emission Rate, lb/ton	0.0	0.0	0.0

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

SAMPLING LOCATION: Stack

		S-M5/202-1	S-M5/202-2	S-M5/202-3
	Total Particulate	-----	-----	-----
mg	Catch Weight, milligrams	60.5	102.7	96.2
mg/DSCM	Concentration, mg/DSCM*	43.6	72.8	62.4
gr/DSCF	Concentration, grains/DSCF*	0.0190	0.0318	0.0273
gr@12%CO2	Concentration, gr/DSCF at 12% CO2	0.0653	0.1060	0.0935
gr@7%O2	Concentration, gr/DSCF at 7% O2	0.0702	0.109	0.101
lb/hr	Emission Rate, lb/hr	17.5	30.6	27.5
lb/ton	Emission Rate, lb/ton	0.495	0.790	0.711

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

APPENDIX C. Modified Method 5 Data Summary

FIELD DATA AND RESULTS TABULATION

PLANT: Georgia-Pacific Corporation, Skippers, VA

LOCATION: Stack

RUN #	DATE	OPERATOR			
S-MM5-1	6/25/91	Clyde E. Nack			
S-MM5-2	6/25/91	Clyde E. Nack			
S-MM5-3	6/26/91	Clyde E. Nack			
			S-MM5-1	S-MM5-2	S-MM5-3
Run Start Time			. 1014	1753	0930
Run Finish Time			1342	2005	1143
Net Traversing Points			32	32	32
Theta	Net Run Time, Minutes		80.00	80.00	80.00
Dia	Nozzle Diameter, Inches		0.268	0.261	0.290
Cp	Pitot Tube Coefficient		0.840	0.840	0.840
Y	Dry Gas Meter Calibration Factor		1.0004	0.9903	0.9903
Pbar	Barometric Pressure, Inches Hg		29.80	29.80	29.80
Delta-H	Avg. Pressure Differential of Orifice Meter, Inches H ₂ O		1.45	1.44	2.13
Vm	Volume Of Metered Gas Sample, Dry ACF		49.889	52.762	63.613
tm	Dry Gas Meter Temperature, Degrees F		87	102	96
Vmstd	Volume Of Metered Gas Sample, Dry SCF*		48.179	49.104	59.951
Vlc	Total Volume of Liquid Collected in Impingers & Silica Gel, ml		293.5	315.0	413.5
Vwstd	Volume of Water Vapor, SCF*		13.815	14.827	19.463
%H ₂ O	Moisture Content, Percent by Volume from Measured Water Catch		22.3	23.2**	24.5
	Saturation at Flue Gas Temperature		22.0**	23.7	23.8**
Mfd	Dry Mole Fraction		0.780	0.768	0.762
%CO ₂	Carbon Dioxide, Percent By Volume, Dry		3.5	3.6	3.5
%O ₂	Oxygen, Percent By Volume, Dry		17.2	16.9	17.2
Md	Gas Molecular Weight, lb/lb-Mole, Dry		29.25	29.25	29.25
Ms	Gas Molecular Weight, lb/lb-Mole, Wet		26.77	26.64	26.58
Pg	Flue Gas Static Pressure, Inches H ₂ O		0.0	0.0	0.0
Ps	Absolute Flue Gas Pressure, Inches Hg		29.80	29.80	29.80
ts	Flue Gas Temperature, Degrees F		144	147	147
Delta-p	Average Velocity Head, Inches H ₂ O		0.4382	0.4721	0.4636
vs	Flue Gas Velocity, Feet/Second		41.37	43.15	42.82
A	Stack/Duct Area, Square Inches		9,161	9,161	9,161
Qsd	Volumetric Air Flow Rate, Dry SCFM*		107,165	109,560	107,891
Qaw	Volumetric Air Flow Rate, Wet ACFM		157,930	164,713	163,449
%I	Isokinetic Sampling Rate, Percent		91.3	95.9	96.3

* 68° F (20° C) -- 29.92 Inches of Mercury (Hg)

** ACTUAL %H₂O USED IN CALCULATIONS

(Continued next page)

TABLE 1. SUMMARY OF MODIFIED METHOD 5 SAMPLING AND ANALYSIS FOR SEMIVOLATILE ORGANIC COMPOUND

Target Analytes	Total Analyte Mass, ug				Analyte Concentration and Mass Emission Rate							
	Run 1	Run 2	Run 3	Reagent Blanks	MM-5 Run 1		MM-5 Run 2		MM-5 Run 3		3-Run Average	
					(ug/M3)	(lbs/hr)	(ug/M3)	(lbs/hr)	(ug/M3)	(lbs/hr)	(ug/M3)	(lbs/hr)
Phenol	< 15	< 9.5	< 13	< 3.2	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroethyl)ether	< 14	< 8.9	< 12	< 2.9	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	< 16	< 10	< 13	< 3.4	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	< 29	< 18	< 26	< 6.8	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	< 16	< 10	< 14	< 3.5	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl alcohol	< 47	< 30	< 40	< 10	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	< 19	< 12	< 17	< 4.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	< 30	< 19	< 26	< 6.7	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl)ether	< 15	< 10	< 13	< 3.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	< 30	< 19	< 26	< 6.7	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitroso-di-n-propylamine	< 40	< 26	< 33	< 8.3	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	< 57	< 36	< 51	< 13	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	< 15	< 11	< 13	< 3.9	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	< 11	< 8.0	< 9.3	< 2.9	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	< 48	< 35	< 36	< 11	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	< 24	< 18	< 21	< 6.7	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic acid	< 49	< 36	< 38	< 11	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroethoxy)methane	< 13	< 9.9	< 12	< 3.7	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	< 22	< 17	< 20	< 6.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	< 19	< 15	< 18	< 5.7	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	< 7.5	< 5.7	d 890	d 426	ND	ND	ND	ND	524	0.212	175	0.070
4-Chloroaniline	< 16	< 12	< 16	< 5.0	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	< 45	< 34	< 43	< 14	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	< 21	< 16	< 18	< 5.7	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	< 9.6	< 7.3	< 9.0	< 2.8	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	< 25	< 19	< 25	< 6.6	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	< 21	< 16	< 21	< 5.5	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	< 19	< 14	< 19	< 5.0	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	< 7.5	< 5.8	< 7.8	< 2.1	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	< 14	< 11	< 13	< 3.3	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	< 5.8	< 4.5	< 5.9	< 1.6	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	< 4.3	< 3.3	< 4.4	< 1.2	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	< 18	< 14	< 18	< 4.8	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	< 8.1	< 6.2	< 8.3	< 2.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	< 87	< 67	< 71	< 18	ND	ND	ND	ND	ND	ND	ND	ND

(continued)

TABLE _ _ (Continued)

