EMISSION MEASUREMENT CENTER
GUIDELINE DOCUMENT (GD-042)

PREPARATION AND REVIEW

OF

SITE-SPECIFIC EMISSION TEST PLANS

Revised March 1999

PREFACE

This guideline document is made available to promote consistency in the preparation and review of site-specific emission test plans for emission test programs performed for the U.S. Environmental Protection Agency (EPA), State and local agencies, and private sector interests.

The site specific test plan comprises written descriptions, summary tables, and figures that encompass all aspects of a planned emission test program at a particular facility location. After the test is performed, an emission test report is prepared to provide the information necessary to document the data collected and provide evidence that proper procedures were used to accomplish the test objectives. The emission test report presents the information gathered according to the emission test plan. Therefore, the contents of the test plan serve as the foundation for the test report.

This guideline document presents a standard format for preparing the test plan. The standard test plan contains a table of contents, nine sections, and appendices if needed. Rather than providing a general discussion of the standard format, this document lists the contents for each section. Then an example is given to illustrate the intent of each item in the list. The list at the beginning of each section serves a dual purpose: (1) as a guide to the preparer and (2) as a checklist for both the preparer and the reviewer of the test plan.

TABLE OF CONTENTS

TABLE OF CONTENTS

The site-specific test plan must contain:

- *Table of contents*
- *List figures*
- *List of tables*

EXAMPLE: *At a minimum, the table of contents must include the items shown below:*

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

*In this section, write a **brief summary** that identifies or states, as applicable, the following:*

- *Responsible groups or organizations*
- *Overall purpose of the emission test*
- *Regulations, if applicable*
- *Industry*
- *Name of plant*
- *Plant location*
- *Processes of interest*
- *Air pollution control equipment, if applicable*
- *Emission points and sampling locations*
- *Pollutants to be measured*
- *Expected dates of test*

EXAMPLE:

1.1 SUMMARY

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 **[Trade Organization]** 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 will coordinate the emission measurement activities. **[Contractor]** and **[Trade Organization]** will conduct the emission measurements.

EPA/EIB and **[Trade Organization]** considered the **[Plant]** in **[City, State]** to be one of four facilities that represent the diversity in wood species and dryer control devices. This test is the second of the four and is scheduled for **[Date]**. Plans are to conduct simultaneous measurements at the inlet and outlet of the electrified filter bed (EFB) for the No. 1 wood wafer dryer exhaust and at the press vents. Pollutants to be measured are: particulate matter (PM), condensible particulate matter (CPM), carbon monoxide (CO), nitrogen oxides (NO_X), hydrocarbons (HC), formaldehyde, other aldehydes, and ketones (F/A/K), and volatile and semivolatile organic compounds.

1.2 TEST PROGRAM ORGANIZATION

In this section, include the following:

- *Test program organizational chart with lines of communication*
- *Names and phone numbers of responsible individuals*
- *If necessary, a discussion of the specific organizational responsibilities*

EXAMPLE:

1.2 TEST PROGRAM ORGANIZATION

Figure 1-1 presents the OSB test program organization, major lines of communication, and names and phone numbers of responsible individuals.

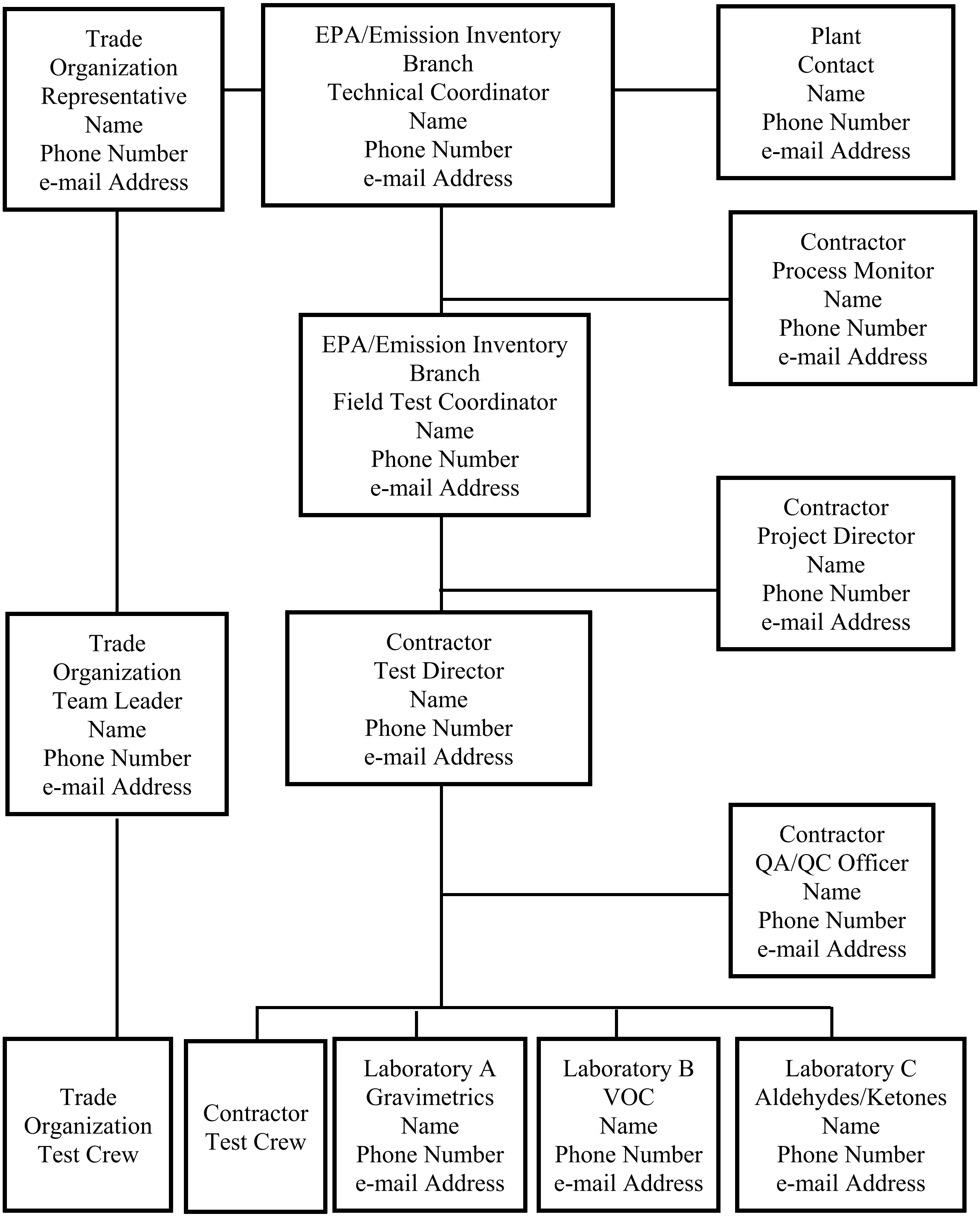


Figure 1-1. Example test program organization.

2.0 SOURCE DESCRIPTION

2.1 PROCESS DESCRIPTION

In this section, include the following:

- *Flow diagram (indicate emission and process stream test points) and general description of the basic process*
- *Discussion of unit or equipment operations that might affect testing or test results, e.g., batch operations, high moisture or temperature effluents, presence of interfering compounds, and plant schedule*
- *List of key operating parameters and standard operating ranges, production rates, or feed rates, if available*

In the flow diagram, trace the process from the beginning to the end. Identify the major operations. Show only those gas, liquid, and solid flow streams that relate to the emissions test.

EXAMPLE:

2.1 PROCESS DESCRIPTION

Figure 2-1 illustrates the basic processing steps for OSB production. The steps are:

- Logs are slashed, debarked, cut into shorter lengths, and sliced into thin wafers.
- The wafers are dried, classified, 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 wafers into a solid sheet.
- Sheets are trimmed, edge treated, and packaged for shipping.

At this **[Plant]**, the wood mix is about 60 percent soft wood (e.g., pine), 30 percent soft hardwood (e.g., sweet gum), and 10 percent hardwood. Two 12-foot diameter dryers process 30,000 to 32,000 lb/hr of flakes. The moisture content of the flakes leaving the dryer is about 3 to 4 percent. Inlet temperatures to the dryer run about 750 to 900°F and the exit temperatures about 235 to 255°F. A McConnel burner fired with recycled waste, such as wood trim, fines, and resinated sander dust, heats the dryers. An oil-fired Wellens burner serves as a backup.

The emission test points are EFB inlet and outlet (stack) and the roof vents from the press (see Figure 2–1)

