

Source Test Procedure **ST-31**

PERCHLOROETHYLENE

REF: Regulation 8-27-302

1. APPLICABILITY

1.1 This procedure is used to quantify emissions of perchloroethylene. It is applicable to the determination of compliance with Regulation 8-27-302.

2. PRINCIPLE

2.1 A continuous representative gas sample is extracted from the sampling point and conditioned to remove water and particulate material. The perchloroethylene concentration is determined by passing a small portion of the sample through a flame ionization detector (FID).

3. RANGE AND SENSITIVITY

3.1 The range of measurable concentrations of perchloroethylene should be 1 ppm to 1%.

3.2 The minimum sensitivity of the FID shall be 2% of full scale.

4. INTERFERENCES

4.1 All other hydrocarbons cause a response on the FID.

5. APPARATUS

5.1 Flame ionization detector.

5.2 Chart recorder. The recorder monitors and records the continuous output from the analyzer.

5.3 Sample conditioning, zero air, and span gas system. The assembly of this system is shown in Figure 31-1. The sample conditioning system provides a dry, particulate-free gas flow to the instrument. The zero air system provides clean dry atmospheric air for instrument calibration. The span gas system provides a known concentration of perchloroethylene for use in calibrating the analyzer. Except as specified, all materials which come in contact with either the sample or span contacting surfaces must be constructed of Teflon or stainless steel.

5.4 Sample probe. Use a tube of inert material and sufficient length to traverse the stack being tested.

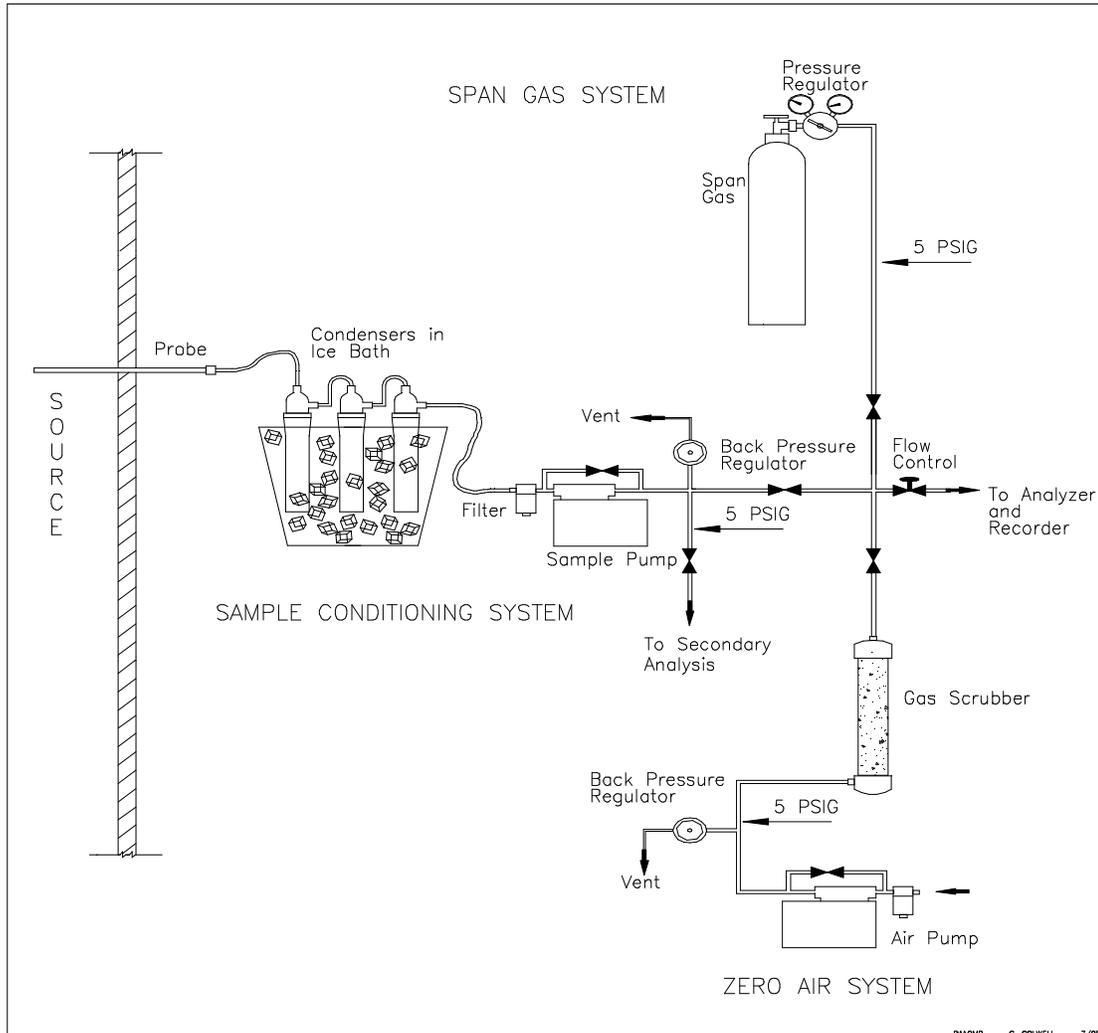
5.5 Condensers. Use modified Greenberg-Smith impingers with the impaction plates removed and the inlet tube shortened to a length of 10 cm (4 inches).