Target Analytes	Total Analyte Mass, ug				Analyte Concentration and Mass Emission Rate							
	Run 1	Run 2	Run 3	Reagent Blanks	MM-5 Run 1 (ug/M3) (lbs/hr)	MM-5 Run 2 (ug/M3) (lbs/hr)	MM-5 Run 3 (ug/M3) (lbs/hr)	3-Run Average (ug/M3) (lbs/hr)	MM-5 Run 1 (ug/M3) (lbs/hr)	MM-5 Run 2 (ug/M3) (lbs/hr)	MM-5 Run 3 (ug/M3) (lbs/hr)	3-Run Average (ug/M3) (lbs/hr)
4-Nitrophenol	< 49	< 38	< 46	< 12	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	< 4.3	< 3.3	< 4.4	< 1.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	< 16	< 12	< 15	< 4.0	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	< 31	< 24	< 30	< 7.9	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	e 19	e 6	e 8	< 1.5	14.1	0.006	4.5	0.002	6.1	0.0025	8.2	0.003
4-Chlorophenyl-phenylether	< 9.6	< 7.4	< 9.8	< 2.6	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	< 5.7	< 4.4	< 5.9	< 1.6	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	< 25	< 19	< 26	< 7.1	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	< 34	< 26	< 24	< 6.3	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine(1)	< 6.5	< 4.8	< 6.3	< 1.7	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl-phenylether	< 11	< 8.1	< 10	< 2.9	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	< 10	< 7.5	< 10	< 2.8	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	< 19	< 14	< 15	< 4.0	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	< 2.8	< 2.1	< 2.7	< 0.7	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	< 3.0	< 2.3	< 2.9	< 0.8	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	e 8.9	e 10	e 9.7	d 13	6.6	0.003	7.5	0.003	5.7	0.002	6.6	0.003
Fluoranthene	< 1.7	< 1.3	< 1.6	< 0.4	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	< 1.4	< 1.0	< 1.5	< 0.4	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	e 6.6	e 6.6	d 34	< 0.6	4.8	0.002	4.8	0.002	20.2	0.008	9.9	0.004
3,3'-Dichlorobenzidine	< 3.0	< 2.2	< 2.9	< 0.7	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	< 1.2	< 0.9	< 1.2	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	< 1.4	< 1.0	< 1.4	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	d 76	d 76	d 79	d 15	55	0.022	54	0.022	58	0.023	56	0.022
Di-n-octylphthalate	e 6.9	e 11	d 56	< 0.3	5.1	0.002	8.2	0.003	41	0.017	18	0.007
Benzo(b)fluoranthene	< 1.0	< 0.7	< 1.1	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	< 1.1	< 0.8	< 1.2	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	< 1.0	< 0.7	< 1.0	< 0.2	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	< 1.2	< 0.8	< 1.2	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	< 1.1	< 0.8	< 1.2	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	< 1.0	< 0.7	< 1.1	< 0.3	ND	ND	ND	ND	ND	ND	ND	ND

DATA QUALIFIER SYMBOLS

< = not detected at less than amount shown

ND= not detected and a value of zero used in averaging with any reported values

d = detected above quantifiable limit

e = estimated value for compound that was detected, but below quantifiable limit

APPENDIX D. Method 25 Data Summary

TABLE 2-4

TOTAL GASEOUS NONMETHANE ORGANICS TESTS SUMMARY

Upper Prequench Inlet

	UI-M25-1	UI-M25-2	UI-M25-3	Average
	-----	-----	-----	-----
Test Date	6/25/91	6/25/91	6/26/91	
Run Start Time	1019	1754	930	
Run Finish Time	1340	2006	1144	
<u>Flue Gas Parameters</u>				
CO ₂ , Percent By Volume, Dry	3.6	2.6	3.9	3.4
O ₂ , Percent By Volume, Dry	17.1	18.3	16.8	17.4
Air Flow Rate, Dry SCFM*	119,126	114,014	112,005	115,048
<u>Total Gaseous Nonmethane Organics as C</u>				
Concentration, ppmvd	343	1,296	538	726
Emission Rate, lb/hr	76.4	276	113	155

* From the average of concurrent M0011 and M5/202 sampling performed at the lower prequench inlet.

TABLE 2-8

TOTAL GASEOUS NONMETHANE ORGANICS TESTS SUMMARY

Stack

	S-M25-1	S-M25-2	S-M25-3	Average
	-----	-----	-----	-----
Test Date	6/25/91	6/25/91	6/26/91	
Run Start Time	1019	1753	930	
Run Finish Time	1340	2005	1144	
<u>Flue Gas Parameters</u>				
CO2, Percent By Volume, Dry	3.5	3.6	3.5	3.5
O2, Percent By Volume, Dry	17.2	16.9	17.2	17.1
Air Flow Rate, Dry SCFM*	117,605	112,518	115,868	115,330
<u>Total Gaseous Nonmethane Organics as C</u>				
Concentration, ppmvd	373	1,189	413	658
Emission Rate, lb/hr	82.0	250	89.5	141

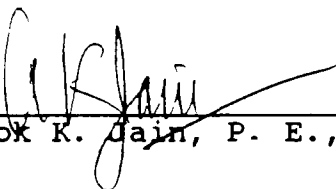
* From the average of concurrent M0011 and M5/202 sampling.

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69

CERTIFICATION SHEET

Having supervised the Method 25 test program described in this report, I hereby certify the data, information and results in this report to be accurate and true according to the methods and procedures used.



Ashok K. Jain, P. E., Regional Manager

SAMPLE QA/QC

- (1) Carrier Gas and System Air Blank (<5 ppm required)

$$\text{CO} + \text{CH}_4 + \text{CO}_2 + \text{NMO} = 0 \text{ ppm}$$

- (2) Catalyst Efficiency Check ($\pm 2\%$)

Methane standard	10150 ppm CH_4
Methane standard after catalyst	10150.5 ppm CO_2

$$\% \text{ difference} = 0.0\%$$

- (3) Analyzer Linearity Check

A full calibration was conducted on the analyzer before each day of analysis.

- (4) System Leak Check

4 mbar/10 min

SAMPLE TANK LEAK CHECK

TANK NO.	INITIAL VACUUM (mbar)	FINAL VACUUM (mbar)	CHANGE (mbar)
1	1008.2	1006.7	-1.5
2	895.6	894.0	-1.6
3	1001.8	1000.3	-1.5
4	1017.0	1015.5	-1.5
5	1017.1	1015.7	-1.4
6	966.2	964.6	-1.6
7	1013.7	1012.2	-1.5
8	1015.8	1014.4	-1.4
9	1016.6	1015.1	-1.5
10	995.6	994.0	-1.6
11	1012.7	1011.1	-1.6
12	1004.3	1002.8	-1.5
13	1014.8	1013.6	-1.2
14	1015.1	1013.5	-1.6
15	1015.4	1014.0	-1.4
16	1003.4	1001.9	-1.5
17	1011.1	1009.7	-1.4
18	1005.3	1003.7	-1.6
19	1006.2	1004.6	-1.6
20	1013.4	1011.9	-1.5
21	1009.4	1008.6	-0.8
22	1011.2	1010.3	-0.9
23	1011.6	1010.8	-0.8
24	1012.9	1012.2	-0.7
25	1010.2	1009.5	-0.7
26	1009.4	1008.4	-1.0
27	1011.9	1011.0	-0.9
28	1014.7	1013.9	-0.8
29	1014.6	1013.6	-1.0
30	1010.0	1009.1	-0.9