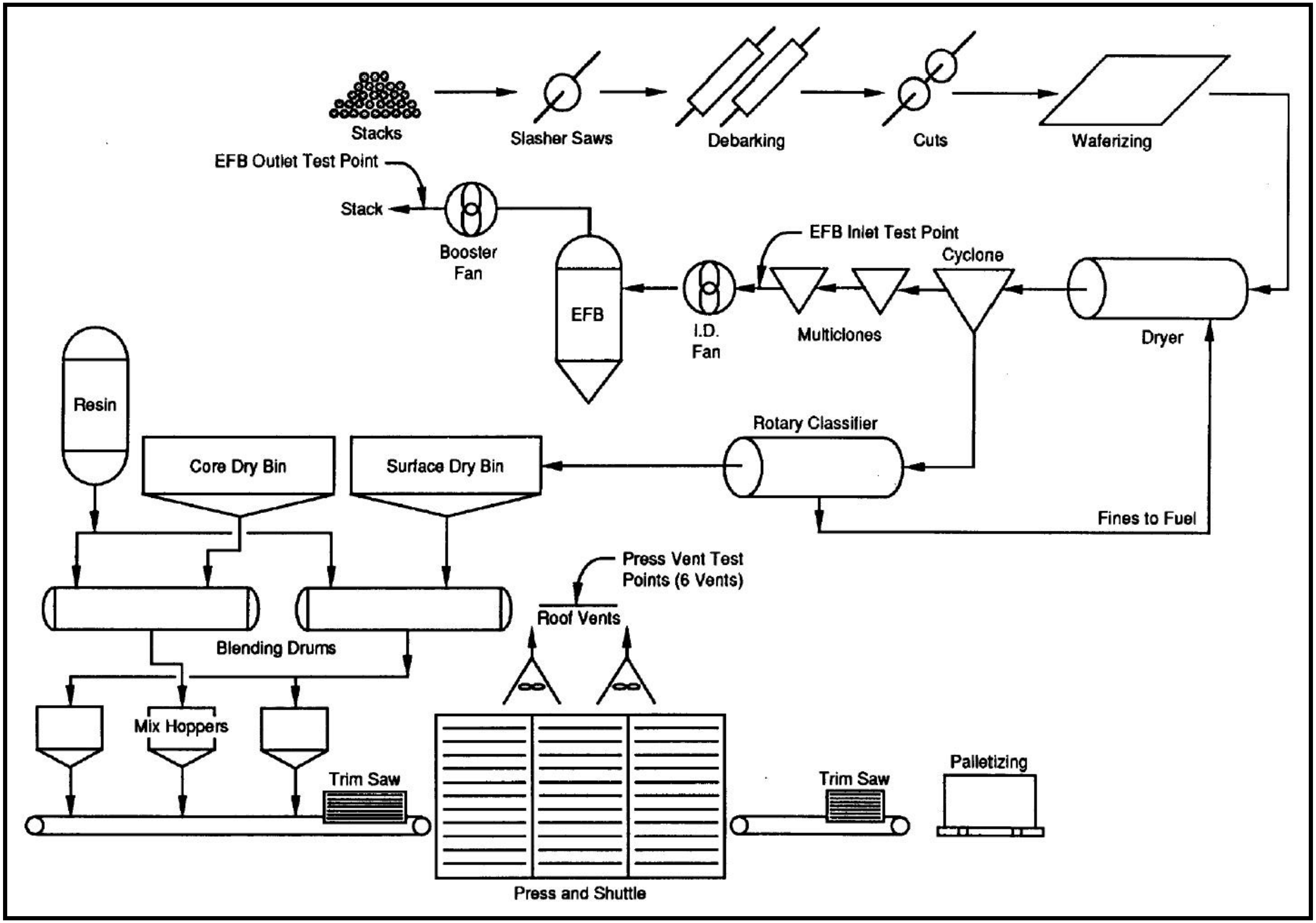


Figure 2-1 Oriented strand board (OSB) process flow diagram.

2.2 CONTROL EQUIPMENT DESCRIPTION

In this section, include the following:

- *Description of all air pollution control systems*
- *Discussion of typical control equipment operation and, if necessary, a schematic*
- *Normal operating ranges of key parameters, if available*

EXAMPLE: *This example covers only the electrified filter bed. In the actual case, the cyclones would also be discussed.*

2.2 CONTROL EQUIPMENT DESCRIPTION

Particulate matter from the wafer dryer is controlled by cyclones and an electrified filter bed (EFB) manufactured by **[Manufacturer]**. Figure 2-2 is a schematic of an ionizer and gravel bed assembly. The EFB is an electrostatic precipitator (ESP) that uses pea-gravel as its collection electrodes.

The gases enter the EFB into an annular region formed by two concentric cylinders. The inner cylinder is the ionizer. Ions formed by the ionizer stream toward the adjacent cylinder wall and impart electrostatic charges on dust particles.

After passing through the ionizer, the gas flows down the chamber into the filter bed section. The filter bed consists of pea-shaped gravel held between two cylindrical louvers. A high DC positive voltage polarizes the gravel and induces regions of positive and negative charge on the pebbles. As the gases pass through the pebble bed, the negatively charged dust particles are collected on the positively charged regions on the gravel.

As dust accumulates in the filter bed, the resistance to gas flow increases. To maintain constant flow and remove collected particles, the EFB slowly and continu-ously removes gravel from the bottom. The removed gravel is agitated to remove the dust particles and is recycled into the EFB at the top.

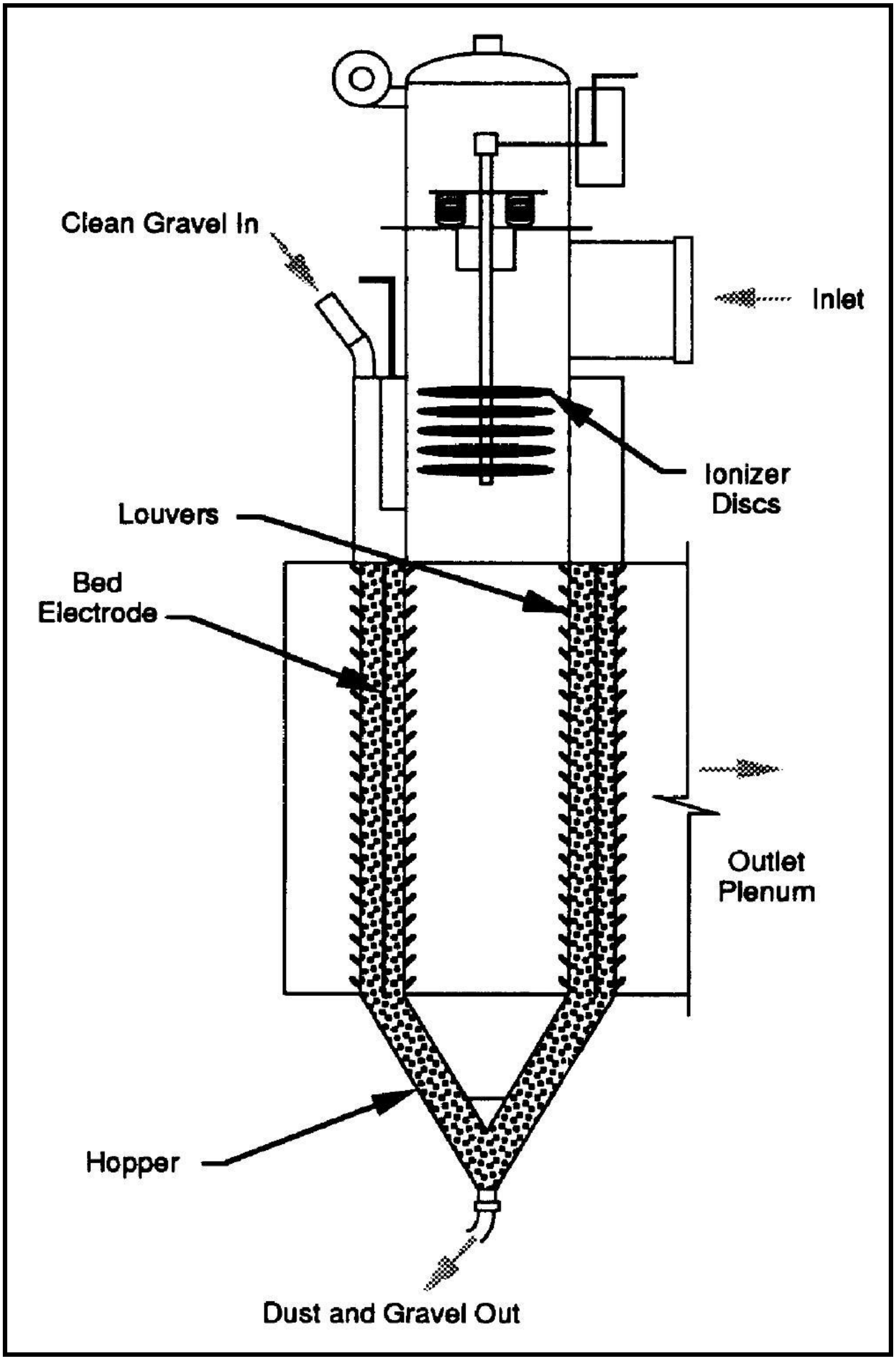


Figure 2-2 Ionizer and gravel bed assembly.

3.0 TEST PROGRAM

3.1 OBJECTIVES

In this section:

- *Restate the overall purpose of the test program.*
- *List (in order of priority) the specific objectives for both emissions and process operation data.*

EXAMPLE:

3.1 OBJECTIVES

The purpose of the test program is to develop emission factors for OSB production facilities from the wood products industry. The specific objectives in order of priority are:

- Measure simultaneously the emissions of PM, CPM, CO, NO_X, HC, formaldehyde (plus other aldehydes and ketones), and volatile and semi-volatile organics at the wood wafer dryer EFB inlet and outlet locations.

- Measure formaldehyde (plus other aldehydes and ketones) emissions from the press vents.

- During the test period, obtain production rates (number of press loads and belt speed), inlet and outlet dryer temperatures, drying rates, EFB bed voltage and current, and EFB voltage and ionizer current.

- Determine the relationship between Method 25 and Method 25A for HC, and between Method 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 normal plant operation in hours/day, days/per week, and weeks/year, overall plant design capacity, and average production rates.

3.2 TEST MATRIX

Include a table showing the following (include schematics, if helpful):

- *Sampling locations*
- *Number of runs*
- *Sample type/pollutant*
- *Sampling method*
- *Sample run time*
- *Analytical method*
- *Analytical laboratory*

EXAMPLE:

3.2 TEST MATRIX

Table 3-1 presents the sampling and analytical matrix. Table 3-2 shows all the measurements being made at each test location.

