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## **METHOD 2C - DETERMINATION OF GAS VELOCITY AND VOLUMETRIC FLOW RATE IN SMALL STACKS OR DUCTS (STANDARD PITOT TUBE)**

Note: This method does not include all of the specifications (e.g., equipment and supplies) and procedures (e.g., sampling) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should also have a thorough knowledge of at least the following additional test methods: Method 1, Method 2.

### *1.0 Scope and Application*

1.1 This method is applicable for the determination of average velocity and volumetric flow rate of gas streams in small stacks or ducts. Limits on the applicability of this method are identical to those set forth in Method 2, Section 1.0, except that this method is limited to stationary source stacks or ducts less than about 0.30 meter (12 in.) in diameter, or 0.071 m<sup>2</sup> (113 in.<sup>2</sup>) in cross-sectional area, but equal to or greater than about 0.10 meter (4 in.) in diameter, or 0.0081 m<sup>2</sup> (12.57 in.<sup>2</sup>) in cross-sectional area.

1.2 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

### *2.0 Summary of Method*

2.1 The average gas velocity in a stack or duct is determined from the gas density and from measurement of velocity heads with a standard pitot tube.

### *3.0 Definitions[Reserved]*

### *4.0 Interferences[Reserved]*

### *5.0 Safety*

5.1 This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

### *6.0 Equipment and Supplies*

Same as Method 2, Section 6.0, with the exception of the following:

6.1 Standard Pitot Tube (instead of Type S). A standard pitot tube which meets the specifications of Section 6.7 of Method 2. Use a coefficient of 0.99 unless it is calibrated against another standard pitot tube with a NIST-traceable coefficient (see Section 10.2 of Method 2).

6.2 Alternative Pitot Tube. A modified hemispherical-nosed pitot tube (see Figure 2C–1), which features a shortened stem and enlarged impact and static pressure holes. Use a coefficient of 0.99 unless it is calibrated as mentioned in Section 6.1 above. This pitot tube is useful in particulate liquid droplet-laden gas streams when a “back purge” is ineffective.

### 7.0 Reagents and Standards[Reserved]

### 8.0 Sample Collection and Analysis

8.1 Follow the general procedures in Section 8.0 of Method 2, except conduct the measurements at the traverse points specified in Method 1A. The static and impact pressure holes of standard pitot tubes are susceptible to plugging in particulate-laden gas streams. Therefore, adequate proof that the openings of the pitot tube have not plugged during the traverse period must be furnished; this can be done by taking the velocity head ( $\Delta p$ ) heading at the final traverse point, cleaning out the impact and static holes of the standard pitot tube by “back-purging” with pressurized air, and then taking another  $\Delta p$  reading. If the  $\Delta p$  readings made before and after the air purge are the same (within  $\pm 5$  percent) the traverse is acceptable. Otherwise, reject the run. Note that if the  $\Delta p$  at the final traverse point is unsuitably low, another point may be selected. If “back purging” at regular intervals is part of the procedure, then take comparative  $\Delta p$  readings, as above, for the last two back purges at which suitably high  $\Delta p$  readings are observed.

### 9.0 Quality Control

Section	Quality control measure	Effect
10.0	Sampling equipment calibration	Ensure accurate measurement of stack gas velocity head.

### 10.0 Calibration and Standardization

Same as Method 2, Sections 10.2 through 10.4.

### 11.0 Analytical Procedure

Sample collection and analysis are concurrent for this method (see Section 8.0).

### 12.0 Calculations and Data Analysis

Same as Method 2, Section 12.0.

### 13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

Same as Method 2, Section 16.0.

17.0 Tables, Diagrams, Flowcharts, and Validation Data

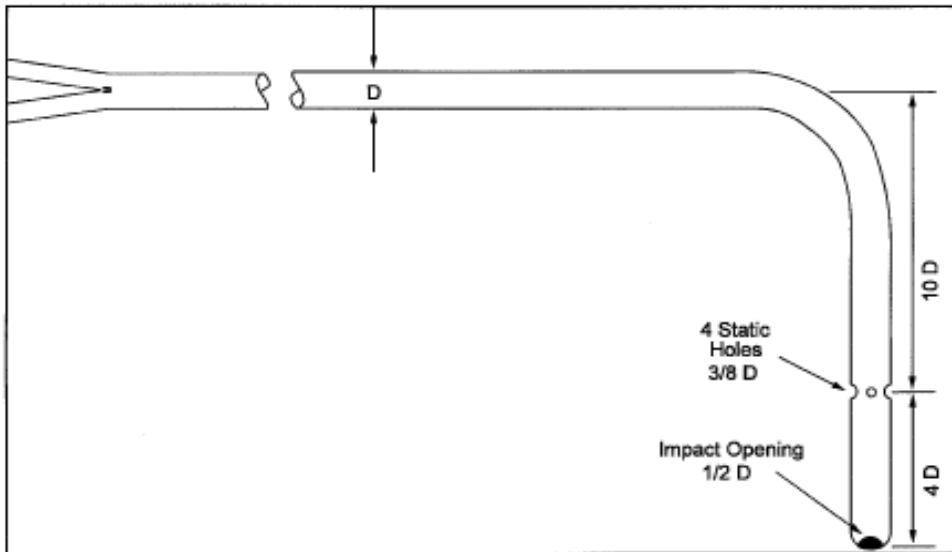


Figure 2C-1. Modified Hemispherical-Nosed Pitot Tube.