EPA METHOD 25 VOC SYSTEM PERFORMANCE CHECK

7/8/91

SAMPLE	VOC (ppm CH4)	VOC (mg C)	SOLVENT (ul)	SOLVENT (mgC)	PERCENT RECOVERY	RSD (<5%)
HEXANE	1458	5.74	10	5.5	104.0%	4.1%
	1453	5.64	10	5.5	102.1%	
	1343	5.31	10	5.5	96.2%	
	6529	26.39	50	27.6	95.6%	2.2%
	6952	27.51	50	27.6	99.6%	
	7188	26.56	50	27.6	96.2%	
	1524	6.05	10	6.2	98.2%	2.6%
	1544	6.38	10	6.2	103.5%	
	1571	6.20	10	6.2	100.6%	
DECANE	7715	30.98	50	30.8	100.6%	1.3%
	8004	31.77	50	30.8	103.1%	
	7859	31.41	50	30.8	102.0%	
	AVERAGE				100.1%	

EPA METHOD 25 VOC DATA SHEET
 GEORGIA PACIFIC CORP. OSB MILL SKIPPER, VA

VENT	RUN#	TANK NO.	TRAP NO.	INITL VAC (mbar)	TANK TEMP (deg F)	BARO PRES (mm Hg)	FINAL VAC (mbar)	TANK TEMP (deg F)	BARO PRES (mm Hg)
INLET	1A	S 14	1	1010	77	766	243	94	765
	1A	B 7		1016	72	761			
	2A	S 18	17	1003	80	765	539	77	766
	2A	B 9B		1017	72	763			
	3A	S 15	10	1010	75	766	401	86	765
	3A	B 11		1017	72	762			
OUTLET	1A	S 8	22	1014	79	764	58	94	763
	1A	B 5		1017	72	762			
	2A	S 29	19	1001	80	764	157	77	764
	2A	B 9		1019	72	763			
	3A	S 25	14	1015	75	763	226	86	763
	3A	B 3B		1018	72	763			
BLANK		B 10		1010	72	766			

VENT	RUN#	TANK NO.	FLSH PRES (mbar)	TANK TEMP (deg F)	BARO PRES (mm Hg)	TANK VOL. (ml)	SAMPL VOL. (ml)	ANAL VOL. (ml)	
INLET	1A	S	14	903	72	761	6148	4456	11564
	1A	B	7	797	72	761	4561		8105
	2A	S	18	784	72	763	6149	2801	10893
	2A	B	9B	822	72	763	4581		8286
	3A	S	15	776	72	762	6145	3587	10815
	3A	B	11	789	72	762	6146		10895
OUTLET	1A	S	8	773	72	762	6148	5543	10802
	1A	B	5	797	72	762	4575		8146
	2A	S	29	765	72	763	6700	5519	11744
	2A	B	9	802	72	763	4581		8196
	3A	S	25	747	72	764	6790	5134	11806
	3A	B	3B	805	72	763	4562		8176
BLANK		B	10	724	72	766	4588		7905

EPA METHOD 25 VOC DATA SHEET
 GEORGIA PACIFIC CORP. OSB MILL SKIPPERS, VA

VENT	RUN#	TANK NO.	TRAP NO.	INITL VAC (mbar)	TANK TEMP (deg F)	BARO PRES (mm Hg)	FINAL VAC (mbar)	TANK TEMP (deg F)	BARO PRES (mm Hg)
INLET	1A	S 14	1	1010	77	766	243	94	765
	1A	B 7		1016	72	761			
	2A	S 18	17	1003	80	765	539	77	766
	2A	B 9B		1017	72	763			
	3A	S 15	10	1010	75	766	401	86	765
	3A	B 11		1017	72	762			
OUTLET	1A	S 8	22	1014	79	764	58	94	763
	1A	B 5		1017	72	762			
	2A	S 29	19	1001	80	764	157	77	764
	2A	B 9		1019	72	763			
	3A	S 25	14	1015	75	763	226	86	763
	3A	B 3B		1018	72	763			
BLANK		B 10		1010	72	766			

EPA METHOD 25 VOC DATA SHEET
 GEORGIA PACIFIC CORP. OSB MILL SKIPPERS, VA

VENT	RUN#	ANALYSIS					TOTAL		SAMPLE CONC.		
		NM	CO	CH4	CO2	TOTAL	VOC (mg C)	VOC-BLANK (mg C)	VOC (mg/DSCM)	VOC (ppm C)	
INLET	1A	48. 0.0			14544	0	0.00	0.763	171	343	
	1A	5.5			191	197	0.79				
	2A	39.4	3.7		9871	0	0.00	1.815	648	1296	
	2A	5.2			442	447	1.85				
	3A	73.0			12718	0	0.00	0.965	269	538	
	3A	4.3			179	183	0.99				
	OUTLET	1A	52.0			18402	0	0.00	1.035	187	373
		1A	4.5			258	263	1.06			
		2A	66.0			16166	0	0.00	3.282	595	1189
		2A	5.5			806	812	3.31			
		3A	92.8	5.2		16555	0	0.00	1.060	206	413
		3A	6.7			261	268	1.09			
BLANK					,7	7	0.03				

APPENDIX E. CEMS Data Summary - O₂, CO₂, CO, NO_x, and THC

PLANT: Georgia-Pacific; Skippers, Virginia

SAMPLING LOCATION: Stack

		S-CEM-1	S-CEM-2	S-CEM-3
		<u>6/25/91</u>	<u>6/25/91</u>	<u>6/26/91</u>
Test Date				
Run Start Time		1014	1754	930
Run Finish Time		1404	2005	1141
Theta	Net Sample Time, Minutes	230	131	131
Mfd	Dry Mole Fraction	0.78	0.78	0.78
%CO2	Carbon Dioxide, Percent By Volume, Dry	3.5	3.6	3.5
%O2	Oxygen, Percent By Volume, Dry	17.2	16.9	17.2
Qsd	Volumetric Air Flow Rate, Dry SCFM *	117,605	112,518	115,868
ton/hr	Process Feed Rate, ton/hr	35.4	38.8	38.7
Carbon Monoxide				
Fwt	Formula Weight, Lb/Lb-Mole	28.01	28.01	28.01
ppmvd	Concentration, ppmvd	95.6	139.8	199
ppm@12%	Concentration, ppmvd @ 12% C	328	466	684
ppm@7%	Concentration, ppmvd @ 7% O2	352	477	735
mg/DSCM	Concentration, mg/DSCM	111	163	232
lb/hr	Emission Rate, lb/hr	49	69	101
lb/ton	Emission Rate, lb/ton	1.385	1.768	2.604
Nitrogen Oxides as NO2				
Fwt	Formula Weight, Lb/Lb-Mole	46.01	46.01	46.01
ppmvd	Concentration, ppmvd	32.0	20.0	21.0
ppm@12%	Concentration, ppmvd @ 12% C	110	66.7	72.0

ppm@7%	Concentration, ppmvd @ 7% O ₂	118	68.3	77.4
mg/DSCM	Concentration, mg/DSCM	61.2	38.3	40.2
lb/hr	Emission Rate, lb/hr	26.96	16.12	17.43
lb/ton	Emission Rate, lb/ton	0.762	0.416	0.450
Total Hydrocarbons, as Carbon				
Fwt	Formula Weight, Lb/Lb-Mole	12.01	12.01	12.01
ppmvw	Concentration, ppmvw	270	652	314
ppmvd	Concentration, ppmvd	346	836	403
ppm@12%	Concentration, ppmvd @ 12% C	1,187	2,786	1,380
ppm@7%	Concentration, ppmvd @ 7% O ₂	1,275	2,854	1,483
mg/DSCM	Concentration, mg/DSCM	173	417	201
lb/hr	Emission Rate, lb/hr	76	176	87
lb/ton	Emission Rate, lb/ton	2.151	4.533	2.254

* From the average of concurrent EPA M0011 and MM5 sampling.

