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California Energy commission
Attention: Docket No. 07-BSTD-1
Dockets Office
1516 Ninth Street, MS-4
Sacramento, CA 95814
Attention: Chris Gekas, Maziar Shirakh, Bill Pennington

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March 25, 2008

Dear Mr. Pennington:

We are writing in response to the Commission's pre-15 day language regarding the proposed manadatory expansion of demand control ventilation (DCV) systems, including outdoor air supply reductions, in multi-zone occupancies (Section 121). As the agency responsible for workplace health and safety in California, we at the Division of Occupational Safety and Health (Division) remain concerned that the current proposal threatens indoor air quality in California workplaces, due to the imposition of a technology that has not proven that it can reliably provide adequate ventilation.

As we have previously stated, we believe it would be best to to put off this expansion until there is more evidence regarding the reliability of sensors and the ability of the system to respond effectively to increased demand. If the Commission is going to procede with this proposal, we would at a minimum urge the following changes to the 15 day language:

1. Although the proposal exempts certain spaces from DCV requirements, it does not prohibit DCV ventilation reductions in these spaces for which it is inappropriate, and in some cases may increase the risk of communicable disease. Multi-zone buildings are often occupied by a variety of tenants, and the operations conducted by those tenants may vary considerably. With no ability to specify which tenants will be in a given multi-zone building, it is more than likely that operations for which DCV may provide inadequate ventilation, such as social services offices, medical offices, or beauty salons may end up in areas with DCV reductions.

We would strongly suggest changing the language in Section 121(c)3.B, exceptions 1 and 3 to read:

> ***EXCEPTION 1 to Section 121(c)3B:*** *The ventilation rate otherwise required by Section 121(b)(2) may not be reduced by demand control ventilation in the following types of occupancies: classrooms, call centers and other high density office environments, healthcare facilities and medical buildings, and public areas of social services buildings.*
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> ***EXCEPTION 3 to Section 121(c)3B:*** *The ventilation rate otherwise required by Section 121(b)(2) may not be reduced by demand control ventilation in spaces that have processes or operations that generate dusts, fumes, mists, vapors, or gases and are not provided with local exhaust ventilation, such as indoor operation of internal combustion engines, areas designated for unvented food service preparation, or beauty salons.*

2. CO2 sensors have not proven to be sufficiently reliable to ensure that ventilation in workplaces subject to DCV will receive an adequate supply of outdoor air. A recent pilot study by Lawrence Berkeley National Laboratory found that some installed CO2 sensors failed in periods less than five years. The Commission's proposal to require that the manufacturer warrant performance of the sensor for five years does not ensure that the sensor will perform reliably during that period, and it does not provide a remedy for the occupants of the space. At a minimum, the code should require that CO2 sensors be capable of self-diagnostics, and that failure of a sensor restore the system to the full ventilation rate.

In addition, requiring only that the sensor be warranted at 1000 ppm, which is generally the highest CO2 level permitted by the standard (based on 400 ppm outside air concentration assumed in subsection (c)4.D.) is not sufficient. First, a single point calibration is not sufficient to ensure accuracy over a range of measurements. More importantly, DCV systems must use predictive algorithms to trigger additional air prior to the detection of 1000 ppm CO2 in a space, or they will be incapable of ensuring that the concentration of CO2 in the space does not exceed that limit. Therefore, the sensors should be warranted and calibrated not only at 1000 ppm, but at 400 ppm and intermediate levels as well. We also note that the proposed NA7 Manual would require on-site sensor verification at 500 and 1000 ppm, and at a minimum that requirement should be reflected in the code.

We would therefore suggest the following changes to Section 121(C)4.F.

> *CO_2 sensors shall be certified by the manufacturer to have an accuracy of no less than 75 ppm at concentrations of 400, 800, and 1000 ppm concentration when measured at sea level and 25 °C, factory calibrated and calibrated at start-up, and certified by the manufacturer to require calibration no more frequently than once every 5 years. CO_2 sensors shall be capable of self-diagnostics that will detect sensor failure. Upon detection of sensor failure, the system shall be reset to supply the minimum quantity of outside air required by section 121(b)(2) to the zone serviced by the sensor at all times that the zone is occupied.*

3. In regards to the NA7 Manual, Section NA7.5.5.2 now apparently treats 1000 ppm (or 600 ppm plus the CO2 concentration in outside air) as the "sensor set point". As stated above, if 1000 ppm is used as a set point for the sensor, it is likely CO2 concentrations in the space will at times exceed 1000 ppm.

Also, in regards to the NA7 manual, the Division still strongly supports that acceptance of the system require testing of the ventilation control measures as a whole, in addition to the current requirements that only test each system separately. The current language requires the disconnection of economizer controls prior to testing the DCV, and vice versa. Testing of the DCV system is to be done with a simulated sensor signal as well as the disconnection of the economizer. At a minimum, at acceptance, the NA7 manual should require testing of the system by creating a test atmosphere at each zone sensor, and testing that the system functions as required, under various outside temperature conditions. We would therefore suggest adding the following language to NA7.5.5.2

> *Step 2: Simulate a signal at or slightly above the CO_2 concentration predictive setpoint, which must be less than the maximum CO2 concentration permitted ~~required~~ by Section 121(c)4C. Verify and document the following:*
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> - *For single zone units, outdoor air damper modulates opens to satisfy the total ventilation air called for in the Certificate of Compliance.*

- *For multiple zone units, either outdoor air damper or zone damper modulate open to satisfy the zone ventilation requirements.*

Step 3: Simulate signal well below the CO_2 predictive setpoint . Verify and document the following:

- *For single zone units, outdoor air damper modulates to the design minimum value.*
- *For multiple zone units, either outdoor air damper or zone damper modulate to satisfy the reduced zone ventilation requirements.*

Step 6: Restore economizer controls and remove all system overrides initiated during the test.

Step 7: With all controls restored, apply a test gas signal at the CO2 predictive set point to the sensor. Verify that the outdoor air damper modulates open to satisfy the total ventilation air called for in the Certificate of Compliance.

For a more complete discussion of these issues, please see the letter previously submitted by Len Welsh, dated October 29, 2007.

In our experience, under-ventilated work places pose substantial health hazards for employees. Although these suggested changes would help to reduce the potential adverse impacts of the proposed expansion of DCV requirements, we continue to believe that expanded DCV requirements are not justified at this time.

Thank you for your consideration.

Sincerely,

Deborah Gold, Senior Safety Engineer

Robert Nakamura, Senior Safety Engineer

Jeffrey Ferrell, Senior Industrial Hygienist

Cc: Len Welsh, Chief