

Source Test Procedure **ST-1B**

**AMMONIA
INTEGRATED SAMPLING**

(Adopted January 20, 1982)

REF: Regulation 7-303

1. APPLICABILITY

- 1.1 This method is used to quantify emissions of ammonia. It determines compliance with Regulation 7-303.

2. PRINCIPLE

- 2.1 Sample gas is drawn through a solution of 0.1 normal (0.1N) hydrochloric acid which absorbs the ammonia. The ammonia is then analyzed according to Analytical Procedure Lab-1.

3. RANGE

- 3.1 The minimum measurable concentration of ammonia is 1 ppm at the sample volume specified in this procedure.
- 3.2 Elevated concentrations of ammonia may be determined by increasing the concentration of the absorbing reagent, hydrochloric acid solution. The concentration of reagent to be used may be determined by stoichiometry, allowing a 50% excess.

4. INTERFERENCE

None Known.

5. APPARATUS

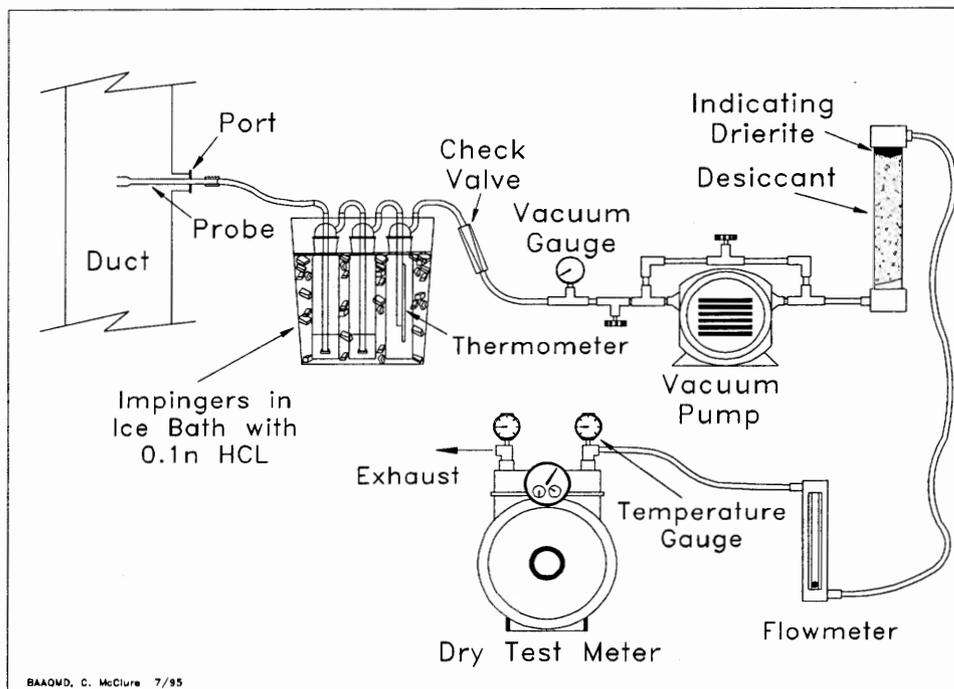
- 5.1 Probe. The probe is constructed of borosilicate glass tubing fitted with a glass wool filter in the nozzle.
- 5.2 Condensers. Use three Greenberg-Smith impingers as adsorber/condensers. The final impinger has a thermometer attached to the inlet stem.
- 5.3 Cooling System. Use an ice bath to contain the impingers.
- 5.4 Sample Pump. Use a leak-free vacuum pump capable of maintaining a 14.3 liter/min (0.5 CFM) flow rate at 15 inches of mercury. The pump must have a flow control valve and vacuum gauge attached to the inlet.
- 5.5 Silica Gel Tube. Use approximately 500cc of silica gel (with a Drierite indicator) to insure that the gas entering the dry test meter is dry.
- 5.6 Dry Test Meter. Use a dry gas test meter accurate within $\pm 2\%$ of the true volume and equipped with a thermometer to measure the outlet temperature.

- 5.7 Connections. Use Teflon tubing in making all connections that come in contact with the sample. Vinyl tubing is acceptable for all other connections.
- 5.8 Barometer. Use a barometer that is accurate to within ± 0.2 inches of mercury.
- 5.9 Rotameter. Use a calibrated rotameter to measure the sampling rate.

