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**EMISSION MEASUREMENT CENTER  
TECHNICAL INFORMATION DOCUMENT**

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**QUADRUPPLICATE SAMPLING PROBE ARRANGEMENT**

**APPLICABILITY**

Stack test method development activities often call for the use of quadruplicate sampling trains in precision and accuracy determinations. The use of quadruple sampling systems will increase as Method 301 of 40 CFR Part 63 is used for the field validation of stack testing methods.

**DESCRIPTION**

Method 301 provides criteria for the quadruple sampling probe tip arrangement. An example is shown in Figure 1. The two primary considerations in the arrangement of the sampling probe tips are: (1) the inlets to the probes shall be in the same plane perpendicular to the gas stream flow; (2) the probe tip openings and of the quadruplicate trains are exposed to the same conditions, i.e., the opportunities to obtain samples from the target population are equal. For example, under isokinetic sampling, if the difference in gas stream flow is greater than 5 percent from one probe tip location to the other, the collection opportunities (or same conditions) are not equal for each sampling train and the probe tip arrangement should be reviewed.

Method 301 states that, the sampling probe tips of the quadruplicate trains shall be in a 6.0 cm x 6.0 cm square measured from the inside edge of each probe tip with the flow measuring device (pitot tube) located in the center. We believe this arrangement will be optimal for most testing situations. The arrangement may require modification depending upon the differences in the flow at the individual probe tips. The ratio of the square area of the quadruple probe tip arrangement to the area of the stack or duct being tested should be evaluated prior to testing. The following guidelines have been used by the Environmental Protection Agency:

- ! If the square area encompassed by the probe tip arrangement is less than 5 percent of the stack or duct cross-sectional area, the flow at the probe tips can be considered similar.
  
- ! For the testing situation where the probe tip arrangement square area is greater than 5 percent of the stack or duct cross-sectional area, an evaluation of the flow at each probe tips should be conducted to establish the flow at the individual probe tips in order to set appropriate sampling rates.

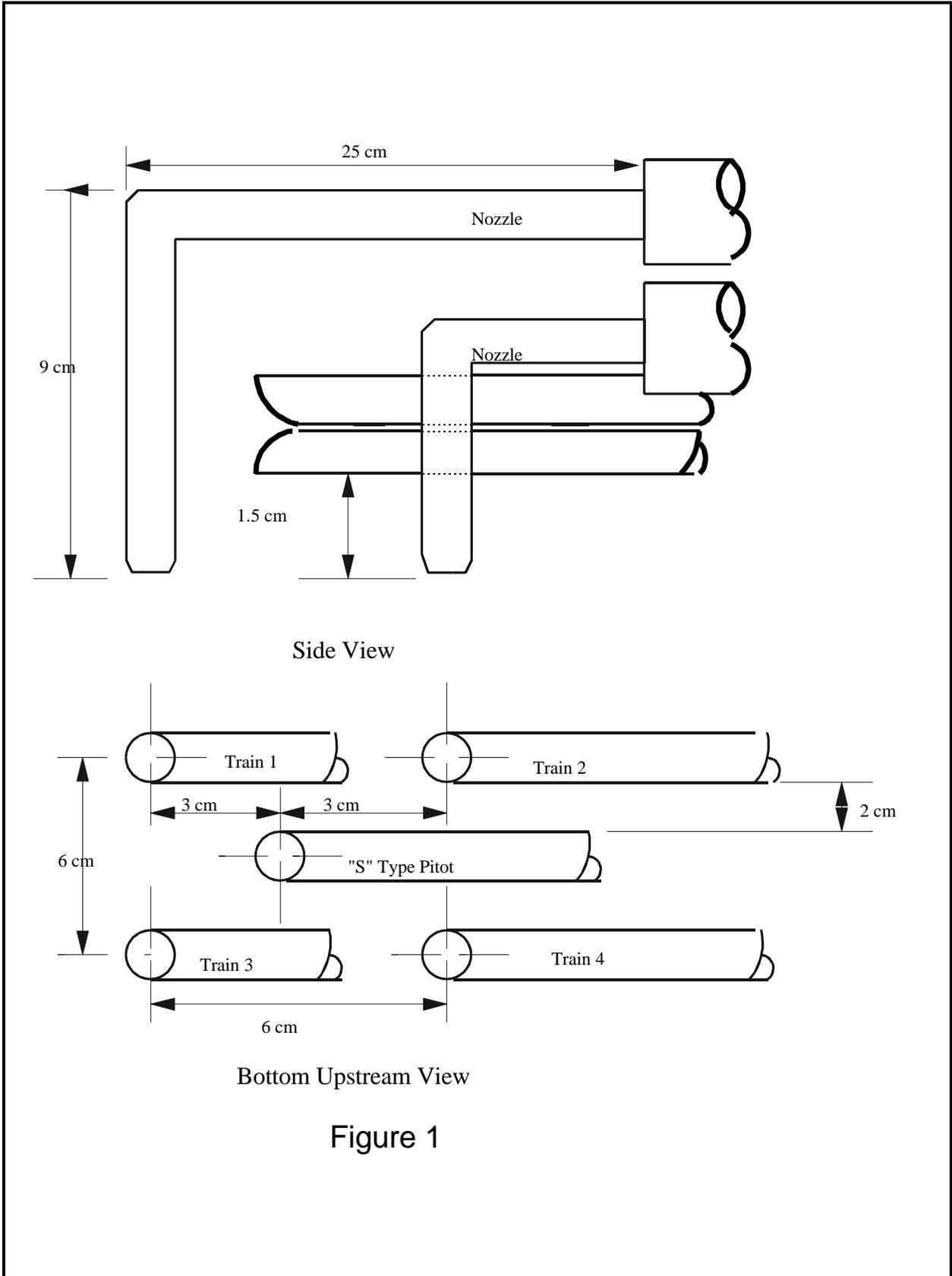


Figure 1

**SUMMARY**

For quadruple probe arrangements under isokenetic testing restrictions, the arrangement of the probe tips shall be in the same plane perpendicular to the flow. When the square area of the quadruple probe arrangement is equal to or greater than 5 percent of the duct or stack cross-sectional area, gas flow velocities should be checked at the individual probe tips.

**REFERENCE**

1. Mitchell, William J., Midgett, M. Rodney, Means to Evaluate Performance of Stationary Source Test Methods, Environmental Science and Technology, Vol. 10, Page 85, January 1976.