PLANT: Georgia-Pacific; Skippers, Virginia

SAMPLING LOCATION: Upper Inlet

		I-CEM-1	I-CEM-2	I-CEM-3
		-----	-----	-----
Test Date		6/25/91	6/25/91	6/26/91
Run Start Time		1014	1754	930
Run Finish Time		1404	2005	1141
Theta	Net Sample Time, Minutes	230	131	131
Mfd	Dry Mole Fraction	0.78	0.78	0.78
%CO2	Carbon Dioxide, Percent By Volume, Dry	3.5	3.6	3.5
%O2	Oxygen, Percent By Volume, Dry	17.2	16.9	17.2
Qsd	Volumetric Air Flow Rate, Dry SCFM *	117,605	112,518	115,868
ton/hr	Process Feed Rate, ton/hr	35.4	38.8	38.7
Total Hydrocarbons, as Carbon				
Fwt	Formula Weight, Lb/Lb-Mole	12.01	12.01	12.01
ppmvw	Concentration, ppmvw	309	790	347
ppmvd	Concentration, ppmvd	396	1,013	445
ppm@12%	Concentration, ppmvd @ 12% C	1,358	3,376	1,525
ppm@7%	Concentration, ppmvd @ 7% O2	1,460	3,458	1,639
mg/DSCM	Concentration, mg/DSCM	198	506	222
lb/hr	Emission Rate, lb/hr	87	213	96
lb/ton	Emission Rate, lb/ton	2.467	5.493	2.491

* From the average of concurrent EPA M0011 and MM5 sampling.

06-25-1991 Time	Outlet NOx	Outlet ppmCO	Outlet %O2	Outlet %CO2	Outlet ppm THC	Inlet ppm THC
10:15	30.8	70	17.53	3.17	247.7	295
10:16	30.9	66.2	17.54	3.16	249.3	299.2
10:17	31.9	68	17.46	3.22	252.9	304
10:18	32.4	68.2	17.4	3.28	261.2	315.9
10:19	33.2	72.1	17.28	3.4	265.8	320.6
10:20	32.1	77.7	17.13	3.53	269	329.3
10:21	30.9	79.9	17.28	3.39	270.5	331.6
10:22	31	86.7	17.19	3.45	271.9	334
10:23	32.9	92.7	17.16	3.52	265.8	332.1
10:24	37.5	95.9	16.99	3.68	261.1	326.9
10:25	34.9	105.1	16.93	3.71	249.1	332.8
10:26	33.5	105.8	16.82	3.81	261.8	332.8
10:27	32.3	110.6	16.84	3.77	268.2	339.5
10:28	32	110.9	16.82	3.82	271.1	340.9
10:29	32	119.7	16.86	3.76	273.2	342.7
10:30	31.7	111.4	17.04	3.6	272.4	340.5
10:31	31.8	107.6	17.05	3.6	268.9	331.2
10:32	31.8	123	16.85	3.79	258.4	342
10:33	31.7	141.5	16.73	3.89	279.2	354.3
10:34	30.8	143.3	16.85	3.79	281.9	355.9
10:35	30.5	135.3	17.03	3.6	279.9	349.8
10:36	31.3	124.8	17.01	3.68	279.9	344
10:37	32.5	130	16.9	3.76	283.1	333.8
10:38	32	139.7	16.89	3.75	286.8	344.3
10:39	32.3	134.8	16.99	3.68	285.2	345.5
10:40	30.9	121.1	17.43	3.17	265.4	360.4
10:41	32.2	111.7	17.42	3.05	245.5	345.1
10:42	28.5	89.4	18.29	2.37	213.5	301.6
10:43	29.7	82.8	18.25	2.37	209.4	242.4
10:44	28.5	74.1	18.58	2.07	189.5	220.5
10:45	27.5	65.7	18.87	1.84	170.9	203.1
10:46	27.6	58.4	19.02	1.72	160.1	207.9
10:47	27.5	53.5	18.89	2.01	159.8	247.2
10:48	29.3	120.8	16.91	3.81	263.7	333.5
10:49	32.8	160.8	16.53	4.08	299.7	350.9
10:50	32.6	170.9	16.7	3.91	308.3	359
10:51	32.9	159.5	16.71	3.94	315.7	368.6
10:52	33.2	154.9	16.78	3.87	312.9	368.4
10:53	33.1	147.9	16.79	3.87	306.5	362.1
10:54	33.2	150.6	16.77	3.86	302.1	365.5
10:55	32	140.6	17.01	3.64	294.6	357

10:56	33.6	121.7	17.12	3.56	287.3	353.4
10:57	34.4	116.3	16.94	3.75	286.6	353
10:58	35.5	128.9	16.59	4.06	297.3	364.2
10:59	35.3	136.1	16.51	4.04	304.3	367.9
11:00	34.6	128.4	16.75	3.87	303.3	367
11:01	34.6	121.5	16.83	3.81	296.1	359.9
11:02	34.5	110.9	16.79	3.84	284.2	358.4
11:03	34	100.6	16.94	3.69	292.8	367.4
11:04	34.2	98.8	16.94	3.71	296.9	375.6
11:05	33.8	108.2	16.88	3.76	295.5	373.2
11:06	33.8	102.8	16.93	3.7	304.4	373.3
11:07	33.7	99.9	16.95	3.7	308.2	376.3
11:08	34.5	102.2	16.91	3.72	308.4	371
11:09	33.8	96.4	17.02	3.62	305.7	364.7
11:10	34.3	94.1	17.01	3.63	304.8	364.1
11:11	34.4	90.7	17.03	3.65	299.2	349.9
11:12	35.6	97.7	16.75	3.9	302.6	345.6
11:13	34.7	107.3	16.73	3.89	301.4	342.4
11:14	34.5	112.7	16.76	3.86	297.9	327.5
11:15	34.6	113.9	16.78	3.85	293.1	329.8
11:16	34.4	113.5	16.78	3.86	291.4	323.5
11:17	34.7	116	16.79	3.86	293.9	311.4
11:18	35.1	120.4	16.74	3.91	298.9	323.7
11:19	36.1	127.7	16.7	3.95	306.5	337
11:20	35.3	135.8	16.49	4.13	311.5	335.1
11:21	33.4	146.5	16.64	3.92	308.5	333.6
11:22	34.5	138.3	16.75	3.91	289.5	332
11:23	33.6	123	16.86	3.81	297	327.8
11:24	32.8	123.8	16.84	3.86	308.2	334.5
11:25	34.3	131	16.61	4.08	318.5	340.7
11:26	35.2	136.1	16.43	4.22	324.8	343.6
11:27	33.7	142.4	16.58	4.08	325.5	343.8
11:28	33.1	128	16.84	3.88	315.6	333.4
11:29	33.9	125.1	16.76	3.97	315.2	333.3
11:30	33.6	128.6	16.78	3.96	319.5	333.3
11:31	33.3	129.8	16.93	3.83	325.4	344.2
11:32	33.2	128.4	16.92	3.88	330.1	348
11:33	34.5	133.4	16.67	4.1	342.6	361.6
11:34	33.3	137.8	16.69	4.05	350.3	373.8
11:35	32.7	128	16.93	3.86	347.6	364.1
11:36	33.2	126.4	16.86	3.95	348.7	361.9
11:37	34.3	133.1	16.79	3.99	345.9	364.6
11:38	33.1	130.9	16.98	3.83	329.6	364.2
11:39	32.4	117.6	17.07	3.74	325.5	351
11:40	32.6	115	17.12	3.72	323.4	343.6