5.7 Particulate filter. Use a Balston type 95 holder with grade B filter, or equivalent, in the sample system.

- 5.8 Pumps. Use leak-free, Teflon-lined, diaphragm pumps in the sample and zero air system. The pumps must have a capacity of at least 28 liters/min (1.0 CFM).
- 5.9 Back-pressure regulator. Use a back-pressure regulator to maintain the sample and zero gas sample pressures to the instrument between 1 and 5 psig.
- 5.10 Gas scrubber. Use a bed of silica gel, Ascarite (or soda-lime), and charcoal to remove moisture, carbon dioxide, and hydrocarbons from the zero air system.
- 5.11 Span gas. Use a high-pressure cylinder containing a known concentration of perchloroethylene in air or nitrogen. The span gas concentration shall be in the same range as the source being tested.

Figure 31-1

Sample Conditioning, Zero Air, and Span Gas Systems



6. PRE-TEST PROCEDURES

- 6.1 Warm-up the instrument according to the manufacturer's instructions.
- 6.2 Assemble the sampling system as shown in Figure 31-1.
- 6.3 Leak-test the sampling system by starting the pump, plugging the probe, and determining that the pressure to the analyzer falls to zero. Other leak-tests are acceptable subject to the approval of the Source Test Section.
- 6.4 Introduce zero air into the analyzer and zero the instrument according to the manufacturer's instructions.
- 6.5 Introduce span gas into the analyzer and calibrate the instrument according to the manufacturer's instructions.
- 6.6 Conduct a preliminary concentration traverse (according to ST-18) to determine if stratification of the stack gases exists. If the perchloroethylene concentration at any point differs from the average concentration by more than 10% traverse the stack during the test. If not, sample at any single point.
- 6.7 Set-up the chart recorder according to manufacturer's instructions.

7. SAMPLING

- 7.1 Each test shall be for entire drying cycle.
- 7.2 Introduce sample gas into the analyzer at the same flow rate used to calibrate the analyzer.
- 7.3 Calibrate the analyzer before and after each test run. Record each step of the process clearly on the chart recording.
- 7.4 Conduct three consecutive runs.

8. AUXILLARY TEST

- 8.1 Stack gas flowrate. Use ST-17 to determine the stack gas flowrate.

9. CALCULATIONS

- 9.1 From the chart recording determine the time-averaged concentration of perchloroethylene on a dry basis for each run.
- 9.2 Mass flowrate of perchloroethylene:

$$M = \frac{166 \times Q_o \times C_{perc} \times 60}{387 \times 10^6}$$

where:

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|-------------------|---|--|
| M | = | Perchloroethylene mass emission rate, lb/hr |
| Q _o | = | Stack gas flowrate, SDCFM |
| C _{perc} | = | Average concentration of perchloroethylene, ppm. |
| 166 | = | Molecular weight of perchloroethylene, lb/lb-mole |
| 387 | = | Standard molar constant, ft ³ / lb-mole |
| 10 ⁶ | = | Conversion to parts per million |

9.3 The abatement efficiency of perchloroethylene by a control device:

$$E = \frac{Min - Mout}{Min} \times 100\%$$

10. REPORTING

10.1 Results shall be reported as shown in Figure 31-2.