TABLE 3-1. **[PLANT, LOCATION]** TEST MATRIX

Sampling Location	No. of Runs	Sample/Type Pollutant[a]	Sampling Method[b]	Sampling Org	Sample Run Time (min)	Analytical Method[c]	Analytical Laboratory
Outlet Stack	3	PM/CPM	M202 (M5 Filter and Backup Filter)[d]	Ctr-A	60	Gravimetric (PM-M5, CPM-M202, Backup Filter-ODEQ M7)	PM/CPM-Ctr-A Backup Filter-Trade Org
Outlet Stack	3	O_2/CO_2	M3 (bag)	Ctr-A	60	Orsat (M3)	Ctr-A
Outlet Stack	3	CO	M10 (CEM)	Ctr-A	60	NDIR (M10)	Ctr-A
Outlet Stack	3	NO_x	M7E (CEM)	Ctr-A	60	Chemiluminescence (M7E)	Ctr-A
Outlet Stack	6[e]	THC	M25A (CEM)	Ctr-A	60	FID (M25A)	Ctr-A
Outlet Stack	6[e]	TGNMO (dual train)	M25	Trade Org	60	Catalysis, GC/FID, NDIR (M25)	Trade Org
Outlet Stack	3	Formaldehyde/ Aldehydes/ Ketones	SW-846 M0011	Ctr-A	60	HPLC (M0011)	Lab-A
Outlet Stack	3	VOC[f]	SW-846 M0010 (MM5)	Ctr-A	60	HRGC/LRMS (M8270), HPLC	Lab-B/ Lab-A
Outlet Stack	3	VOC[g]	SW-846 M0030 (VOST)	Ctr-A	60	HRGC/LRMS (M5040 and M8240)	Lab-B
Outlet Stack	3[h]	TOC	Evacuated Cylinder	Ctr-B	60	Catalytic FID	Ctr-B
Inlet	3	PM/CPM	M202 (M5 Filter and Backup Filter)[d]	Ctr-A	60	Gravimetric (PM-M5, CPM-M202, Backup Filter-ODEQ M7)	PM/CPM Ctr-A Backup Filter-Trade Org
Inlet	6[e]	O_2/CO_2	M3	Ctr-A	60	Orsat (M3)	Ctr-A
Inlet	6[e]	THC	M25A (CEM)	Ctr-A	60	FID (M25A)	Ctr-A
Inlet	3	TGNMO (dual train)	M25	Trade Org	60	Catalysis, GC/FID (M25)	Trade Org
Inlet	3	Formaldehyde/ Aldehydes/ Ketones	SW-846 M0011	Ctr-A	60	HPLC (M0011)	Lab-A

Sampling Location	No. of Runs	Sample/Type Pollutant[a]	Sampling Method[b]	Sampling Org	Sample Run Time (min)	Analytical Method[c]	Analytical Laboratory
Press Vents	3[i]	Formaldehyde/ Aldehydes/ Ketones	SW-846 M0011	Ctr-A	60	HPLC (M0011)	Lab-A
	3	O_2/CO_2	M3	Ctr-A	60	Orsat	Ctr-A

[a] PM-particulate matter, CPM - condensible particulate matter, TGNMO - total gaseous nonmethane organics, VOC - volatile organic compounds, TOC - total organic carbon.

[b] M - EPA Method, CEM - EPA Instrumental Method using continuous emission monitors.

[c] NDIR - Nondispersive infrared, FID - flame ionization detector, GC - gas chromatograph, HPLC - high performance liquid chromatography.

[d] Backup filter to approximate Oregon Department of Environmental Quality (ODEQ) Method 7.

[e] Three additional runs are tentatively planned following the main test program; if possible, the process parameters will be varied during this additional testing.

[f] Semivolatile organic compounds, including target compounds and tentatively identified compounds, plus oxygenated compounds caught in aqueous fractions.

[g] Volatile organic compounds.

[h] To be conducted with final three of six runs for M25 and M25A; sample acquisition to evaluate proposed analytical technique for total organic carbon measurements.

[i] Each run will be conducted on two of eight vents.

TABLE 3-2. MEASUREMENTS AT EACH TEST LOCATION

RUNS 1, 2, AND 3	
EFB Inlet	**EFB Outlet**
PM/CPM (M-202)	PM/CPM (M-202)
O_2/CO_2 (M-3)	O_2/CO_2 (M-3)
HC (M-25A)	HC (M-25A)
TGNMO (dual) (M-25)	TGNMO (dual) (M-25)
F/A/K (M-0011)	F/A/K (M-0011)
	CO (M-10)
	NO_X (M-7E)
	TOC (Evac. Cont.)
RUNS 4, 5, AND 6	
	HC (M-25A)
	TGNMO (dual) (M-25)

RUN 1	**RUN 2**	**RUN 3**
Press Vents 2 & 3	Press Vents 4 & 5	Press Vents 6 & 7
F/A/K (M-0011)	F/A/K (M-0011)	F/A/K (M-0011)
O_2/CO_2 (M-3)	O_2/CO_2 (M-3)	O_2/CO_2 (M-3)

Note: All sampling trains are to be conducted simultaneously within each run. For example, during Run 1, all trains under EFB inlet, EFB outlet, and Press Vents 2&3 are to be run simultaneously.

4.0 SAMPLING LOCATIONS

4.1 FLUE GAS SAMPLING LOCATIONS

In this section:

- *Provide a schematic of each location. Include:*
  - *duct diameter*
  - *direction of flow*
  - *dimensions to nearest upstream and downstream disturbances (include number of duct diameters)*
  - *location and configuration of the sampling ports*
  - *nipple length and port diameters*
  - *number and configuration of traverse points*
- *Confirm that the sampling location meets EPA criteria. If not, give reasons and discuss effect on results.*
- *Discuss any special traversing or measurement schemes.*

EXAMPLE:

4.1 FLUE GAS SAMPLING LOCATIONS

Emission sampling will be conducted at: (1) the EFB inlet on dryer No. 1, (2) the EFB outlet stack on dryer No. 1, and (3) the press vents. Figures 4-1, 4-2, and 4–3 are schematics of these sampling locations.

4.1.1 EFB Inlet. See Figure 4-1. Four 4-inch ports will be installed at Sections XX and YY as shown. Because of obstructions around the site, Section XX was the only practical location for Methods 202 and 0011. Method 1 requires that Section XX have 24 traverse points; each point will be sampled for 2.5 minutes for a total time of 60 minutes. One train will traverse into the duct while the other traverses out. At Section YY, about 2 feet below Section XX, one port will be used for the paired Method 25 single-point sampling and the second for Methods 25A and 3.

4.1.2 EFB Outlet. See Figure 4-2. The outlet stack for the EFB presently has two 4-inch sampling ports A and B. Additional 4-inch ports C through H will be installed as shown. Methods 202, 0011, and MM5 will be conducted at Section XX at 24 points (2.5 minutes at each point), the VOST train will be conducted at port E, and Methods 25 (dual), 10, 7E, and 3 will be conducted at Section YY.

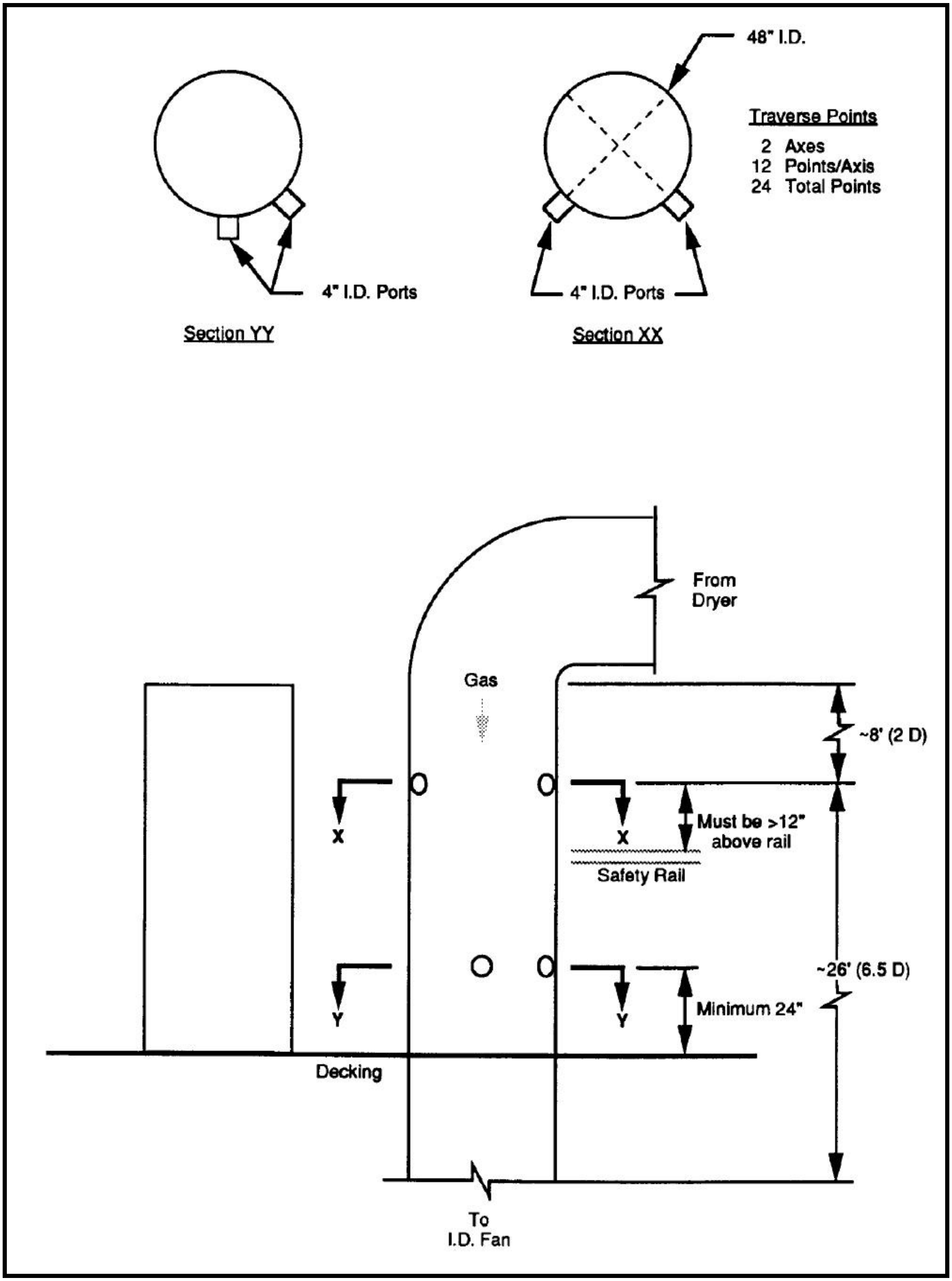


Figure 4-1 Schematic of Unit No, 1EFB inlet sampling location.

