FIELD PROCEDURE 4
Moisture

Note: Use this procedure for accurate determinations of moisture content (such as are needed to calculate emission data).

A. *Preliminaries*

1. Use at least the following number of traverse points and locate them according to Method 1.
   a. 8 for circular <24 in. diameter.
   b. 9 for rectangular <24 in. equivalent diameter.
   c. 12 for all other cases.
2. Place known volumes of water in the first two impingers.
3. Weigh the silica gel to ±0.5 g, and transfer the silica gel to the fourth impinger; alternatively, weigh the silica gel plus impinger.
4. Determine the sampling rate to collect ≥21 scf at ≤0.75 cfm simultaneously with, and for the same total length of time as, the pollutant emission rate run, if appropriate.
5. If gas stream is saturated or laden with moisture droplets, attach a temperature sensor (±2°F) to the probe. **See section E.**

B. *Sampling*

1. Set up the sampling train as shown in Figure F4-1.
2. ***Optional:*** Check the volume metering system (see QCP 5).
3. Turn on the probe heater and (if applicable) the filter heating system to temperatures of about 248°F; allow time for the temperatures to stabilize. Place crushed ice in the ice bath container.
4. ***Optional:*** Leak-check the sampling train from the inlet of the first impinger inlet or, if applicable, the filter holder (see FP 5a, section F).
5. Position the probe tip at the first traverse point. Sample at a constant (±10%) flow rate. Record data as shown in FDS 4.
6. Traverse the cross section, sampling at each traverse point for an equal length of time.
7. Add more ice and, if necessary, salt to maintain ≤68°F at the silica gel outlet.
8. At completion of sampling, disconnect the probe from the filter holder (or from the first impinger).
9. ***Mandatory:*** Leak-check the sampling train as in step B4.

C. *Sample Recovery*

1. Measure the volume of the moisture condensed to the nearest mL.
2. Determine the increase in weight of the silica gel (or silica gel plus impinger) to ±0.5 g. Record data on FDS 4.
3. Calculate the moisture percentage.
4. Verify constant sampling rate.

D. *Post-test Calibrations*

Calibrate metering system, temperature gauges, and barometer (see calibration section). Attach applicable CDS's

E. Saturated or Moisture Droplet-Laden Gases

1. Measure the stack gas temperature at each traverse point. Calculate the average stack gas temperature.
2. Determine the saturation moisture content by (a) using a psychrometric chart and making appropriate corrections if stack pressure is different from that of the chart, or (b) using saturation vapor pressure tables.
3. Use the lower of this value or the value from section C.

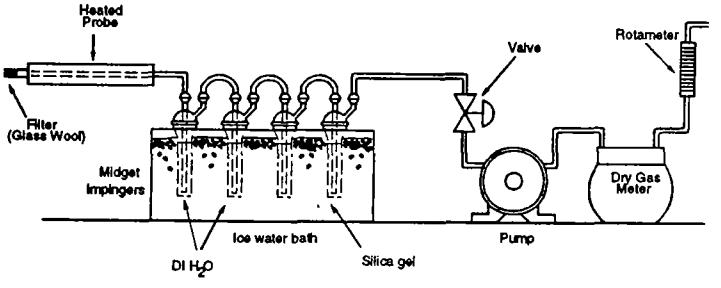

Figure F4-1. Moisture sampling train.

FIELD DATA SHEET 4
Moisture Content (Reference)

Client/Plant Name _____ Job # _____

City/State _____ Date _____

Test Location/Run # _____ Personnel _____

Dry Gas Meter Cal Factor, Y = _____

Trav. Pt.	Samplg Time (min)	Stk Temp (°F)	ΔH (in. H_2O)	Vol. Rdg, V_m (cf)	ΔV (cf)	% Dev *(≤10%?)*	DGM Temp., t_m		Imp. Temp. °F
							In, °F	Out, °F	
				Avg:					

