

## 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 CO2-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 CO2 sensors. Other utility may offer rebates based on the energy savings potential, so check with your local power provider.

For additional information on CO2-based ventilation control and CO2 sensing products, please contact GE Sensing at (800) 833-9438 or visit our website, <http://www.gesensing.com/telaireproducts> .

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.	<a href="http://www.ashrae.org">http://www.ashrae.org</a>
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.	<a href="http://www.energy.ca.gov/title24/">http://www.energy.ca.gov/title24/</a>
LEED (Leadership in Energy and Environmental Design)	One LEED point given where CO2 levels are monitored in high density areas (25 people or more per 1,000 sq. feet. CO2 monitoring also required in all naturally ventilated spaces.	<a href="http://www.leedbuilding.org">http://www.leedbuilding.org</a>
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	<a href="http://www.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml#Non_Residential_Publications">http://www.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml#Non_Residential_Publications</a>
Washington State Energy Code	Demand controlled ventilation is required for spaces that are greater than 500 ft <sup>2</sup> and have occupant density greater than 40 people per 1,000 ft. <sup>2</sup>	<a href="http://www.sbccc.wa.gov/docs/codes/WSEC06.pdf">http://www.sbccc.wa.gov/docs/codes/WSEC06.pdf</a>
New York City Green Schools Guide	New York City now requires the use of CO2-based ventilation control in all school gymnasiums and auditoriums.	<a href="http://source.nycsca.org/pdf/nycgs-g-031507.pdf">http://source.nycsca.org/pdf/nycgs-g-031507.pdf</a>

Philadelphia, PA School District	Volume 1 of the Building Design Criteria states the CO2-based ventilation control is to be used with air handling devices using outdoor air. It also states that motion detectors should be avoided.	<a href="http://www.phila.k12.pa.us/offices/psit/docs/buildstandards.pdf">http://www.phila.k12.pa.us/offices/psit/docs/buildstandards.pdf</a>
New Jersey Schools Construction Corporation Program	The New Jersey Schools Construction Program's Design Manual requires the use of CO2-DCV in spaces with significant variance in occupancy.	<a href="http://www.njscc.com/Innovations/High_Performance_Schools/PDF/DM.pdf">http://www.njscc.com/Innovations/High_Performance_Schools/PDF/DM.pdf</a>
United Kingdom Building Bulletin 101 Ventilation of School Buildings	In classrooms, CO2 is recognized as the key indicator of ventilation performance for the control of IAQ. The average CO2 level must be kept below 1,500 ppm.	<a href="http://www.teachers.gov.uk/_doc/9953/Building%20Bulletin%20101%20-%20Version%201.4.doc">http://www.teachers.gov.uk/_doc/9953/Building%20Bulletin%20101%20-%20Version%201.4.doc</a>

CO2-based ventilation control is recommended or recognized.

ASHRAE Advanced Energy Design Guides	CO2 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.	<a href="http://www.ashrae.org/aedg">http://www.ashrae.org/aedg</a>
US Department of Energy	In March 2004, the DOE published a Federal Technology Alert study titled "Demand Controlled Ventilation Using CO2 Sensors: Preventing energy losses from over-ventilation while maintaining indoor air quality".	<a href="http://www1.eere.energy.gov/fe mp/pdfs/fta_co2.pdf">http://www1.eere.energy.gov/fe mp/pdfs/fta_co2.pdf</a>
US Environmental Protection Agency (EPA)	EPA's 'Tools for Schools' recognizes CO2 based ventilation control for energy savings and indoor humidity control by reducing ventilation when it is not required.	<a href="http://www.epa.gov/iaq/schoold esign/moisturecontrol.html">http://www.epa.gov/iaq/schoold esign/moisturecontrol.html</a>
New York City High Performance Building Guidelines	CO2-based ventilation control is recognized as a way to ensure proper ventilation and good IAQ while reducing peak loads in buildings.	<a href="http://www.nyc.gov/html/ddc/html/ddcgreen/documents/guidelines.pdf">http://www.nyc.gov/html/ddc/html/ddcgreen/documents/guidelines.pdf</a>
Canada Department of Natural Resources	The report on energy savings technologies discusses the history, current status, and future of CO2 based ventilation control as well as the expected energy savings.	<a href="http://www.sbc.nrcan.gc.ca/documentation/pdf/publications/BuildingsEmergingTechnologyReport.pdf">http://www.sbc.nrcan.gc.ca/documentation/pdf/publications/BuildingsEmergingTechnologyReport.pdf</a>
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.	<a href="http://oee.nrcan.gc.ca/publications/infosource/pub/hospitality_sector/english/index.cfm">http://oee.nrcan.gc.ca/publications/infosource/pub/hospitality_sector/english/index.cfm</a>

Hawaii Commercial Building Guidelines for Energy Efficiency	Hawaii recommends the use of CO2 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 CO2 sensors.	<a href="http://www.archenergy.com/library/general/hawaiigl/">http://www.archenergy.com/library/general/hawaiigl/</a>
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 CO2-based demand controlled ventilation that covers the benefits, applications, cost and savings estimates, and control strategy.	<a href="http://www.gvrd.bc.ca/BuildSmart/pdfs/gvrdmunicipalleeddesignguide2006.pdf">http://www.gvrd.bc.ca/BuildSmart/pdfs/gvrdmunicipalleeddesignguide2006.pdf</a>
Broward County Florida School Board Design Criteria	Section 2A-6.A.29 states that CO2 based DCV (or similar) should be investigated in areas requiring large amounts of outside air like auditoriums.	<a href="http://www.broward.k12.fl.us/Facilities_Construction/DSS/DS_Docs/Design_Criteria/Section%202A-6+%20Mechanical%20Design%20Criteria%20(rev.%206-01-07).doc">http://www.broward.k12.fl.us/Facilities_Construction/DSS/DS_Docs/Design_Criteria/Section%202A-6+%20Mechanical%20Design%20Criteria%20(rev.%206-01-07).doc</a>

Utility companies offering rebates for installing CO2 sensors for ventilation control.

Florida Power & Light	FPL pays rebates ranging from \$12 to \$522 per 1,000 sq. ft. for implementing CO2-based ventilation control.	<a href="http://www.fpl.com/business/savings/dcv.shtml">http://www.fpl.com/business/savings/dcv.shtml</a>
New York State Energy Research and Development Authority (NYSERDA)	NYSERDA pays \$200 per CO2 sensor through their 'Smart Equipment Choices' program.	<a href="http://www.nyserda.org/programs/hvac/installdvc.asp">http://www.nyserda.org/programs/hvac/installdvc.asp</a>
Check w/ 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.	