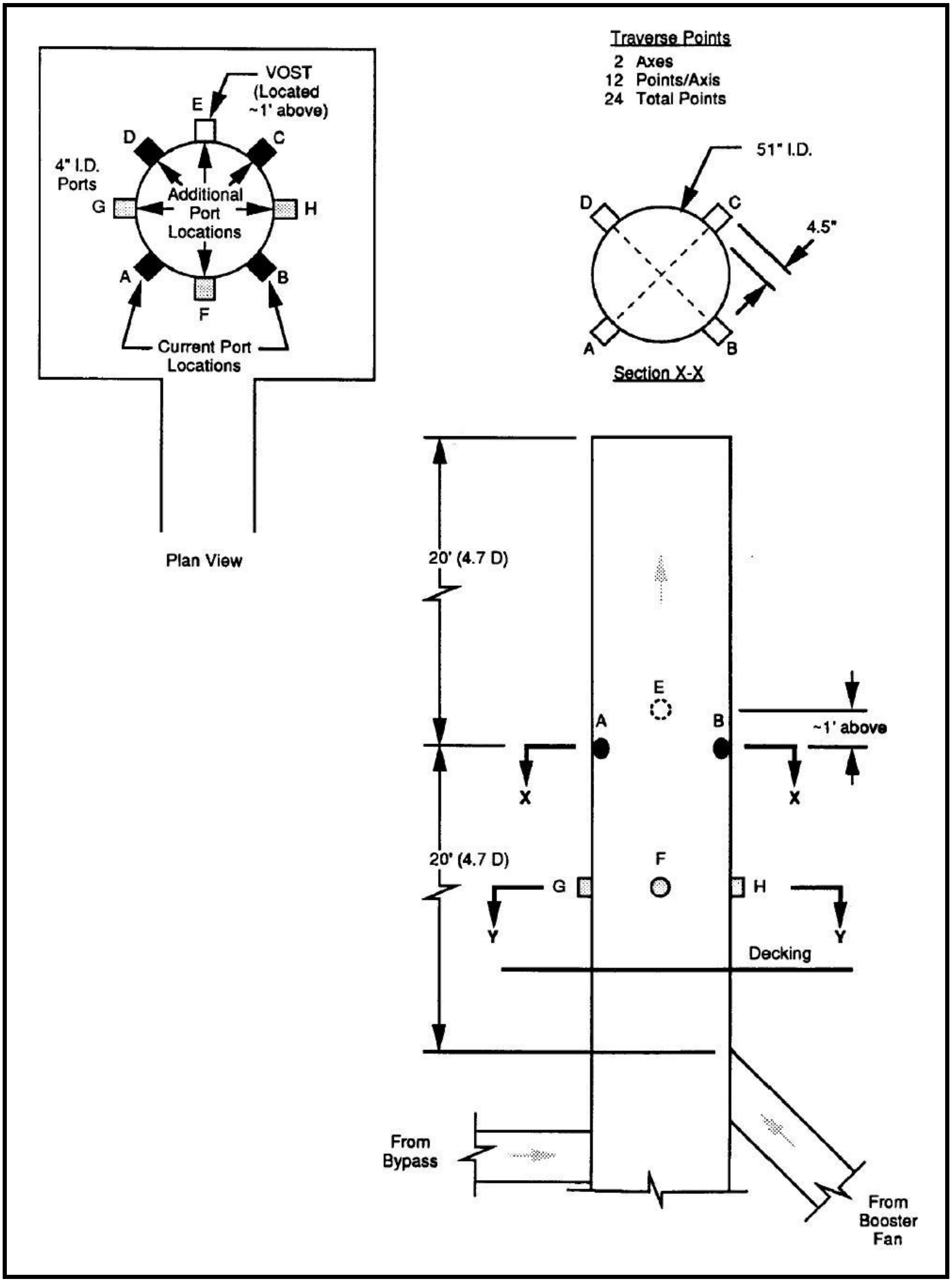


Figure 4-2 Schematic of Unit 1 EFB outlet stack sampling location.

4.1.3 Press Vents. See Figure 4-3. The press has eight roof vents as shown in the figure. The two vents on the ends (1 and 8) will not be tested because they are not directly over the press and little or no emissions are expected from these vents. Different pairs of the other six vents will be sampled for formaldehyde emissions (Method 0011) during each of the three test runs.

At this location, a 4-foot stack extension to improve flow conditions will be constructed. The extension will contain one 4-inch port. Each vent "stack" will be traversed (12 points) in only one direction. The traverse of the second vent of a pair will be in the direction perpendicular to the first vent traverse. Although the location does not meet Method 1 requirements, the results will not be affected since no particulate sampling is conducted at the press vents. The flow will be checked for non-parallel flow using the procedure in Section 2.5 of Method 1 before the tests to ensure that velocity can be measured accurately.

4.2 PROCESS SAMPLING LOCATIONS

If process stream samples will be taken, include the following:

- *Schematic of locations, if helpful (location can be shown in figure in Section 2.0)*
- *Description of each sampling or measurement location*
- *Discussion on the representativeness of each of the process stream sampling locations*

EXAMPLE: *The OSB test plan did not require any process samples to be taken. Therefore, the example below was taken from a site-specific test plan for a drum mix asphalt plant. At this plant, a tank of waste fuel is used to supply the burners for the drum mixer. The plan required one grab sample per run of the waste fuel.*

4.2 WASTE FUEL SAMPLE LOCATION

The sample for each test run will be taken from a tap at the outlet of the waste fuel supply tank to the burners. The sample is this point is expected to be homogeneous.

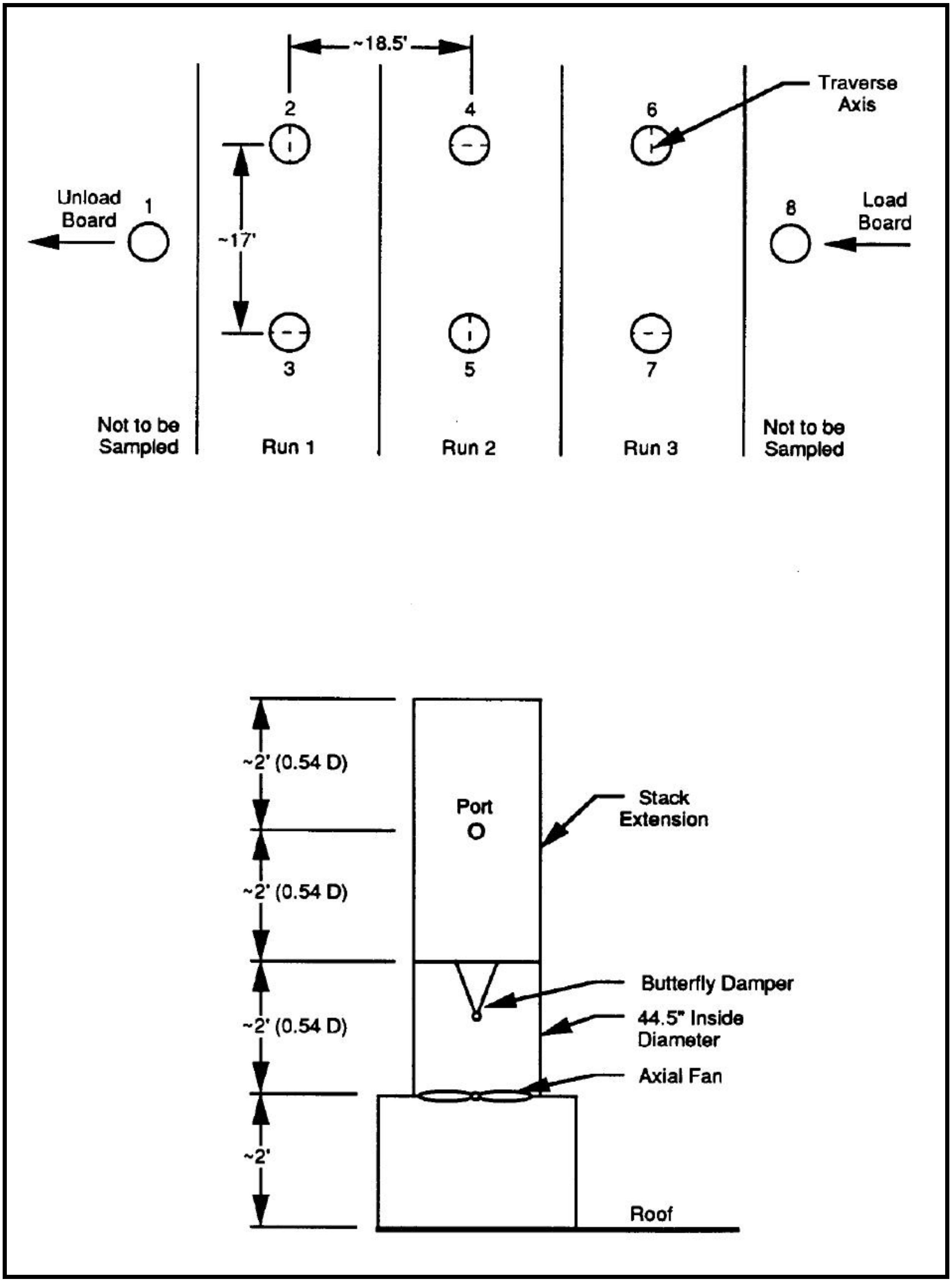


Figure 4-3 Press Vents sampling location configuration and testing scheme.

5.0 SAMPLING AND ANALYTICAL PROCEDURES

5.1 TEST METHODS

In this section, include the following:

- *Schematic of each sampling train*
- *Flow diagram of the sample recovery*
- *Flow diagram of sample analysis*
- *Description of any modifications and reasons for them*
- *Discussion of any problematic sampling or analytical conditions*

If a non-EPA method is used instead of an EPA method, explain the reason. Place a copy of all methods in Appendix A. Be sure that non-EPA methods are written in detail similar to that of the EPA methods.

EXAMPLE: *This example is for just one of the test methods. The site-specific test plan should include similar schematics and flow diagrams for each of the test methods.*

5.1 TEST METHODS

5.1.1 Particulate Matter/Condensible Particulate Matter. PM/CPM at the inlet and outlet of the EFB will be determined by Method 202. One of the objectives of this test is 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, Method 202 will be modified by inserting a second filter in the same position as that in the ODEQ Method 7. This back-up filter will be analyzed gravimetrically according to the ODEQ procedure. All other procedures will be those of Method 202. These modifications will not affect the results from Method 202. Figures 5-1 and 5-2 are schematics of Method 202 (showing modification) and ODEQ Method 7, respectively.

Figures 5-3 and 5-4 illustrate the sample recovery procedure and analysis schemes, respectively.