Analytical Data

	Impinger Volume (mL)	Silica gel weight (g)
Final	V_f	W_f
Initial	V_i	W_i
Difference		

$$V_{wc(std)} = 0.04707\ (V_f - V_i)$$

$$V_{wsg(std)} = 0.04715\ (W_f - W_i)$$

$$V_{m(std} = 17.64\ Y\ \frac{V_m\ P_m}{(t_m + 460)}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

QA/QC Check
Completeness ____ Legibility ____ Accuracy ____ Specifications ____ Reasonableness ___

Checked by: _____ _____
Personnel (Signature/Date)
Team Leader (Signature/Date)

FIELD PROCEDURE 4a
Moisture Content (Approximation)

Note: Use this procedure to approximate moisture content to aid in setting isokinetic sampling rates prior to a pollutant emission measurement run.

A. Preliminaries

1. Calibrate metering system according to CP 6.
2. Calibrate the barometer according to CP 2d.

B. Sampling

1. Refer to Figure F4a-1. Place exactly 5 mL water in each impinger.
2. Leak-check the sampling train according to FP 3c, procedure B or C.
3. Connect the probe, insert it into the stack, and sample at a constant rate of 2 L/min until the dry gas meter registers about 1.1 ft^3 or until visible liquid droplets are carried over from the first impinger to the second.
4. Record temperature, pressure, and dry gas meter readings as shown in **FDS 4a.**

C. Sample Recovery

1. After sampling, combine the contents of the two impingers, and measure the volume to the nearest 0.5 ml.
2. Calculate the moisture content **(see FDS 4a).**

D. Alternatives

Use drying tubes, wet bulb-dry bulb techniques, condensation techniques, stoichiometric calculations, previous experience, etc.

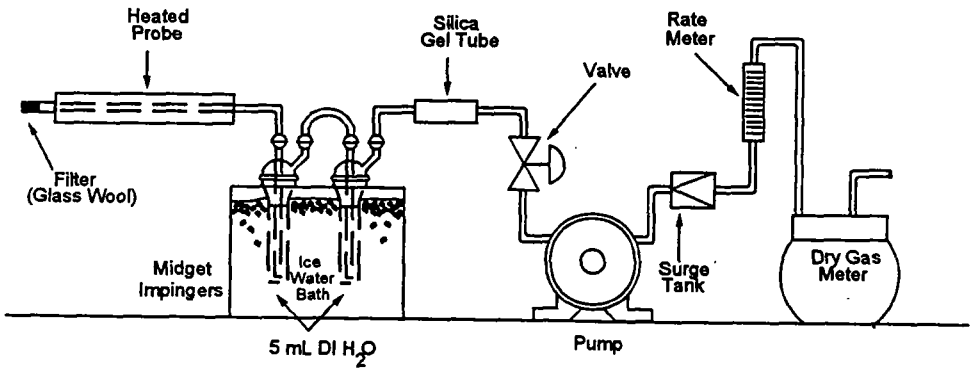

Figure F4a-1. Moisture Sampling Train - Approximate Method.

FIELD DATA SHEET 4a
Moisture Content (Approximate)

Client/Plant Name _____ Job # _____

City/State _____ Date _____

Test Location/Run # _____ Personnel _____

Dry Gas Meter Cal Factor, Y = _____ Bar. Pressure, P_b (P_m) _____ in. Hg

Initial Volume H_2O, V_i = _____ mL Final Volume H_2O, V_f _____ mL

Clock Time	Gas Meter Volume V_m (cf)	Rate Meter Setting Q (cfm)	Meter Temp, t_m (°F)

$$V_{wc} = 0.04707\ (V_f - V_i)$$

$$V_{m(std)} = 17.64\ Y\ \frac{V_m\ P_m}{(t_m + 460)}$$

$$B_{ws} = \frac{V_{wc}}{V_{mc} + V_{m(std)}} + 0.025$$

QA/QC Check
Completeness ____ Legibility ____ Accuracy ____ Specifications ____ Reasonableness ____

Checked by: _____ _____
Personnel (Signature/Date) Team Leader (Signature/Date)