6. REAGENTS

- 6.1 Hydrochloric acid, 0.1N. Dissolve 7.30 ml concentrated HCl in sufficient water to make a 1.0 liter solution.

Figure 1B-1
Ammonia Sampling Train



7. PRE-TEST PROCEDURES

- 7.1 Add 100ml of the HCl solution to each of two impingers.
- 7.2 Stopper the impingers.
- 7.3 Retain 100 ml of the HCl solution to analyze as a blank.
- 7.4 Assemble the sampling train as shown in Figure 1B-1.
- 7.5 Leak-test the sampling train by starting the pump, plugging the probe, and adjusting the pump inlet vacuum to 10 inches Hg. The leak rate must not exceed 0.6 liter/min (0.02 CFM) through the dry test meter. Before stopping the pump, carefully release the plug in the sample probe to avoid backflow of the impinger solution.

- 7.6 Record the initial dry test meter reading and barometric pressure on the sampling data sheet, Form 1B-1.
- 7.7 If there is evidence of concentration stratification, select the sampling traverse points according to ST-18. Otherwise, sample at a single point.

8. SAMPLING

- 8.1 Each test run shall be of thirty minute duration when testing emissions from continuous operations. Each test run at batch process operation shall be for 90% of the batch time or thirty minutes, whichever is less.
- 8.2 Position the probe at the sampling point and start the pump.
- 8.3 Sample at a constant rate of 14.3 liter/min (0.5 CFM) during the test as determined by the rotameter. Use the rotameter only to establish the initial sampling rate. Then remove it from the system.
- 8.4 Record the following information at five-minute intervals.

Dry test meter temperature
Impinger outlet temperature
Dry test meter volume

- 8.5 Add ice as necessary to maintain impinger temperature at 7 °C (45°F) or less.
- 8.6 At the conclusion of each run, stop the pump, remove the probe from the stack, record the final meter reading. Point the probe upward and purge the sample train with ambient air.
- 8.7 Take three consecutive samples.

9. POST-TEST PROCEDURES

- 9.1 Stopper the impingers until they are analyzed.
- 9.2 Individually analyze the hydrochloric acid solutions and blank for total ammonia content according to Analytical Procedure Lab-1.

10. CALCULATIONS

- 10.1 Standard sample volume:

$$V_o = \frac{(17.71)V_m P_b}{T_m}$$

Where:

- V_o = Corrected sample volume, SDCF at 70 °F and 29.92 inches Hg.
- V_m = Uncorrected meter volume, ft³
- T_m = Average run meter temperature, °R
- P_b = Barometric pressure, inches Hg.
- 17.71 = A constant correcting to 70 °F and 29.92 inches Hg

10.2 Ammonia Concentration:

$$C = \frac{5.02 \times 10^4 W}{V_0}$$

Where:

C = Ammonia concentration, ppm by volume on a dry basis

W = Total weight of ammonia in the impinger catch, for each run, grams

5.02×10^4 = A constant derived from the molecular weight and correcting to 70°F and 29.92 inches Hg

11. REPORTING

11.1 Report the data indicated on Form 1B-2.

Form 1B-2

Distribution: Firm Permit Services Enforcement Services Technical Services Planning Requester DAPCO	BAY AREA AIR QUALITY MANAGEMENT DISTRICT 939 Ellis Street San Francisco, California 94109 (415) 771-6000 Summary of Source Test Results	Report No.: _____ Test Date: _____ Test Times: Run A: _____ Run B: _____ Run C: _____
Source Information		BAAQMD Representatives
Firm Name and Address	Firm Representative and Title	Source Test Engineers
	Phone No. ()	
Permit Conditions:	Source:	Permit Services Division/Enforcement Division
	Plant No. Permit No. Operates Hr/Day & Day/Yr.	Test Requested By:
Operating Parameters		
Applicable Regulations:		VN Recommended:

Source Test Results and Comments:

<u>METHOD</u> <u>TEST</u>	<u>RUN A</u>	<u>RUN B</u>	<u>RUN C</u>	<u>AVERAGE</u>	<u>LIMIT</u>
ST-1B Ammonia, ppmv					

Air Quality Engineer II	Date	Supervising Air Quality Engineer	Date	Approved by Air Quality Engineering Manager
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