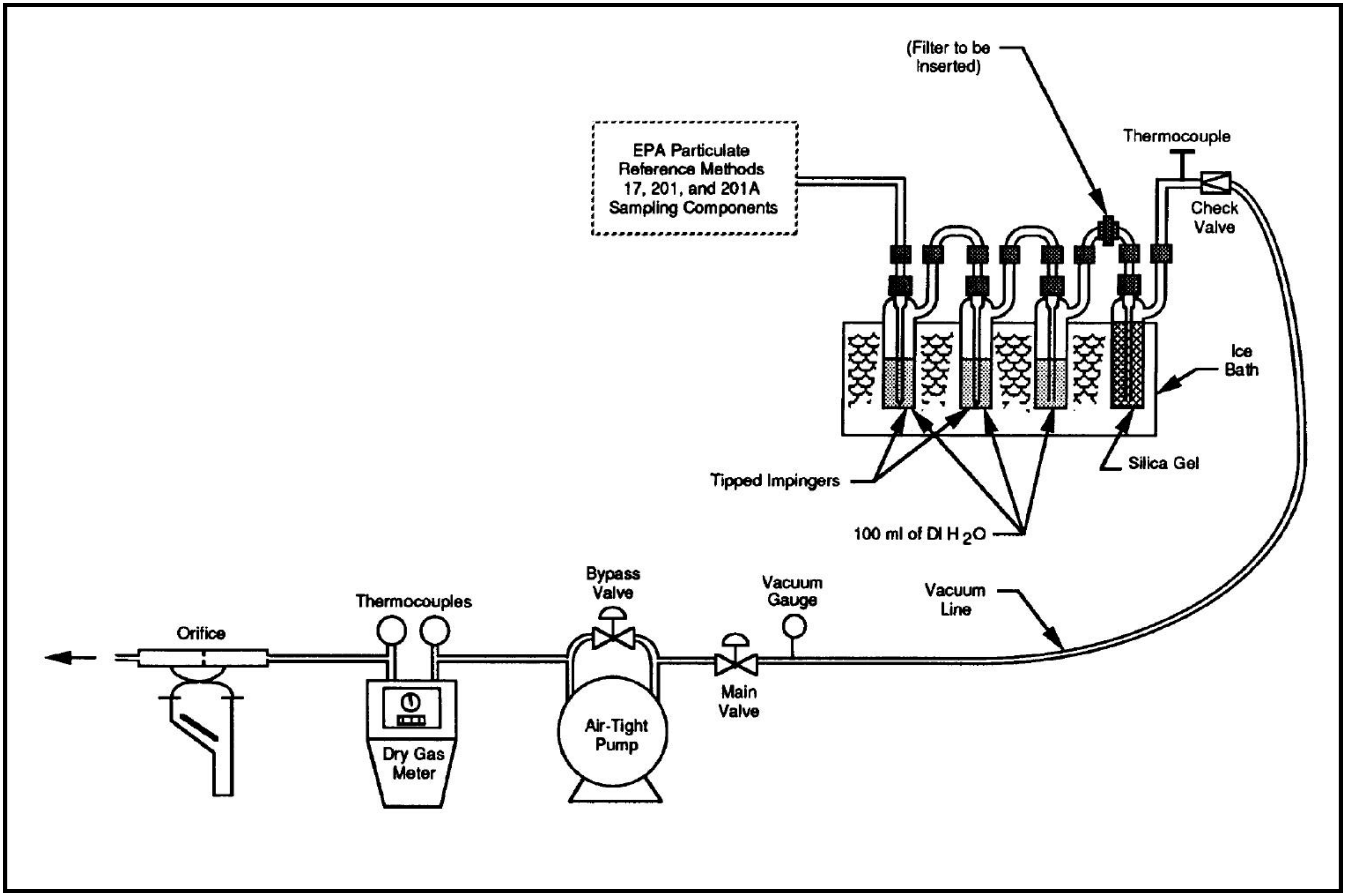


Figure 5-1 EPA Method 202 condensable particulate sampling train.

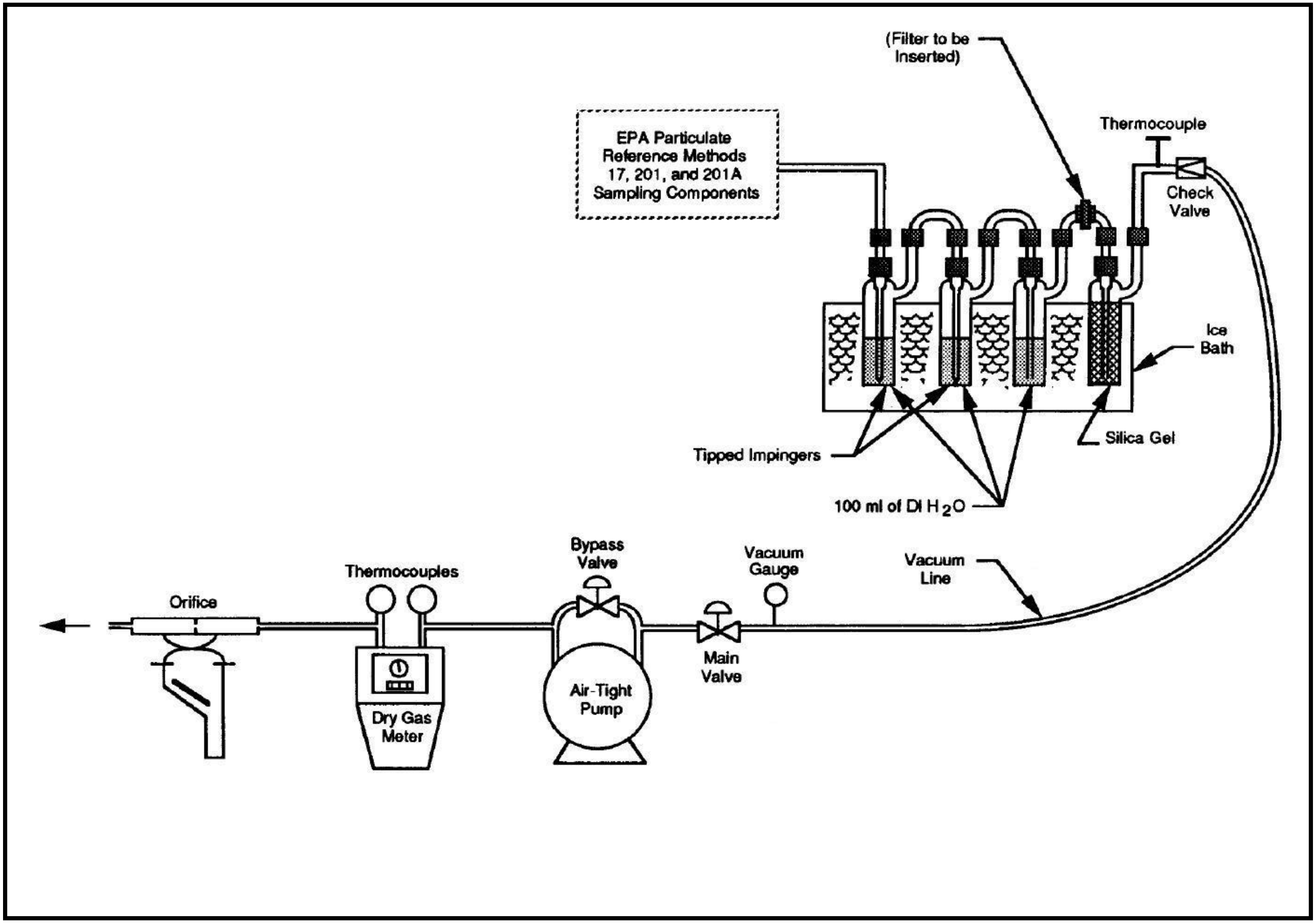


Figure 5-2 EPA Method 202 condensable particulate sampling train.

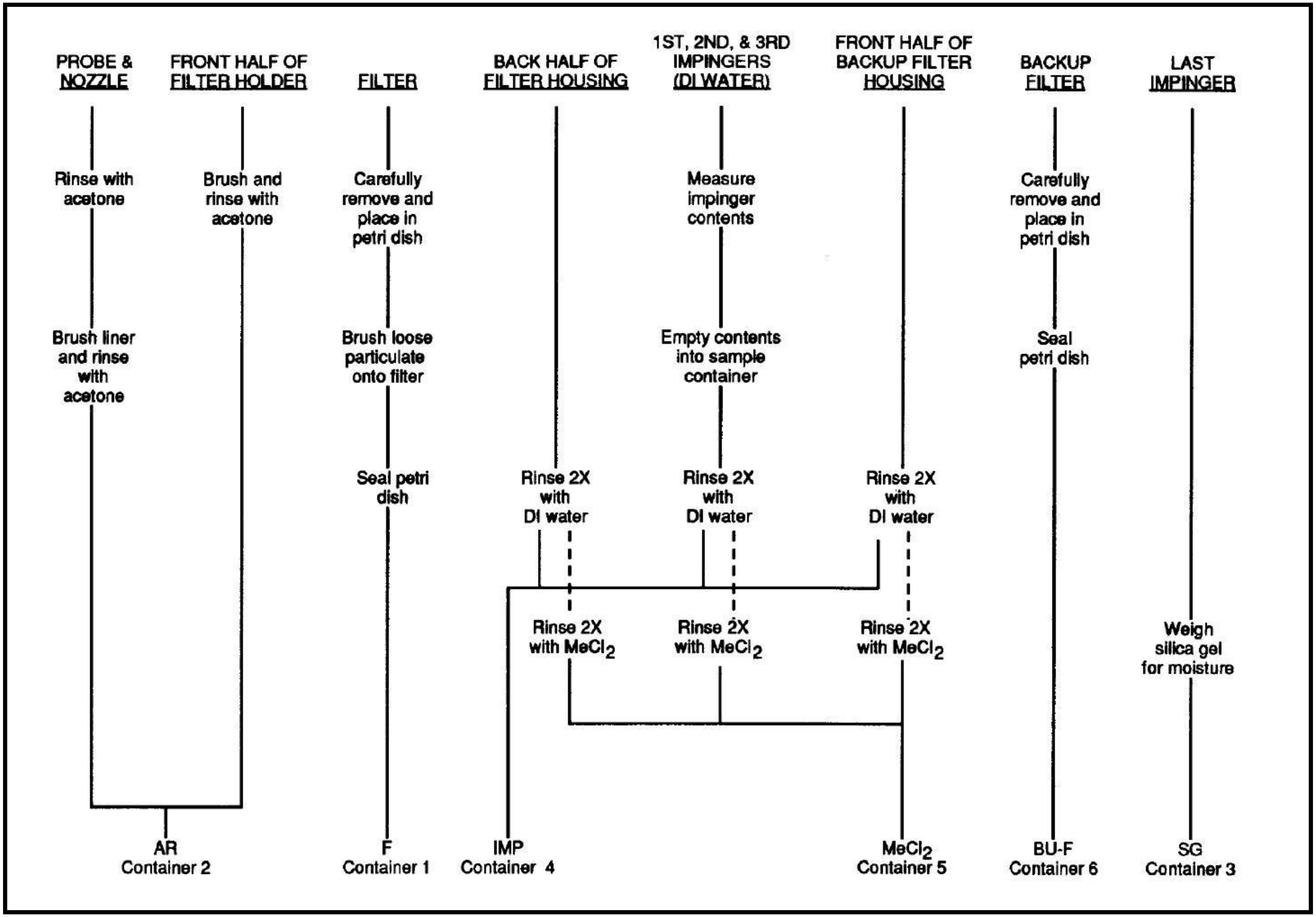


Figure 5-3 Sample recovery scheme for particulate/condensables samples.