11:41	32.5	119.6	17.15	3.68	313.1	345.3
11:42	32.8	127.5	16.94	3.92	309.6	338.3
11:43	33.4	131.6	16.87	3.97	319.1	340.6
11:44	32	131.5	16.89	3.96	318.1	331.4
11:45	31.8	131.8	16.89	3.96	319.3	338.9
11:46	31.7	129.1	16.92	3.96	314	324.3
11:47	31.4	133.2	16.84	4.01	312.9	322.2
11:48	31.4	148.3	16.9	3.98	320.4	333.7
11:49	31.7	142.2	16.95	3.94	315.9	336.2
11:50	32.9	121.4	16.94	3.95	308.7	334.4
11:51	34	121.2	16.94	3.95	313	344.7
11:52	34.2	147.9	16.98	3.9	311.8	339.9
11:53	35.5	115.5	17.11	3.79	301.7	330.8
11:54	35	92.2	17.26	3.64	295.8	322.9
11:55	35.8	86.4	17.22	3.71	290.3	310.1
11:56	35.7	84.2	17.26	3.66	286.9	311.7
11:57	36.7	84.8	17.18	3.74	280.8	307.2
11:58	37.4	85.2	17.18	3.73	274.6	299.9
11:59	37.2	86	17.28	3.64	271.1	311.5
12:00	37.8	75.4	17.32	3.61	267.3	300.6
12:01	37.7	69.4	17.53	3.39	270.7	303.1
12:02	39.4	81.6	17.65	3.29	264.3	309.4
12:03	41.4	44.4	17.74	3.2	262	298.5
12:04	41.3	36.3	17.86	3.07	260.4	300.8
12:05	42.2	32.6	17.91	3.03	255.2	294.1
12:06	40.9	28.6	18.07	2.86	250.1	287.2
12:07	40.1	26.4	18.12	2.81	246.5	285.3
12:08	40.5	25.9	18.02	2.93	242.9	279.2
12:09	39	28.2	17.93	3.02	249.4	278.6
12:10	40.4	50.3	17.92	3.02	253.6	282.9
12:11	40.1	46	18.12	2.83	242.6	290.7
12:12	39.4	30.1	18.13	2.84	245.8	280.5
12:13	39.1	32.3	18.13	2.83	248.8	270.7
12:14	39.7	35.4	18.13	2.86	249.3	273
12:15	40.5	39.9	17.98	3.02	247.5	275.7
12:16	40	43.4	17.89	3.1	246.9	276.1
12:17	39	49.7	17.9	3.11	244.3	278.2
12:18	38.2	60	17.71	3.29	243.4	273.2
12:19	37.3	70.6	17.72	3.27	245.8	272.6
12:20	36.6	70.3	17.74	3.24	246.2	279
12:21	37.1	69.1	17.7	3.28	239	277.8
12:22	38.2	64.1	17.76	3.21	236.2	271.3
12:23	39.7	56.6	17.88	3.09	234.8	271.1
12:24	37.2	55.2	18.05	2.91	231.7	258.3
12:25	33.6	51.9	18.35	2.58	225.1	242.7

12:26	31.8	42.9	18.51	2.45	216	222.4
12:27	32.8	32.3	18.51	2.44	207.4	219.5
12:28	32.8	25.9	18.62	2.35	203.3	211.4
12:29	33.3	24.6	18.64	2.36	200.7	212.5
12:30	33.6	25.5	18.68	2.33	196.1	218.1
12:31	34.2	30.1	18.62	2.39	196.4	221.8
12:32	35	34.3	18.55	2.45	198.6	223.1
12:33	35.7	34.8	18.56	2.45	202.4	231.1
12:34	37.2	35.9	18.42	2.61	204	243.8
12:35	38.6	35.8	18.19	2.83	206.6	248.6
12:36	38.8	36.9	18	3.02	210.9	256.6
12:37	37.7	39.2	17.83	3.14	214.6	262.8
12:38	36.4	40.6	17.96	3.01	214.7	269.9
12:39	36.8	40.7	18.05	2.94	211.8	274.6
12:40	36.5	36.2	17.95	3.05	227.9	277.8
12:41	36.4	34.7	17.88	3.1	233.6	277.2
12:42	35.1	35.9	17.89	3.08	235.3	275.2
12:43	34.3	38.8	17.97	3.01	233.1	266.6
12:44	34.3	43	17.91	3.1	232.8	265.2
12:45	34.7	47.7	17.73	3.26	238.2	269
12:46	33.6	53	17.56	3.41	244.1	273.6
12:47	32.4	57.7	17.55	3.41	250.6	282.9
12:48	31.8	62.8	17.53	3.42	253.3	286.1
12:49	31.3	70.2	17.32	3.65	261.5	292.3
12:50	30.3	76.6	17.51	3.41	258	296.6
12:51	29.8	76.6	17.85	3.16	246.4	290.7
12:52	30.7	85.2	17.76	3.25	247.6	279.5
12:53	31.7	84.2	17.58	3.33	244.1	281.3
12:54	31	90.3	17.53	3.45	236.3	280.8
12:55	31.8	90.8	17.62	3.37	247.5	282.8
12:56	34.7	113.5	17.31	3.66	259.3	283.1
12:57	37.2	120	17.3	3.63	261.6	292.3
12:58	37.2	109.3	17.54	3.4	260.7	287.5
12:59	38	74.8	17.69	3.27	253.5	282.7
13:00	39.2	44	17.78	3.19	249.9	287.6
13:01	39.2	26.6	17.92	3.06	246.6	273.8
13:02	37.4	21.2	18.12	2.85	242.5	268
13:03	35.3	20.2	18.3	2.69	238	262
13:04	36.3	22.9	18.31	2.69	237.8	265
13:05	38	19	18.3	2.69	235.3	267.6
13:06	38.6	16.5	18.4	2.6	232.4	263.2
13:07	38.4	18	18.43	2.57	231.6	263.2
13:08	39.9	18	18.36	2.66	228.7	262.6
13:09	39.9	16.5	18.32	2.7	221.6	259.2
13:10	39.6	17.3	18.26	2.76	217.7	260.9

