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Application Note

CO2-based Ventilation Control Where Required and Recommended

Ventilation is an important part of maintaining a comfortable, healthy, productive environment for students and faculty. Improper ventilation can have a negative impact on occupant health and performance, increase the risk from litigation, and/or waste energy.

Numerous organizations now require and/or recommend CO_2-based ventilation control in different commercial HVAC applications. The following tables give examples and links to these codes, standards, and reports. Also, some utility companies offer rebates to building owners for installing CO_2 sensors. Other utility may offer rebates based on the energy savings potential, so check with your local power provider.

For additional information on CO_2-based ventilation control and CO_2 sensing products, please contact Amphenol Advanced Sensors at +1 814-834-9140 or visit our website: www.amphenol-sensors.com.

Ventilation Control is Required

ASHRAE 90.1 (Section 6.4.3.8)	Ventilation control is required in systems with outdoor air capacities greater than 3,000 cfm and occupant density of 100 or more people per 1,000 sq. feet.	http://www.ashrae.org
California Title 24 Energy Efficiency Standards	DCV is required in spaces that have an economizer and occupant density greater than or equal to 25 people per 1,000 sq. feet. See the standard for the exceptions.	http://www.energy.ca.gov/title24/
LEED (Leadership in Energy and Environmental Design)	One LEED point given where CO_2 levels are monitored in high density areas (25 people or more per 1,000 sq. feet. CO_2 monitoring also required in all naturally ventilated spaces.	http://www.leedbuilding.org
Oregon Chapter 13 Energy Conservation Code	In Section 1317.2.2, Ventilation control is required in systems with 1,500 cfm or more of ventilation air and areas with average occupancy of 20 square feet per person or less.	http://www.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml#Non_Residential_Publications
Washington State Energy Code	Demand controlled ventilation is required for spaces that are greater than 500 ft^2 and have occupant density greater than 40 people per 1,000 $ft.^2$	http://www.sbcc.wa.gov/docs/codes/WSEC06.pdf
New York City Green Schools Guide	New York City now requires the use of CO_2-based ventilation control in all school gymnasiums and auditoriums.	http://source.nycsca.org/pdf/nycgs g-031507.pdf
Philadelphia, PA School District	Volume 1 of the Building Design Criteria states the CO_2-based ventilation control is to be used with air handling devices using outdoor air. It also states that motion detectors should be avoided.	http://www.phila.k12.pa.us/offices/psit/docs/buildstandards.pdf
New Jersey Schools Construction Corporation Program	The New Jersey Schools Construction Program's Design Manual requires the use of CO_2-DCV in spaces with significant variance in occupancy.	http://www.njscc.com/Innovations/High_Performance_Schools/PDF/ DM.pdf
United Kingdom Building Bulletin 101 Ventilation of School Buildings	In classrooms, CO_2 is recognized as the key indicator of ventilation performance for the control of IAQ. The average CO_2 level must be kept below 1,500 ppm.	http://www.teachers.gov.uk/_doc/9953/Building%20Bulletin%20101%20-%20Version%201.4.doc

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CO_2-Based Ventilation Control is Recommended or Recognized

ASHRAE Advanced Energy Design Guides	CO_2 ventilation control is recommended when designing a building do reduce energy usage by 30%. When complete, there will be AEDG's e for small office buildings, small retail spaces, K-12 schools, and big box retail stores	http://www.ashrae.org/aedg
US Department of Energy	In March 2004, the DOE published a Federal Technology Alert study titled "Demand Controlled Ventilation Using CO_2 Sensors: Preventing energy losses from over-ventilation while maintaining indoor air quality".	http://www1.eere.energy.gov/femp/pdfs/fta_co2.pdf
US Environmental Protection Agency (EPA)	EPA's 'Tools for Schools' recognizes CO_2 based ventilation control for energy savings and indoor humidity control by reducing ventilation when it is not required.	http://www.epa.gov/iaq/schooldesign/moisturecontrol.html
New York City High Performance Building Guidelines	CO_2-based ventilation control is recognized as a way to ensure proper ventilation and good IAQ while reducing peak loads in buildings	http://www.nyc.gov/html/ddc/html/ddcreen/documents/guidelines.pdf
Canada Department of Natural Resources	The report on energy savings technologies discusses the history, current status, and future of CO_2 based ventilation control as well as the expected energy savings	http://www.sbc.nrcan.gc.ca/documentation/pdf/publications/BuildingsEmergingTechonologyReport.pdf
Canada Natural Resources	"Saving Energy Dollars in Hotel, Motels, and Restaurants" states that demand control ventilation saves energy by reducing air flow when a room is not in use.	http://oee.nrcan.gc.ca/publications/infosource/pub/hospitality_sector/english/index.cfm
Hawaii Commercial Building Guidelines for Energy Efficiency	Hawaii recommends the use of CO_2 based DCV for humidity control and energy savings and to ensure proper ventilation in buildings. It also suggests that local utility companies may offer rebates for the use of CO_2 sensors.	http://www.archenergy.com/library/general//hawaiigl/
Greater Vancouver Regional District Green Building Program	The GVRD developed a LEED implementation guide for municipal buildings to achieve better performing buildings and get LEED certification. There is a section on CO_2-based demand controlled ventilation that covers the benefits, applications, cost and savings estimates, and control strategy.	http://www.gvrd.bc.ca/BuildSmart/pdfs/gvrdmunicipalleeddesignguide2006.pdf
Broward County Florida School Board Design Criteria	Section 2A-6.A.29 states that CO_2 based DCV (or similar) should be investigated in areas requiring large amounts of outside air like auditoriums.	http://www.broward.k12.fl.us/Facilities_Construction/DSS/DS_Docs/Design_Criteria/Section%202A-6+%20Mechanical%20Design%20Criteria%20(rev.%20206-01-07.doc

Utility Companies Offering Rebates for Installing CO_2 Sensors for Ventilation Control

Florida Power & Light	FPL pays rebates ranging from $12 to $522 per 1,000 sq. ft. for implementing CO_2-based ventilation control.	http://www.fpl.com/business/savings/dcv.shtml
New York State Energy Research and Development Authority (NYSERDA)	NYSERDA pays $200 per CO_2 sensor through their 'Smart Equipment Choices' program.	http://www.nyserda.org/programs/hvac/installdcv.asp
Check with your utility company	Many utility companies offer rebates for implementing energy savings measures in new and existing buildings. Make sure to check with your utility company to see if rebates are available.	

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AAS-930-139B - 10/2014