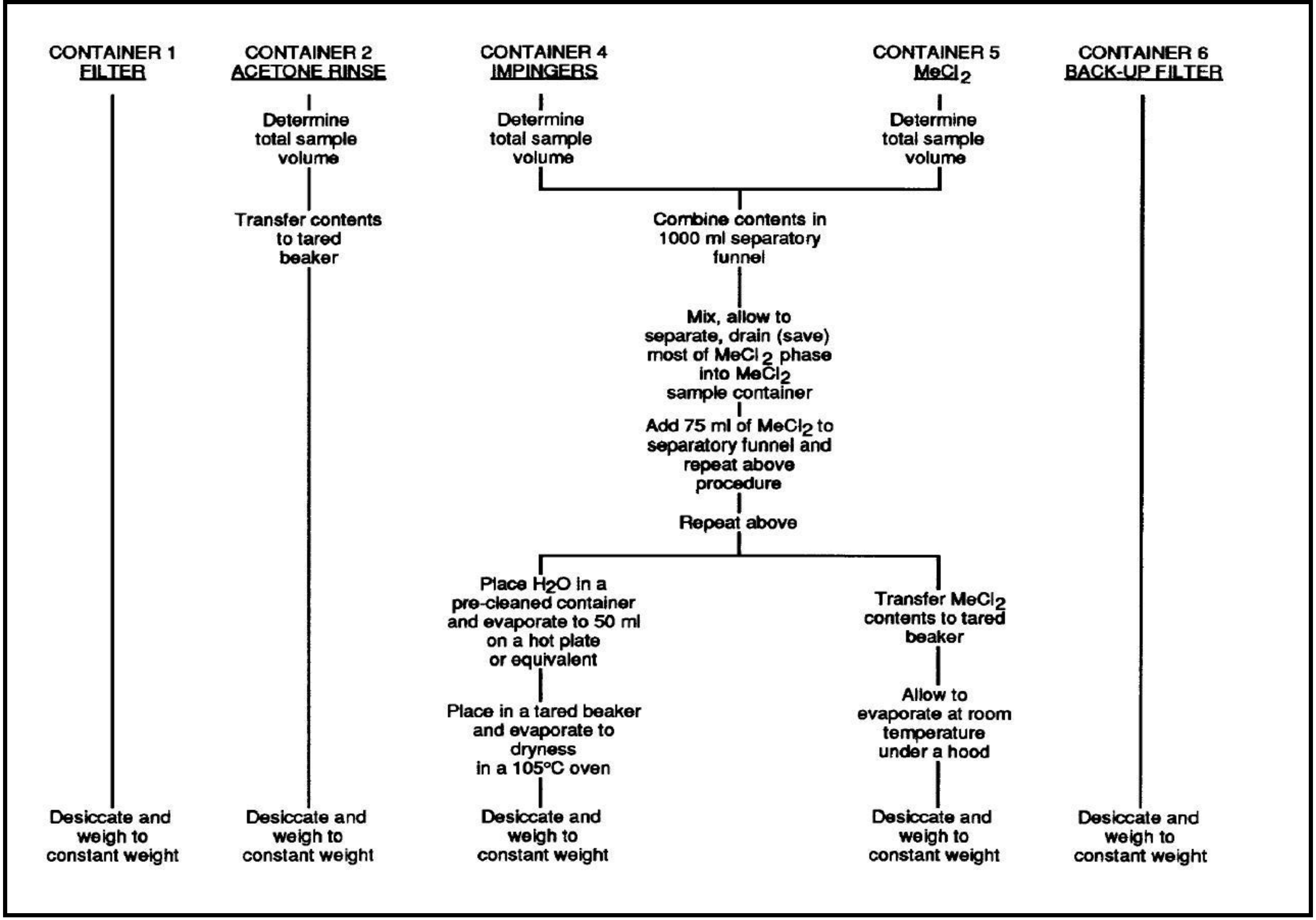


Figure 5-4 Analytical scheme for particulate/condensables samples.

5.2 PROCESS DATA

In this section, include the following:

•Description of analytical, sampling, or other procedures for obtaining process stream and control equipment data

EXAMPLE:

5.2 PROCESS DATA

The following process operation data will be collected:

- Number of press loads during EFB inlet/outlet testing
- Number of press loads during press vent testing
- Dryer inlet and outlet temperatures
- Belt speed
- EFB bed voltage and current
- EFB ionizer voltage and current

The **[Process Monitor]** will count the number of press loads, and obtain the dryer data from the central control panel and the EFB data from the EFB control panel.

6.0 QA/QC ACTIVITIES

6.1 QC PROCEDURES

In this section, provide the following for each test method:

- *Data sheets*
- *QC check lists, which could be part of the data sheets*
- *QC control limits*
- *Discussion of any special QC procedures*

Examples of QC checks would be calibration of instruments, matrix spikes, duplicate analyses, internal standards, blanks, linearity checks, drift checks, response time checks, and system bias checks.

EXAMPLE: *Examples for Method 1 and Method 2 are provided below. Other examples of data sheets/QC check lists may be obtained through EMTIC.*

6.1 QC PROCEDURES

Data sheets that also act as QC check lists and include QC control limits for Methods 1 and 2 are shown in Figures 6-1 and 6-2.

6.2 QA AUDITS

For each of the test methods for which an audit is to be conducted, list (if applicable) the following:

- *Type of audits to be conducted*
- *Limits of acceptability*
- *Supplier of audit material*
- *Audit procedure*
- *Audit data sheet/QC check list*

EXAMPLE: *An example for Method 5 dry gas meter is provided below. Other examples of data audit sheets/QC check lists may be obtained from EMTIC.*

6.2 QA AUDITS

Calibrated critical orifices (about 0.5 cfm) supplied by EPA will be used to audit the Method 5 dry gas meter calibration. The dry gas meter value must agree to within ±5 percent of the critical orifice value. The procedure in Section 7.2 of Method 5 will be used. The data sheet provided by EPA will be used.

Sampling and Velocity Traverse Point Determination
EPA Method 1

PLANT NAME ____________________

CITY, STATE ____________________

SAMPLING LOCATION ____________________

NO. OF PORTS AVAILABLE ____________________

NO. OF PORTS USED ____________________

PORT INSIDE DIAMETER ____________________

DISTANCE FROM FAR WALL TO OUTSIDE OF PORT ________

NIPPLE LENGTH AND/OR WALL THICKNESS ________

DEPTH OF STACK OR DUCT ________

STACK OR DUCT WIDTH (IF RECTANGULAR) ________

EQUIVALENT DIAMETER:

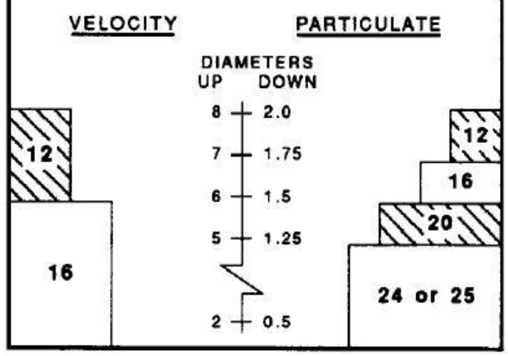
$$D_E = \frac{2 \times DEPTH \times WIDTH}{DEPTH + WIDTH} = \frac{2\,(\quad)(\quad)}{(\quad + \quad)} = \_\_\_\_\_\_$$

DISTANCE FROM PORTS TO FLOW DISTURBANCES	UPSTREAM	DOWNSTREAM
	________	________
DIAMETERS	________	________

STACK/DUCT AREA = ________ = ________ IN^2 (must be > $113 in.^2$)

DRAW HORIZONTAL LINE THROUGH DIAMETERS

If more than 8 and 2 diameters and if duct dia. is 12 - 24, use 8 or 9 points.



POINT	% OF DUCT DEPTH	DISTANCE FROM INSIDE WALL	DISTANCE FROM OUTSIDE OF PORT
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

LOCATION OF POINTS IN CIRCULAR STACKS OR DUCTS

	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF POINTS IN RECTANGULAR STACKS OR DUCTS

	3	4	5
1	16.7	12.5	10.0
2	50.0	37.5	30.0
3	83.3	62.5	50.0
4		87.5	70.0
5			90.0

Do not place points closer to stack walls than
1.0 in. for stack dia. >24 in.
0.5 in. for stack dia. 12 to <24 in.

