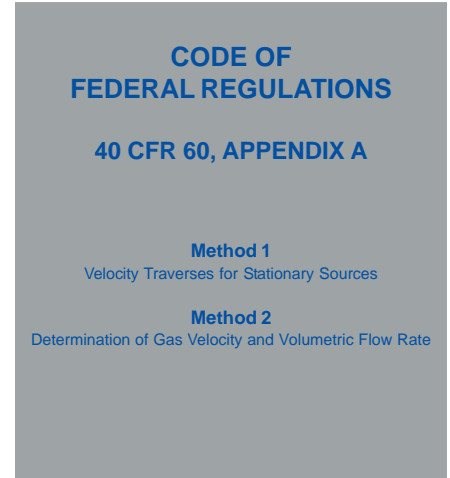
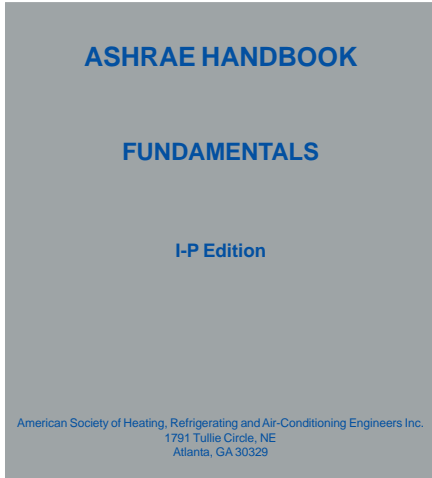


STANDARDS

Velocity Traverse of Air Ducts



These Standards, and others, provide formats for the quantity and positioning of individual velocity measurements. Simply stated, these long established Standards recognize that the accuracy of any duct velocity traverse is highly dependent upon the quantity and location of the flow measuring points in a duct (or stack) cross-section. Listed below is a summary table of the duct traverse formats set forth in the above Standards. In addition, for your referral, we have reproduced portions of the text of the referenced Standards.

Duct / Station Configuration	ASHRAE HANDBOOK	AMCA PUBLICATION 203	CODE OF FEDERAL REGULATIONS
Rectangular	25 or more points, maximum 6 or 8 inches apart, depending on duct size	24 or more points, no less than 1 point per 3 square feet	9 to 16 minimum, depending on distance to flow disturbances
Circular	12 to 30 points, along 2 or 3 diameters	24 to 48 points, along 3 diameters	8 to 16 minimum, along 2 diameters, depending on distance to flow disturbances

ASHRAE HANDBOOK – FUNDAMENTALS

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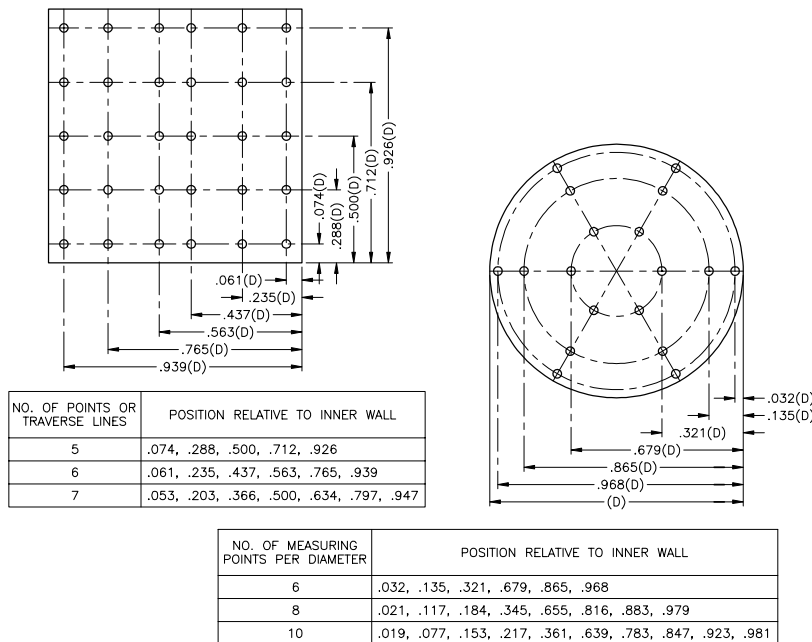
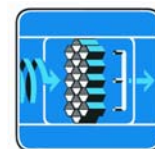


Figure 6 – Measuring Points for Round and Rectangular Duct Traverse

To determine the velocity in the traverse plane, a straight average of individual point velocities will give satisfactory results when point velocities are determined by the log-Tchebycheff rule (ISO 3966). Figure 6 shows suggested sensor locations for traversing round and rectangular ducts. For circular ducts, the log-Tchebycheff and log-linear traverse methods are similar. Log-Tchebycheff is now recommended for rectangular ducts as well. It minimizes the positive error (measured greater than actual) caused by the failure to account for losses at the duct wall. This error can occur when using the older method of equal subareas to traverse rectangular ducts.