13:11	39	19.4	18.26	2.75	214.1	246.2
13:12	39	19.9	18.25	2.77	212.2	235.9
13:13	37.9	20.9	18.3	2.71	209.4	229.1
13:14	37.1	22.9	18.32	2.7	208.7	226.9
13:15	35.3	26.4	18.44	2.54	205.5	217
13:16	35.4	31.5	18.47	2.57	205.6	208.7
13:17	35.3	35.2	18.31	2.7	207.6	211.5
13:18	34	37.4	18.49	2.51	209.3	212.5
13:19	35.1	37.6	18.44	2.59	214.3	217.2
13:20	34.8	42.6	18.4	2.61	220.8	223.9
13:21	34.8	51.6	18.37	2.66	227.2	228.3
13:22	36.7	60.1	18.17	2.87	233.9	240.4
13:23	36.8	63	18.12	2.89	239	250.6
13:24	36.7	84.5	18.08	2.94	237.3	254.4
13:25	36.4	142.5	17.84	3.19	240.4	258.1
13:26	36.5	116.4	17.6	3.43	248.3	263.9
13:27	36.1	121.9	17.52	3.46	257.5	279.2
13:28	36.7	135.6	17.51	3.52	261.4	284.6
13:29	39.7	144.1	16.91	4.05	276.3	294.9
13:30	38.6	135.4	16.85	4.05	284.9	312.1
13:31	36.2	127	17.19	3.74	283.8	314.3
13:32	36.7	114.1	17.15	3.84	286	311.8
13:33	37.3	130.3	16.93	3.99	292.6	321
13:34	36.7	134.7	16.99	3.94	303.8	323.7
13:35	35.9	131.3	17.08	3.87	309.4	340.5
13:36	35.8	130.9	17.11	3.83	309.5	343.1
13:37	35.5	126.1	17.24	3.73	310	342.2
13:38	36.2	129.4	17.14	3.83	308.8	334.9
13:39	36.1	137.8	17.14	3.81	306.5	336.6
13:40	35.2	132.6	17.28	3.69	302.2	336.5
13:41	35	124.7	17.34	3.65	293.1	327.6
13:42	34.4	122.5	17.29	3.69	290.1	312.7
13:43	33.6	130.7	17.24	3.74	288.9	313.4
13:44	33.3	136	17.26	3.7	286.5	311.5
13:45	33.5	127	17.36	3.62	285.9	309.3
13:46	33.2	114.8	17.53	3.46	285	314.9
13:47	33.3	112.4	17.41	3.61	288.3	314.3
13:48	33.8	122.1	17.27	3.73	288.8	314.8
13:49	33.5	122.5	17.31	3.7	288.4	502.6
13:50	38.8	125.8	17.23	3.75	287.2	316.2
13:51	34.2	122	17.18	3.8	289.5	319.4
13:52	33.7	121	17.24	3.73	294.1	325.5
13:53	33.4	103.9	17.38	3.62	288.4	323.2
13:54	34.2	93.5	17.46	3.55	287.9	321.9
13:55	36.4	90.9	17.3	3.7	298.3	330.8

13:56	37.2	90.8	17.18	3.81	310.7	345.8
13:57	35.8	89.8	17.12	3.85	314.6	351.3
13:58	33.9	86.4	17.11	3.85	314	381
13:59	31.6	88.6	17.18	3.81	319.1	368.9
14:00	31.8	96.3	17.02	3.94	333.5	373.5
14:01	33.4	105.5	17.07	3.89	328.9	389.6
14:02	31.6	104.9	17.05	3.9	323.6	400
14:03	31.2	107.5	17.24	3.74	322.3	399.9
14:04	32.5	102.4	17.16	3.88	319.9	397.7
Average	34.7	90.4	17.43	3.4	270.3	308.8

06-25-1991 Time	Outlet NOx	Outlet ppmCO	Outlet %O2	Outlet %CO2	Outlet ppm THC	Inlet ppm THC
17:11	14.5	146.9	17.05	3.8	517.2	533.1
17:12	14.3	149.4	17.12	3.72	508.1	541.9
17:55	18.2	84.3	17.77	3.2	539.6	743.1
17:56	16.8	165.5	17.77	3.2	589	755
17:57	17	216.3	17.81	3.16	582.5	749.7
17:58	17	205.5	17.78	3.2	574.5	745.9
17:59	16.5	223.7	17.71	3.25	584.9	750.6
18:00	16.5	211.9	17.76	3.21	585.8	749.2
18:01	16.4	165.4	17.77	3.19	581.6	742.8
18:02	16	183.2	17.67	3.29	597.2	727.3
18:03	18.7	140.4	17.53	3.42	588.8	731
18:04	18.1	89.8	17.57	3.37	586.9	735.3
18:05	19.3	92.3	17.48	3.46	613.3	746.4
18:06	21.3	99.2	17.49	3.44	545	751.3
18:07	19.6	102.6	17.46	3.47	575.8	747.9
18:08	18.9	114.2	17.42	3.51	591.8	752
18:09	19.2	124.3	17.19	3.72	605.3	769.7
18:10	19.4	133.7	17.21	3.67	608.2	765.9
18:11	18.7	127.4	17.31	3.6	629.5	758.8
18:12	26	129.9	17.29	3.61	554.1	756.6
18:13	21	132.2	17.26	3.65	609.5	755.4
18:14	20.3	138.4	17.24	3.65	624	753.6
18:15	19.9	134.7	17.3	3.61	612	756.7
18:16	22	137.3	17.27	3.62	620.6	723.2
18:17	22.5	140.9	17.14	3.75	645.8	722.4
18:18	21.7	149.1	17.11	3.78	645.7	768.7
18:19	20.5	161.3	17.02	3.86	649.5	777.1
18:20	20.4	166.3	17.05	3.81	651.2	779.3
18:21	19.5	154.4	17.25	3.66	652.4	783.7
18:22	19.5	151.8	17.23	3.67	673	784.9
18:23	19.6	155	17.18	3.73	674.3	788
18:24	19.7	162.9	17.09	3.8	713.6	821.1
18:25	19.3	163	17.15	3.74	722.6	841.1
18:26	19.2	154.2	17.19	3.71	725.9	840.4
18:27	19.9	155.5	17	3.89	741.2	857
18:28	20	166.6	16.94	3.91	736.3	836.9
18:29	19.5	157.8	17.17	3.72	727.9	812.8
18:30	19.6	145.8	17.23	3.67	711	798.1
18:31	19.3	138.9	17.49	3.43	738.3	794.2
18:32	20.5	135.6	17.25	3.69	738	811.4
18:33	21	160.6	17.06	3.82	727	822.2
18:34	20.5	162.1	17.24	3.67	722	800