For rectangular stacks, use only the following matrices:

No. Pts.	Matrix
9	3 x 3
12	4 x 3
16	4 x 4
25	5 x 5

Check for completeness________

Checked by (Signature)______________________

Figure 6-1

FIGURE 6-2. EXAMPLE VELOCITY DATA SHEET

Date ______________________ Run No. _______ Test Location ___________________
Plant________________________________ Operator_________________________________

Schematic: Cross-Section

Pitot ID No. ____________________________
Pitot coeff: C_p = _______________________
Last calibrated: Date: __________________
Pitot condition: ________________________
____

Gauge sensitivity:
Req'd _______________________ in. H_2O
Actual _______________________ in. H_2O
Calibration:
Pre-test _________________
Post-test ________________
Leak check: (None)
Pre-test: ________________
Post-test: _______________

Temp. ID No. ________________
Temp. calibration: (1.5% abs)
Pre-test _________________
Post-test ________________

Barometric presssure gauge calibration:
(0.1 in. Hg)
Pre-test _________________
Post-test ________________
Barometric pressure: P_b = _________ in. Hg

Static pressure: P_s = _____________ in. Hg

Pitot configuration/assembly:
Sketch/dimensions

Checked for completeness by (Signature/Title) ________________________________

Start Time: ________________________

Port/ Trav. Pt.	Δp in. H_2O	Stk temp. °F

6.3 QA/QC CHECKS OF DATA REDUCTION

In this section, describe the following:

- *Procedure for assuring accurate transfer of raw data and accuracy of calculations*
- *Data quality indicators, such as*
  - *Using F_o factors to validate Orsat, CEM CO_2/O_2 data*
  - *Comparing process O_2 monitor and CEM O_2 data*
  - *Comparing flow rates measured at different locations or by different sampling trains*
  - *Comparing relative concentrations at different sampling locations*
  - *Comparison of data with previous field test results (if applicable)*
  - *Running mass balances*

EXAMPLE:

6.3 QA/QC CHECKS OF DATA REDUCTION

The **[QA Officer]** will run an independent check (using a validated computer program) of the calculations with predetermined data before the field test. This will ensure that calculations done in the field are accurate. The **[QA Officer]** will also conduct a spot check on-site to assure that data are being recorded accurately. After the test, the **[QA Officer]** will check the data input to assure that the raw data have been transferred to the computer accurately.

The F_o factors from Method 3 will be used to validate the CO_2/O_2 data. Since the fuel consists of wood trim, fines, and resinated sander dust, the F_o factor is expected to be within 1.000 and 1.120.

The inlet and outlet volumetric flow rates will be compared. In addition, the volumetric flow rates from the Method 202 and MM5 trains will be compared. Agreement within these two trains should be ±10 percent.

6.4 SAMPLE IDENTIFICATION AND CUSTODY

- *Person responsible*
- *Sample identification and chain-of-custody procedure*
- *Sample identification label*
- *Chain-of-custody form*
- *Sample log sheet*

EXAMPLE: *The scheme for identifying samples should be logical and easily deciphered, e.g., 2I-PM-F means Run No. 2, inlet, particulate matter sample, filter.*

6.4 SAMPLE IDENTIFICATION AND CUSTODY

The **[Task Leader]** is responsible to ensure that all samples are accounted for and that proper custody procedures are followed. After collecting and recovering the sample, the **[QA Officer]** will supply sample labels and integrity seals, maintain inventory records of all the samples taken, and ensure that chain-of-custody forms are filled. Figures 6-3 through 6-6 show some examples.

PLANT:
JOB #: DATE: / /

RUN #:

MATRIX:
LOT #
FINAL WT.______________

TARE WT.______________

FV, mls.=

PLANT:
JOB #: DATE: / /

RUN #:

MATRIX: 200ml 5% HNO_3 / 10% H_2O_2
LOT #
FINAL WT.______________

TARE WT.______________

FV, mls.=

PLANT:
JOB #: DATE: / /

RUN #:

MATRIX:
LOT #
FINAL WT.______________

TARE WT.______________

FV, mls.=

RINSE ADDED IN FIELD? _____YES _____NO

MARK LIQUID LEVEL IF APPLICABLE
T-- = tared vol. of reagent
RV-- = reagent vol. after use
(does not include rinse)
FV-- = final volume (reagent + rinse)

PLANT:
JOB #: DATE: / /

RUN #:

PLANT:
JOB #: DATE: / /

RUN #:

MATRIX: 200 ml 5% H_2O_2
LOT #
FINAL WT.______________

TARE WT.______________

FV, mls.=

Figure 6-3. Example sample labels.

FIELD SAMPLE QUALITY CONTROL
50-CAPACITY CONTAINER, BOX NO. ________

Assembly Date ____________ Assembled By ____________ Job No. ____________

Plant Name/Address ________________________________

Individual Tare Of Reagent ________ (mL)(gm) of ________________

Individual Tare Of Reagent ________ (mL)(gm) of ________________

Individual Tare Of Reagent ________ (mL)(gm) of ________________

Individual Tare Of Sil. Gel ________ Gm ________________
Other (specify)

Run/Sample I.D.	Samp. Method	Recovery Date	Recovery Time	Init	Run/Sample I.D.	Samp. Method	Recovery Date	Recovery Time	Init

All liqud levels at mark (check)? ___ Yes ___ No (estimate loss of not at mark; use REMARKS section).

Remarks ________________________________

____

____

Custodian ________________ Date __________ Time ________

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Figure 6-4. Example field sample quality control sheet.

VOST SAMPLES USAGE INVENTORY, CONTAINER NO. ________

Plant Name ______________________________ Job No. __________

City/State ______________________________ Packed By ______________

Total No. Tenax Tubes ______ Tenax/Charcoal Tubes ______ (SHOW TOTALS ON PAGE 1 ONLY)

PAGE _____ OF _____

Date	Sampling Location	Run Number	Sample I.D.	Tenax Tube No.	Tenax/ Charcoal Tube No.	Conden- sate Vial No.
Personnel ____________						
Remarks*						
Personnel ____________						
Remarks*						
Personnel ____________						
Remarks*						
Personnel ____________						
Remarks*						
Personnel ____________						
Remarks*						

*INCLUDE LISTING OF TUBES NOT USED DUE TO BREAKAGE AND ABORTED RUNS.

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Figure 6-5. Example sample inventory sheet.

RECORD OF CUSTODY, CONTAINER NO. __________

Container Type (check) ___Reagent Box ___Cooler ___Other____________________

Plant Name/Address ____

Job No. ______________ Sampling Method ________________ (EPA, NIOSH, etc.)

Seal ID	Date	Time	*	Full Signature	Reason for Breaking Seal**
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		

* S = Sealed By; B = Broken By   ** Use "REMARKS" Section if more space needed.

Received by Sample Custodian   **Seal Intact?

___________________ Signature   __________ Date   ________ Time   ___Yes ___No

As Applicable:
All liquid levels at mark (check)? ___ YES ___ NO (Estimate loss if not at mark; describe in "REMARKS")

As Applicable:
TUBE SAMPLES put in freezer by ______________________ Date __________ Time ________

CONDENSATE SAMPLES put in refrige. by ______________________ Date __________ Time ________

REMARKS ____

____

____

L-0023 rev. 10-91   Figure 6-6. Example chain-of-custody form.

Figure 6-6. Example chain-of-custody form.

7.0 REPORTING AND DATA REDUCTION REQUIREMENTS

7.1 REPORT FORMAT

In this section, include:

- *Table of contents for the test report*

EXAMPLE:

7.1 REPORT FORMAT

The Table of Contents for the report will be:

TABLE OF CONTENTS

7.2 DATA REDUCTION AND SUMMARY

In this section, include:

- *Data summary tables; include units (e.g., lb/mmBtu, lb/ton of product, dscm corrected to 6% O_2)*

EXAMPLE: *The example is for only one of the sets of measurements. Similar tables should be made for all sets of data.*

7.2 DATA REDUCTION AND SUMMARY

Table 7-1 shows the format to be used to summarize the data.

TABLE 7-1. SUMMARY TABLE FORMAT OF EMISSION DATA

Method/Component	Units	EFB Inlet				EFB Outlet				Press Vents			
		Run 1	Run 2	Run 3	Avg	Run 1	Run 2	Run 3	Avg	Run 1	Run 2	Run 3	Avg
Method 202													
PM	mg/dscm												
CPM	mg/dscm												
Back-up Filter	mg/dscm												
Total	mg/dscm												
Method 25A, HC	ppm C												
Method 25 - A													
TGNMO	ppm C												
Condensibles	ppm C												
Non-condensibles	ppm C												
Method 25 - B													
TGNMO	ppm C												
Condensibles	ppm C												
Non-condensibles	ppm C												
M0011													
Formaldehyde	mg/dscm												
Other aldehydes	mg/dscm												
Ketones	mg/dscm												
Total	mg/dscm												
Method 3													
O_2	%												
CO_2	%												
Method 10, CO	ppm												
Method 7E, NO_X	ppm												
TOC	ppm C												

8.0 PLANT ENTRY AND SAFETY

8.1 SAFETY RESPONSIBILITIES

Identify the following individuals:

- *Person responsible for ensuring compliance with plant entry, health, and safety requirements*
- *Facility person or safety officer who has the authority to impose or waive facility restrictions*
- *Tester who has authority to negotiate with facility person any deviations from the facility restrictions*

EXAMPLE:

8.1 SAFETY RESPONSIBILITIES

The **[Test Director]** is responsible for ensuring compliance with plant entry, health, and safety requirements. The **[Facility Person]** has the authority to impose or waive facility restrictions. The **[Project Director]** has the authority to negotiate with facility person any deviations from the facility restrictions.

8.2 SAFETY PROGRAM

Briefly describe:

- *Test contractor's health and safety program*

EXAMPLE:

8.2 SAFETY PROGRAM

[Contractor] has a comprehensive health and safety program that satisfies Federal OSHA requirements. The basic elements include: (1) written policies and procedures, (2) routine training of employees and supervisors, (3) medical monitoring, (4) use of personal protection equipment, (5) hazard communication, (6) pre-mobilization meetings with **[facility]** personnel and **[contractor]** test team personnel, and (7) routine surveillance of the on-going test work.

8.3 SAFETY REQUIREMENTS

In this section:

- *List the facility's safety requirements and emergency response plan.*
- *Note any deviations from the safety requirements, discussions with the plant, and outcome of the discussions concerning the deviations.*

Requirements may include such items as personnel safety equipment, first aid gear, smoking restrictions, vehicle traffic rules, escorts, entrance and exit locations, required communications during and after business hours, e.g., times when testing crew arrives and leaves site, or evacuation procedure for various alarms.

EXAMPLE:

8.3 SAFETY REQUIREMENTS

All test personnel will adhere to the following standard safety and precautionary measures as follows:

- Confine selves to test area only.
- Wear hard hats at all times on-site, except inside sample recovery trailers and mobile CEM laboratory.
- Wear protective shoes or boots in test area.
- Wear protective glasses or goggles at the EFB inlet and outlet test sites, and other areas as designated.
- Have readily available first aid equipment and fire extinguishers.

Before or on the first day on-site, the **[Test Director]** will fill out the Emergency Response Procedure form (see Figure 8-1) and provide copies to be posted at each test site.

