

MEMO

Subject: Anemometer

Notes:

Please be sure to also review the manufacturer’s instructions when conducting the measurements below. Ensure the correct units are used for your particular device.

Variables and Measurements:

The only way to assess airflow is to measure it. There are four variables that must be measured or calculated:

1. V – The volume of the room (i.e. Length*Width*Height)
2. Q – The rate of air flow (using the anemometer)
3. R – The radius of a round air duct or window
4. Y – The cross-sectional area of the window, door, or air duct

Units:

Note: All calculations must use either imperial or metric units consistently. You cannot, for example, measure the room in cubic meters and the air flow in feet/min.

The variables above should utilize the following units:

Variable	Imperial unit	Metric unit
V	Cubic feet (ft ³)	Cubic meters (m ³)
Q	Feet per min (ft/min)	Meters per sec (m/sec)
R	Feet (ft)	Meter (m)
Y	Square feet (ft ²)	Square meters (m ²)

Formulas:

In order to calculate Y, the cross-sectional area of the window, door, or air duct, use the following equations:

For a round duct or window:

$$Y = \pi * R^2$$

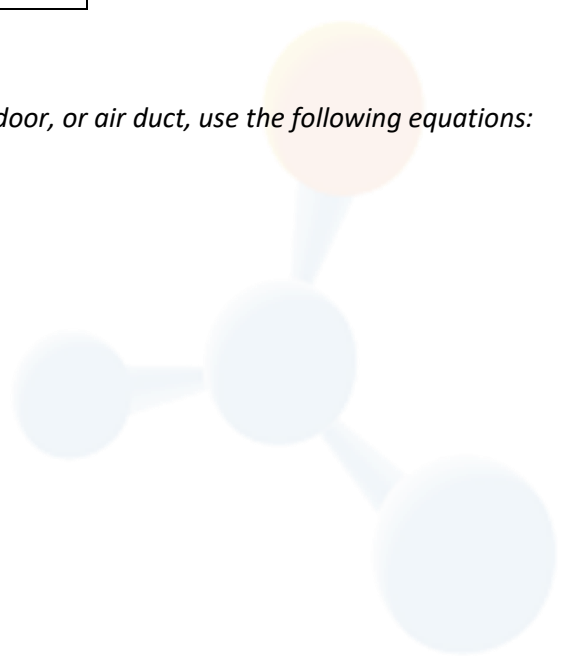
Where $\pi = 3.14159$

For a square or rectangular duct, window, or door:

$$Y = L * W$$

Where L = length

W = width



Once you have calculated Y , you should be able to calculate the amount of air flow through a single window, door, or air duct in cubic feet per minute (ft^3/min) or cubic meters per second (m^3/sec). This measurement is called CFM.

To calculate CFM, use the following formula:

$$\text{CFM} = Q * Y$$

Once you have calculated CFM, you should be able to calculate the air changes per hour for the entire room (ACH).

If you calculated CFM in ft^3/min , use the following formula to calculate ACH:

$$\text{ACH} = \frac{60 * \text{CFM}}{V}$$

If you calculated CFM in m^3/sec , use the following formula to calculate ACH:

$$\text{ACH} = \frac{3600 * \text{CFM}}{V}$$

If a room has multiple windows, doors, or air ducts, you can add their individual CFMs to the numerator of the equation as such:

$$\text{ACH} = \frac{60 * (\text{CFM1} + \text{CFM2})}{V}$$

Higher ACH values correspond to better ventilation.

Sample Calculation:

$$V = 10\text{ft} * 8\text{ft} * 8\text{ft} = 640\text{ft}^3$$

$$Q = 100\text{ft}/\text{min} \text{ out of a circular duct}$$

$$R = 2\text{ft}$$

$$Y = 3.14159 * (2\text{ft})^2 = 12.57 \text{ft}^2$$

$$\text{CFM} = 100\text{ft}/\text{min} * 12.57\text{ft}^2 = 1257\text{ft}^3/\text{min}$$

$$\text{ACH} = \frac{60 * 1257\text{ft}^3/\text{min}}{640\text{ft}^3} = 1.96 \text{ACH}$$