18:35	23	152.1	17.4	3.53	716.9	777.8
18:36	19.9	138.6	17.39	3.55	703.2	783.5
18:37	19.7	146.2	17.3	3.63	750.7	799.9
18:38	19.9	162.2	17.19	3.7	780.1	814.1
18:39	19.3	160.7	17.3	3.6	807.1	831
18:40	19.2	157.2	17.29	3.6	820.4	860.8
18:41	19.2	155.4	17.32	3.57	823.6	858.8
18:42	19.6	147	17.29	3.6	808.1	872.6
18:43	19.8	149.1	17.26	3.62	813.8	902.4
18:44	20.6	156.1	17.09	3.78	796.9	901.2
18:45	20.6	158.7	17.17	3.69	737.1	890.5
18:46	20.8	148	17.23	3.67	752.8	873.9
18:47	21.2	143.1	17.32	3.55	753.9	846.9
18:48	22.3	131.8	17.55	3.36	713.2	843
18:49	21.5	116.3	17.54	3.39	705.8	846.8
18:50	22	128.7	17.27	3.63	712.6	883.6
18:51	21.7	132.3	17.39	3.5	719.2	891.2
18:52	21.5	121.2	17.45	3.46	743.8	903.3
18:53	21.2	123	17.46	3.43	795.5	965.6
18:54	20.9	114.4	17.52	3.4	815.3	983.6
18:55	21	116.7	17.54	3.34	704.3	978.6
18:56	13.9	101.4	19.22	1.63	273.2	963
18:57	8.1	12.2	20.4	0.94	338.4	966.8
18:58	22.4	88.1	17.62	3.32	784.8	946.5
18:59	19.3	115.3	17.59	3.35	826.5	920.7
19:00	20	112.2	17.53	3.39	811.1	952.5
19:01	21.2	126.5	17.31	3.61	803.2	944.9
19:02	20.7	136.4	17.29	3.62	776.1	940.5
19:03	20.3	147	17.27	3.63	757.6	915.8
19:04	19.9	151.2	17.29	3.6	712.4	920.2
19:05	20.1	149.5	17.29	3.61	749.3	942.8
19:06	20.6	156.3	17.17	3.71	751.3	937.6
19:07	20.1	156	17.36	3.52	730	972.3
19:08	20.7	143.5	17.34	3.56	722.2	948.6
19:09	21.1	159	17.15	3.72	731	952.6
19:10	21.3	171.3	17.07	3.79	730.7	951.8
19:11	21.4	175.3	17.07	3.78	687.8	958.5
19:12	20.7	167.9	17.17	3.69	657.4	948.8
19:13	20.4	162.4	17.27	3.61	651.6	943.1
19:14	22.8	160.2	17.19	3.69	681.9	957.2
19:15	20.5	166.2	17.09	3.78	693.3	968.1
19:16	20.3	173.1	17.16	3.71	707.4	962
19:17	20.2	156.8	17.26	3.63	717.6	988.3
19:18	20	149	17.33	3.58	732.3	982.4
19:19	20.1	154.7	17.22	3.7	744.6	994.8

19:20	20.7	171	17.05	3.83	749.7	1009.7
19:21	20.4	167.2	17.17	3.73	772.5	1037
19:22	20.9	156	17.15	3.76	759.5	1024.8
19:23	20.8	149.5	17.21	3.69	711.4	973.2
19:24	20.9	145.7	17.26	3.66	698.4	924.9
19:25	21	145.3	17.3	3.6	677.4	872.2
19:26	20.9	138.9	17.32	3.59	679.8	857.4
19:27	21	139.2	17.3	3.61	681.2	846.2
19:28	21.6	155.3	17.07	3.8	683.8	842.1
19:29	21.3	163.1	17.13	3.73	695.7	827.9
19:30	21.4	151.8	17.18	3.69	674.1	807.4
19:31	20.7	144.4	17.33	3.55	671.6	794.7
19:32	21.2	133.4	17.41	3.48	652.1	785.2
19:33	21.7	128.7	17.33	3.56	642.4	761.3
19:34	22.6	133.2	17.2	3.69	639.5	729.9
19:35	22.6	142.5	17.16	3.71	634.8	717.5
19:36	22.3	133.6	17.28	3.62	632	720
19:37	23	135.1	17.12	3.74	626.9	724.1
19:38	22.5	132.2	17.34	3.52	597.2	705
19:39	22.3	119.9	17.41	3.5	580.8	676.9
19:40	24.3	123.1	17.41	3.48	576.5	659.7
19:41	23.4	122.3	17.34	3.55	582.5	664.9
19:42	22.8	122.7	17.4	3.49	585.7	661.2
19:43	22.6	118.5	17.41	3.49	582.5	658.2
19:44	22.7	111.5	17.5	3.42	563	645.1
19:45	24	109.4	17.46	3.45	552.9	635.9
19:46	24.6	105.4	17.42	3.5	554.9	628
19:47	24.9	105	17.31	3.6	546.1	613.6
19:48	24.8	104.1	17.33	3.58	558.3	628.2
19:49	24.2	104.4	17.42	3.5	551.5	621.3
19:50	25	103.1	17.35	3.59	553.5	611
19:51	25.1	105.7	17.29	3.62	553.2	600.3
19:52	24.3	101.4	17.46	3.48	536.3	589.2
19:53	25.1	97.9	17.45	3.5	524.2	574.7
19:54	24.7	100.6	17.38	3.57	508.3	575.5
19:55	25.1	107	17.32	3.61	519.5	582.5
19:56	25.5	101.4	17.42	3.54	516.8	568.1
19:57	25.7	106.1	17.33	3.62	515.4	574.3
19:58	24.4	102.7	17.36	3.59	512.5	567.8
19:59	24.1	99.4	17.46	3.5	510.4	561.9
20:00	24.5	95	17.42	3.54	517.2	562.9
20:01	23.8	97.4	17.48	3.49	531.8	570.2
20:02	23.5	98.2	17.48	3.49	536.1	568.5
20:03	23.5	97.7	17.54	3.45	526.7	566.4
20:04	24.3	100.3	17.38	3.6	522.7	570.1

20:05	24.5	108.4	17.3	3.65	539.2	580.7
20:06	23.2	113.7	17.39	3.57	536.5	571.7
20:07	23.4	110.5	17.43	3.54	520.5	565.5
Average	20.9	136.6	17.4	3.5	651.6	789.5

06-25-1991 Time	Outlet NOx	Outlet ppmCO	Outlet %O2	Outlet %CO2	Outlet ppm THC	Inlet ppm THC
09:31	23.6	117.5	17.28	0.02	382.9	430.8
09:32	24.6	121.6	17.22	6.1	389.5	433.8
09:33	25.4	126	17.25	4.74	382.5	427.6
09:34	26.8	136.3	16.97	3.9	395.7	432
09:35	27.9	181.4	16.73	4.06	400.4	435.5
09:36	27	185.1	17.03	3.8	392.5	428.2
09:37	26.9	166.3	17.01	3.84	394.3	428.5
09:38	28.6	187.9	16.69	4.11	400.5	428.7
09:39	27.6	212.8	16.8	4	387.5	416.1
09:40	26.9	213.3	16.84	3.98	383.6	413.1
09:41	27	220.2	16.88	3.94	367.3	399.1
09:42	26	203.4	17.06	3.78	361.6	388.8
09:43	26.6	184.6	17.1	3.76	354.5	389.9
09:44	26.4	181.1	17.05	3.82	359	400.1
09:45	26.1	185.6	16.98	3.87	357.4	410.4
09:46	25.8	184.4	16.91	3.95	361.2	390.7
09:47	25.1	184.7	16.99	3.85	359.2	398.2
09:48	24.8	183.1	17.14	3.73	354.2	395.8
09:49	25	175.4	17.18	3.69	353.3	394.3
09:50	22.6	167.4	17.12	3.75	341.8	391.6
09:51	22.2	178.3	17.01	3.83	337	386
09:52	22.4	171.4	17.05	3.79	329.3	372.5
09:53	22.4	156.6	17.14	3.71	322.9	362.4
09:54	22.5	147.9	17.12	3.72	317	353.9
09:55	27.4	137.2	16.59	3.59	312	350
09:56	25.1	142.8	16.92	3.89	324	353.6
09:57	24.1	148.4	16.96	3.86	323.3	348.4
09:58	24.2	152.9	16.93	3.88	324.7	347.1
09:59	23.8	146.3	16.98	3.84	325.3	345
10:00	23	149.6	17.06	3.76	327.7	349
10:01	22.7	147.5	17.11	3.72	317.6	338.7
10:02	22.6	154.2	17.09	3.74	313.4	337.1
10:03	22.1	153.7	17.23	3.61	313.5	330.4
10:04	23.1	153.2	17.14	3.72	323.5	336.6
10:05	23.9	180.6	16.91	3.91	323.4	337.5
10:06	23.1	205.9	16.93	3.88	320	338.8
10:07	23.1	221.6	16.91	3.9	324.2	329.6
10:08	23.2	229.4	16.93	3.88	325.8	333.4
10:09	23.9	248	16.73	4.07	326.6	342.4
10:10	23.2	264.9	16.82	3.97	317.2	348.6
10:11	22.4	251.1	16.88	3.94	312.3	336.9
10:12	21.8	251.9	16.99	3.83	308.9	332.2