Figure 8-1. On-Site Emergency Response Procedures[*]

Project:______________________________ Date:____________________

Location:_____________________________ By:______________________

Evacuation Signal:____

When it sounds:____
____
____
____

Gather with other test personnel at (location):____________________
____
____

All clear signal: ____
____

First aid station location and phone number:_______________________

Ambulance phone number:____

Fire Department phone number:_______________________________________

Hospital phone number:____

[*] Post or secure at your work station for easy reference in the event of an emergency.

9.0 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE

9.1 TEST SITE ORGANIZATION

In this section:

- *List the key tasks and task leaders.*

EXAMPLE:

9.1 TEST SITE ORGANIZATION

The key tasks and task leaders are:

- Management: **[Name]**
- Test Preparation/Site Restoration: **[Name]**
- Modifications to Facility/Services: **[Name]**
- Sampling Site Accessibility: **[Name]**
- Sample Recovery: **[Name]**
- Daily Sampling Schedule: **[Name]**

9.2 TEST PREPARATIONS

In this section, describe or identify the following:

- *Construction of special sampling and analytical equip-ment*
  - *Description*
  - *Dates for completion of work*
  - *Responsible group*
- *Modifications to the facility, e.g., adding ports, building scaffolding, installing instrumentation, and calibrating and maintaining existing equipment*
  - *Description*
  - *Dates for completion*
  - *Responsible group*
- *Services provided by the facility, such as electrical power, compressed air, and water*
  - *List of all services to be provided by the facility*
  - *Description of modifications or added requirements, if necessary*
- *Access to sampling sites*
  - *Description*
  - *If modifications are required, requirements and responsible group*
- *Sample recovery area*
  - *Description*

- *If a mobile recovery area or laboratory is used, installation location, dates for installation, and responsible group*

EXAMPLE:

9.2 TEST PREPARATIONS

9.2.1 Construction of Special Sampling and Analy-tical Equipment. There are no equipment modifications or special analytical equipment required for this site.

9.2.2 Modifications to Facility. The **[Plant]** crew will install additional 4-inch ID sampling ports as shown in Figures 4-1 and 4-2. In addition, the decking at the outlet stack will be extended to circumvent the stack to allow access to the new sampling port locations. All work will be completed during the scheduled plant shutdowns on July 11 and 25, 1991.

9.2.3 Services Provided by Facility. The **[Plant]** agreed to furnish additional temporary 110 volts, 20 amp power as follows:

• EFB inlet	5 outlets
• EFB outlet stack	5 outlets
• Press vents	2 outlets
• Mobile CEM lab	5 outlets

[Contractor] will provide all other services.

9.2.4 Access to Sampling Sites. There are no special problems or safety issues in gaining access to the testing locations.

9.2.5 Sample Recovery Areas. **[Contractor]** will provide an office trailer (32 ft, 2 foot tongue) and a smaller trailer for sample recovery areas. The office trailer requires a single phase 220 volt power supply for lighting and air conditioning and the smaller trailer requires two 110 volt, 20 amp circuits. The sample recovery task leader will be responsible for locating both sample recovery units in areas as free as possible from ambient dust contamination. The office unit will be used for recovering the M202 and MM5 samples, and the smaller unit will be used for the M0011 (formaldehyde) samples.

9.3 TEST PERSONNEL RESPONSIBILITIES AND DETAILED SCHEDULE

In this section:

- *Describe pre-test activities.*
- *Provide a table that lists staff assignments and responsibilities.*
- *Provide a table or text detailing the test schedule.*

EXAMPLE:

9.3 TEST PERSONNEL RESPONSIBILITIES AND DETAILED SCHEDULE

[Contractor] personnel will arrive at the plant about 1.5 hours before the start of the first test run on each of the two days scheduled for sampling. Pre-test activities on these days will include:

- Meet with the plant contact and the EPA WAM to review the daily test objectives.
- Prepare and set-up (including leak checks) the manual method trains at all test locations.
- Calibrate instrumental analyzers and verify that the data acquisition systems are functioning properly.
- Verify communication links between team members/leaders/plant personnel.

Table 9-1 lists the test personnel and their specific responsibilities. Figure 9-1 and Table 9-2 present a detailed test schedule.

TABLE 9-1. TEST PERSONNEL AND RESPONSIBILITIES

	Staff Assignment	Responsibility
1.	Project Manager/Field Coordinator	Coordinate all test activities. Maintain communications between all test participants, plant personnel, and the EPA Work Assignment Manager. Collect EFB process data
2.	Sampling Location Leader (EFB inlet)	Coordinate and monitor all testing activities at the EFB inlet location. Ensure all field calculations are completed. Prepare and operate the M0011 train.
3.	Sampling Team Leader (EFB inlet)	Prepare and operate the M202 train at the inlet. Record data. Assist in sample recovery as required.
4.	Field Technician (EFB inlet)	Assist in preparation and operation of M202 and M0011 trains as required at EFB inlet location.
5.	Sampling Location Leader (EFB outlet)	Coordinate and monitor all testing activities at outlet stack location. Ensure all field calculations and data are completed. Prepare and operate the MM5 train.
6.	Sampling Team Leader (EFB outlet)	Prepare and operate the M202 train. Record data. Assist in sample recovery as required.
7.	Sampling Team Leader (EFB outlet)	Prepare and operate the M0011 train. Record data. Assist in sample recovery as required.
8.	Sampling Team Leader (EFB outlet)	Prepare and operate VOS train. Record data. Recover VOST samples.
9.	Field Technician (EFB outlet)	Assist in preparation and operation of the MM5, M0011, M202, and VOS trains as required.
10.	Field Technician (EFB outlet)	Assist in preparation and operation of the MM5, M0011, M202, and VOS trains as required.
11.	CEM Inorganics Team (EFB outlet)	Prepare and operate M7E and M10 monitoring systems at EFB outlet stack location. Coordinate with M25A and manual methods testing efforts.
12.	CEM Organics Team (EFB inlet and outlet)	Prepare and operate the M25A monitoring systems at EFB inlet and outlet locations. Coordinate with other CEM and the manual methods testing efforts.
13.	Sampling Location Leader (press vents)	Coordinate testing activities at the press vents. Ensure all field calculations are completed. Prepare and operate the M0011 train.
14.	Field Technician (press vents)	Assist in preparation and operation of M0011 at press vents.
15.	Field Laboratory Team Leader	Coordinate preparation and recovery of sampling trains. Maintain sample chain of custody. Coordinate field repairs.
16.	Field Laboratory Technician	Assist in preparation and recovery of sampling trains and sample inventory.
17.	Process Data Collector (control room)	Record required process parameters at appropriate intervals.

TABLE 9-2. DETAILED TEST SCHEDULE

Crew Member	Activity
Monday, July 29	
1 - 17	Travel to **[City, State]**
1	Contact **[Plant Contact]** EPA Work Assignment Manager, and **[Trade Organization]** representative.
1	Establish communications between the test team, EPA, **[Trade Organization]**, and the plant.
2,3,4	Prepare the inlet sampling location for testing and set-up the equipment. Conduct preliminary measurements.
5,6,7,8,9,10	Prepare the outlet stack sampling location for testing and set-up the equipment. Conduct preliminary measurements.
13,14	Prepare the press vent sampling location for testing and set-up the equipment. Conduct preliminary measurements.
11	Set-up and calibrate the M7E and M10 monitoring equipment at the outlet stack. Warm up and check all monitoring and data acquisition systems for M7E and M10. Coordinate with M25A team leader and manual methods testing team.
12	Set-up and calibrate the monitoring systems for Method 25A at the inlet and outlet stack locations. Coordinate with M7E/M10 team leader and manual methods testing team.
15,16	Set-up the sample recovery areas and inventory all reagents and glassware.
17	Locate points for gathering process data. Establish communications with appropriate plant personnel.
Tuesday, July 30	
SET-UP	
1	Contact **[Plant Contact]** and EPA Work Assignment Manager. Review plant and testing status. Prepare for tests.
2,3,4,5,6,7,8,9, 10,13,14	Perform initial calibrations and daily QC checks. Set-up trains and leak check. Warm-up all equipment and prepare for testing.
11,12	Perform all initial calibrations and QC checks. Check all probe locations, condensers, etc. Verify that the data acquisition system is functioning properly.
15,16	Prepare sampling trains for first run.
17	Prepare to collect process data. Assist others as needed.
TESTING	
2,4	M0011 train - 2 runs at the inlet.
7,9	M0011 train - 2 runs at the outlet.

Table 9-2 (Continued)

13,14	M0011 train - 2 runs at the press vents.
3,4	M202 train - 2 runs at the inlet.
6,9	M202 train - 2 runs at the outlet.
5,10	MM5 train - 2 runs at the outlet.
8,10	VOS train - 2 runs at the outlet.
11,12	Methods 7E, 10, 25A - 2 runs at inlet and outlet.
15,16	Support sampling teams, sample recovery and train preparation. Review paperwork for completeness.
17,1	Collect process data.
1	Coordinate testing effort with plant, EPA, and test personnel. At end of day, secure area and communicate with the plant and the EPA on the testing status.

Wednesday, July 31

Assignments and responsibilities will be the same as for Tuesday, July 30 for the third run. If possible, three additional runs of Method 25 and 25A will be conducted on Wednesday afternoon and Thursday morning. These will involve **[Contractor]** crew members 11,12,17, and 1 and the **[Trade Organization]** staff. The remaining **[Contractor]** staff will pack samples, unneeded equipment, restore the sampling sites, and travel home. If due to testing or plant conditions, the schedule is not completed as planned, Thursday, August 1 will be used as a contingency test day. At the conclusion of the test, there will be a brief informational meeting with the plant and EPA personnel to resolve any questions before the remaining test team members leave the site.

MONDAY July 29, 1991	**TUESDAY** July 30, 1991	**WEDNESDAY** July 31, 1991	**THURSDAY** August 1, 1991
•Travel to site •Establish test team/ Plant communications •Set up test locations •Conduct preliminary measurements •Set up lab for sample recovery	•Complete 2 test runs	•Complete 3rd test run •Pack up all but Methods 25 and 25A equipment •Conduct 2 additional Method 25/25A runs •Collect 2 evacuated cylinder samples •Rest of staff drive home •Afternoon: contingency test day	•Conduct 1 additional Method 25/25A run •Collect 1 evacuated cylinder sample •Restore sites •Remaining staff drive home •Contingency test day

Figure 9-1. Proposed daily test schedule for **[Plant]** test program.