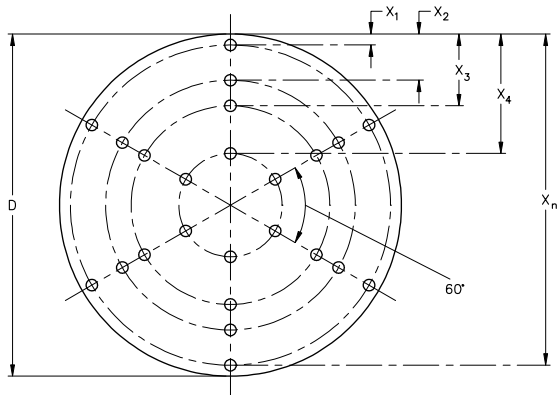
For a rectangular duct traverse, a minimum of 25 points should be measured. For a duct side less than 18 inches, locate the points at the center of equal areas not more than 6 inches apart, and use a minimum of 2 points per side. For a duct side greater than 56 inches, the maximum distance between points is 8 inches. For a circular duct traverse, the log-linear rule and three symmetrically disposed diameters may be used. Points on two perpendicular diameters may be used where access is limited.



FIELD PERFORMANCE MEASUREMENTS – PUBLICATION 203

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Appendix H – Distribution of Traverse Points

In order to obtain a representative average velocity in a duct, it is necessary to locate each traverse point accurately. It is recommended that the number of traverse points increase with increasing duct size. The distribution of traverse points for circular ducts, as indicated below, are based on log-linear Pitot traverse method.



$X_a = D \times K_a$
where D is the inside diameter of the duct and K_a is the factor corresponding to the duct size and the traverse point location as indicated in the table below.

Inside Dia of Duct	# of Traverse Pts in Each of 3 Dia	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}	K_{15}	K_{16}
< 8 ft	8	.021	.117	.184	.345	.655	.816	.883	.978	-	-	-	-	-	-	-	-
8-12 ft	12	.014	.075	.114	.183	.241	.374	.626	.750	.817	.886	.925	.986	-	-	-	-
>12 ft	16	.010	.055	.082	.128	.166	.225	.276	.391	.609	.724	.775	.834	.872	.918	.945	.990

Figure H-1. Distribution of Traverse Points for Circular Ducts

The recommended minimum number of traverse points for rectangular ducts is indicated below in Figure H-3. For rectangular ducts with cross-sectional areas of 24 square feet and less, the recommended minimum number is 24. For cross-sectional areas greater than 24 square feet, the minimum number of points increases as indicated in Figure H-3. The points are to be located in the centers of equal areas with the areas as nearly square as practical (see Figure H-2). If the flow conditions at the traverse plane are less than satisfactory, the accuracy of the determination of flow rate may be improved by using more than the recommended minimum number of points. Fewer points may be used if the flow is very uniform; however, the maximum area covered per point should not exceed 3 square feet.

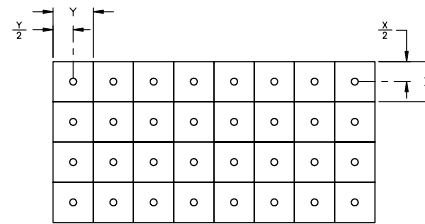


Figure H-2. Distribution of Traverse Points for Rectangular Duct

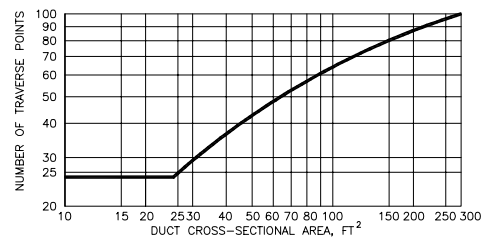


Figure H-3. Recommended Minimum Number of Traverse Points for Rectangular Ducts

CODE OF FEDERAL REGULATIONS – 40CFR60 Appendix A, Methods 1 and 2

Method 1 – Velocity Traverses for Stationary Sources
Method 2 – Determination of Gas Velocity and Volumetric Flow Rate

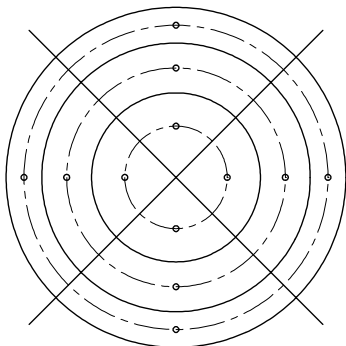


Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

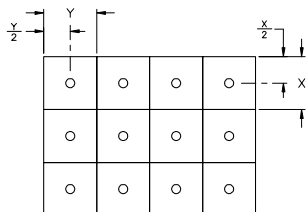


Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

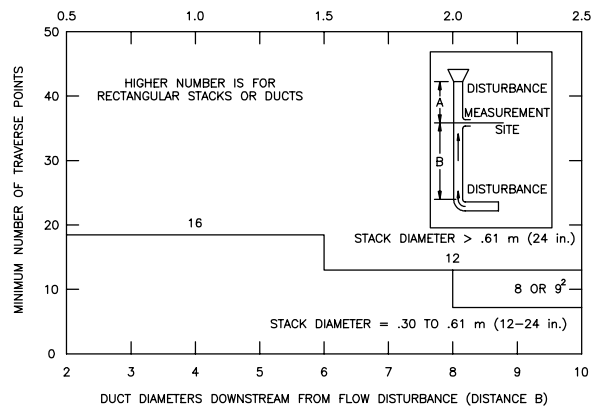


Figure 1-2. Minimum number of traverse points for velocity (non-particulate) traverses.

