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:

$$\mathbf{Y = \pi * R^2}$$

Where $\pi = 3.14159$

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

$$\mathbf{Y = L * W}$$

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:

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:

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

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

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

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

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

Higher ACH values correspond to better ventilation.

Sample Calculation:

$V = 10ft * 8ft * 8ft = 640ft^3$

$Q = 100ft/min$ out of a circular duct

$R = 2ft$

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

$CFM = 100ft/min * 12.56ft^2 = 1257ft^3/min$

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