10:13	21.4	241.8	17.13	3.7	305.7	317.3
10:14	21.3	240.7	17.17	3.69	299.6	309.9
10:15	22.4	248.4	17.09	3.76	295.6	310.2
10:16	22.6	256.7	17.14	3.7	289.1	303.3
10:17	22.2	227.9	17.13	3.72	296.6	314.4
10:18	22.1	234.7	17.11	3.75	304.5	323.4
10:19	22.3	245.3	17.08	3.77	300	320.6
10:20	22.7	258.7	17	3.84	298.8	315.8
10:21	23	261.8	17.04	3.8	288.9	315.8
10:22	23.2	253.6	17.02	3.85	284.3	311.8
10:23	23.4	272.1	16.86	3.97	289.7	310.3
10:24	23.8	284	16.91	3.91	290.8	315.7
10:25	23.4	263.4	16.85	3.98	290	306.4
10:26	23.5	258.7	16.76	4.05	292.3	312.1
10:27	22.8	253.3	16.81	3.99	292.1	317
10:28	20.4	253.3	16.84	3.96	289.3	321.5
10:29	20	251.6	16.94	3.86	288.6	319
10:30	18.8	227.3	17.2	3.64	288.1	308.9
10:31	19	208.6	17.18	3.67	290.1	310.5
10:32	19.3	214.9	17.04	3.78	291.8	314.5
10:33	19.2	213.1	17.08	3.74	291.2	314.4
10:34	18.7	200.1	17.12	3.69	292.3	314.7
10:35	18.5	184.3	17.33	3.51	288.6	314.8
10:36	18.4	166.2	17.37	3.49	280.4	305.7
10:37	19.2	163.8	17.26	3.59	278.9	306
10:38	19.2	172.4	17.21	3.64	279.5	312.6
10:39	19.2	178.2	17.18	3.65	278.2	314.3
10:40	19.2	171.7	17.29	3.56	269.3	310.8
10:41	19.8	161.2	17.23	3.62	269.3	308
10:42	19.7	171.5	17.18	3.67	270.1	330.1
10:43	19.4	171	17.25	3.6	264.8	299.6
10:44	23.8	173.1	16.97	3.66	266.2	305.9
10:45	21.1	184	17.12	3.73	271.6	311.8
10:46	20.7	202.6	16.92	3.91	274	315.3
10:47	20.8	213.1	17.03	3.8	276.1	322
10:48	21	200.5	17.15	3.7	275.8	317.3
10:49	20.6	195.1	17.12	3.73	277.6	315.9
10:50	21.2	208.8	16.99	3.85	281	323.5
10:51	21.4	218.3	16.96	3.87	290.4	326.2
10:52	20.7	217.9	17.04	3.78	292.2	328.1
10:53	20.5	206.9	17.12	3.72	288.2	315.9
10:54	20.7	198.2	17.17	3.69	286.2	318
10:55	21.1	204.6	17.16	3.66	286.7	316.4
10:56	21.9	195.2	17.16	3.7	288.7	318.9
10:57	23.1	219.5	16.97	3.85	291.7	321.7

10:58	23.4	230.1	16.94	3.86	291.7	321.2
10:59	23.7	226.6	17.06	3.77	293.3	317.3
11:00	24.1	212.5	17.03	3.78	293.5	324.8
11:01	22.7	207.1	17.12	3.72	293.5	326.2
11:02	23	214.1	16.98	3.83	299.2	329
11:03	22.1	219.6	17.11	3.7	298.9	334.5
11:04	21.6	190.7	17.23	3.62	296.7	332.2
11:05	22.5	182.4	17.12	3.72	298.1	333.8
11:06	22.8	179.2	17.12	3.73	297.7	334.2
11:07	23.4	176.8	17.02	3.81	299.1	332.9
11:08	22.3	176	17.15	3.68	295.4	390.8
11:09	21.2	166	17.24	3.6	299	339.3
11:10	21	164.4	17.26	3.58	304.9	343.9
11:11	21.3	168.9	17.22	3.6	306.9	352.6
11:12	23.2	159.8	17.34	3.47	309.4	350.3
11:13	21.4	160.7	17.37	3.44	312.3	350.5
11:14	21.1	146.7	17.43	3.44	313.6	348.6
11:15	22.9	162.6	17.08	3.76	318.9	347.3
11:16	23.1	189.6	17	3.81	322	349.7
11:17	23.1	190	17.01	3.8	322.5	353.8
11:18	22.8	194.4	17.01	3.8	325	357.3
11:19	22.4	186	17.09	3.73	321.5	356.9
11:20	21.6	172.3	17.3	3.54	314.5	348.3
11:21	21.6	168.6	17.2	3.64	319.3	355.3
11:22	22.1	185.7	17.06	3.76	324.8	364.5
11:23	21.9	207.9	17.05	3.76	329.2	378.3
11:24	21.9	207.4	17.14	3.68	327	370
11:25	21.9	208.9	17.2	3.63	324.5	368.8
11:26	22.4	219.9	17.1	3.71	319.1	361.9
11:27	22.2	227.4	17.16	3.68	316.3	360.8
11:28	22.7	239	17.05	3.75	320.6	364.3
11:29	21.5	226.5	17.27	3.57	312.5	357.2
11:30	22.4	228.8	17.15	3.67	318.8	360.3
11:31	22.1	234.8	17.13	3.7	326.8	372.3
11:32	22.6	261.8	16.96	3.84	336.2	384.3
11:33	22.6	271.1	16.89	3.89	339	384.2
11:34	22.1	274	17.04	3.74	333.9	374.8
11:35	21.9	236.3	17.21	3.6	326.7	364.1
11:36	22	217.8	17.14	3.68	332.5	369.8
11:37	21.1	183.2	17.52	3.27	314.6	349.2
11:38	20.9	126.9	17.44	3.42	318.3	352.8
11:39	21.5	136.5	17.44	3.35	306.2	351.9
11:40	20.3	113	17.62	3.2	302.9	349.5
11:41	20	104.4	17.64	3.2	297.4	344.3
11:42	20.4	104.7	17.54	3.3	295	338.6

11:43	20.8	102.6	17.55	3.28	291.4	341.1
11:44	21	103.3	17.63	3.19	288.7	334
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Average	22.5	195.0	17.1	3.7	314.0	347.3