TELAIRE®

Application Note

Demand Control Ventilation Q&A

How many sensors are required in a typical installation? Where should they be located?

The number of zones with different occupancy patterns should dictate the number of sensors. In a small office application for example, it would be ideal to have a sensor in the office space and one in the conference area. Carbon dioxide distribution in a space is influenced by the same factors that influence temperature distribution. These factors include convection, diffusion and mechanical air movement. Much like temperature sensors, placement of CO_2 sensors should be based on the zone to be controlled and anticipated loads (e.g. common occupancy density and patterns). For optimum control, there should be a CO_2 sensor placed in every location where temperature controls are used. If an HVAC system is serving a series of zones with similar occupancy patterns, sensors placed in the return air ducting may be appropriate.

Should we use duct or wall mounted sensors?

This will depend on how critical response time and measurement accuracy is to the application. Wall mounted sensors may have a slightly higher installation cost (due to longer wire runs) but will provide readings closest to actual zone conditions. A duct mounted sensor may be averaging concentrations from several zones and have a slower response time to occupancy changes.

Can we data-log the CO_2 level?

Telaire's 8000 series CO_2 sensor has dual outputs (a 0-10 Volt and 4-20 mA). The 0-10 Volts is wired to the economizer controller and the 4-20 mA current loop could be used for data-logging through a DDC system or other data-logger.

Is CO_2 control accepted by ASHRAE-62?

CO_2 control is officially accepted by ASHRAE. An interpretation (IC 62-1989-27) has passed which clarifies its use to modulate ventilation based on actual versus design occupancy. Call Telaire at 800-472-6075 for a copy of this interpretation.

How does this effect a building with a .3 cfm/sq. ft. requirement (i.e. retail space)?

CO_2 control can be implemented in buildings with a .3 cfm per square foot requirement. The .3 cfm/sq. ft requirement is intended to address two types of contaminants in retail spaces: namely occupancy and merchandise related contaminants. CO_2 control can be implemented to modulate the portion of ventilation intended to dilute for contaminants from people in the space while still providing ventilation to dilute contaminants created by retail merchandise. The general concepts of ventilation control still apply. Ventilation will be modulated based on occupancy with a base ventilation rate. However, in this case, the base ventilation rate will be higher to ensure that source contaminants are sufficiently diluted. This base ventilation rate is typically 50% of the .3 cfm/sq.ft. design. Several large retail chains are successfully employing this method.

What is ventilation control?

Ventilation control is a method of ventilation control, which uses carbon dioxide (CO_2) as an indication of occupancy. By ventilating "on demand" and following actual occupancy patterns versus fixed ventilation rates you can meet outside air requirements at all times while minimizing energy costs.

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Is CO_2 a measure of IAQ?

ASHRAE 62-1989 states “Indoor Air Quality shall be considered acceptable if the required rates of acceptable outdoor air in Table 2 are provided for the occupied space.” CO_2 is not a direct measure of IAQ. It is an excellent measure of effective ventilation (mechanical ventilation plus infiltration). The higher the CO_2 concentration the lower the ventilation. When indoor CO_2 levels are very high (above 1800 ppm), ventilation is low (below 7 cfm/person) and other contaminants can build up, causing irritation and discomfort.

What is a good CO_2 level?

There is no single ‘good’ CO_2 level. CO_2 is not directly harmful unless concentrations get very high (i.e. above 15,000 ppm). An appropriate indoor CO_2 level is determined based on the ventilation requirements established by ASHRAE and the outside CO_2 levels. It is the difference of these two values which correlates to the ventilation rate. Take for example an indoor level of 1100 ppm (measured while occupancy is steady). Assuming an outside level of 400 ppm the difference between indoor and outdoor levels is 700 ppm. This equates to 15 cfm per person. For more information on this conversion or additional examples use the Telaire Ventilation calculator.

How do you Calibrate the sensor?

Sensor calibration is very easy. It is quickly accomplished by flowing a nitrogen gas to the sensor using a calibration kit available from Telaire. Depending on the model of sensor, either a computer interface or push button on the sensor is used to re-zero it.

How does the economizer work with CO_2 control?

Economizer control is not effected by CO_2 control. Many economizer controllers will override the demand controlled system if free cooling is available during periods of low occupancy.

What are the energy savings versus no control at all? What is the payback?

Typical energy savings range from $0.10 to $0.50 per square foot depending on ventilation requirements, weather, local utility rates, and occupancy patterns in the application. This typically translates to a payback of 6 months to 2 years. This payback varies based on the number of sensors and the cost of installation.

What are the maintenance requirements?

Telaire CO_2 sensors have calibration intervals of only once every 5 years. Checking the sensor and system annually during normal maintenance inspections is also recommended.

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