



Department of Development Services

4701 West Russell Road • Las Vegas NV 89118
(702) 455-3000 • Fax (702) 455-5810

Division:	Building Division	Code Interpretation	BD-CI-001
Subject:	CARBON MONOXIDE SENSORS USED IN GARAGE VENTILATION SYSTEMS	Effective Date:	05/01/2007
Code:	IBC 406.4.2	Revised Date:	01/29/2008

A. CODE REQUIREMENT

Section 406.4.2 of the IBC and the Southern Nevada Amendments require mechanical ventilation for enclosed parking garages. This interpretation outlines the Quality Assurance Agencies (QAA) responsibilities for the testing of carbon monoxide (CO) sensors.

B. INTERPRETATION

1. CCDDS will require garage ventilation systems to have special inspections to witness the testing of the CO sensors and associated equipment to ensure their safe operation. Item O for Special Cases will be invoked for permits issued with CO sensor-controlled garage ventilation systems. QAA who are currently certified as Item K (Smoke Control) or K-TAB (Test and Balance) will be the only agencies allowed to perform special case inspections on CO sensor-controlled ventilation systems.
2. A proposed test plan must be submitted to CCDDS by the QAA prior to acceptance testing in the field. The primary features of the test plan will be verification of the CO concentrations required for activation, the minimum number or percentage of sensors to test within an activation zone or system, the exhaust flow rates required for the fans, installation and spacing of the sensors, initiation of fans and initiation of audible/visual annunciation, if required.
3. The CO sensors will be tested with actual CO test gas at concentrations recommended by the manufacturer, which shall also include the number or percentage of sensors in a zone or system required to be tested. These recommendations will also be reviewed by the CCDDS to ensure compliance with Clark County Codes. These recommended concentrations for fan activation may be lower than the 50 ppm and 200 ppm in the referenced code section. Factory CO sensor calibration alone will not be accepted because it will not reveal improper installation or any damage which has occurred to the sensor between the factory and the point of installation.
4. The QAA will also verify that the correct sensors have been installed in accordance with the recommendations of the manufacturer at the mounting height and spacing required by the manufacturer or system designer. The QAA will verify that correct fan operation and audible/visual annunciation, if required, is activated in response to initiation of an alarm. The QAA will also verify that the exhaust quantities stipulated by the mechanical designer are achieved after the system is activated by a CO sensor. A properly configured garage ventilation system requires the activation of a CO sensor at the correct concentration and response of the fan(s) at flow rates recommended by the mechanical designer. If Variable Frequency Drives (VFDs) are used to operate the exhaust fans, the set points shall also be documented by the QAA inspector. Many garage ventilation systems will also be designed as a smoke control system, usually with the fan(s) running at a higher flow rate for smoke control than normal garage ventilation. Override of the normal fan operation for smoke

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control will be tested by the smoke control inspection agency under item K, Smoke Control.

5. The final QAA report should contain the following information: Table of Contents, project name and address, a list of reference documents, description of work, test results, vendor data, daily reports, Non Conformance Reports, permit copy, QAA contract copy and an inspector list with a copy of their signature and the items for which the inspector is approved.
6. The following verbiage shall be used on QAA contracts for CO sensor testing:
Special cases: Special inspections shall be required for proposed work that is, in the opinion of the Building Official, unusual in its nature per Section 1704.13. Testing of carbon monoxide sensors for garage ventilation in accordance with Southern Nevada IBC Amendments, Section 406.4.2 and manufacturer's recommendations. Verification of exhaust quantities in accordance with recommendations of the Registered Design Professional-Mechanical. See Clark County Building Division Code Interpretation AD-CI-IBC-004, for additional information and verification responsibilities.

C. RATIONALE

This policy has been developed by the Clark County Department of Development Services (CCDDS) to assist manufacturers, designers, and contractors in understanding code requirements applicable to the use of CO sensors in garage ventilation systems. An increasing number of parking garages are built underground or enclosed. Mechanical ventilation is an important life safety system which is required to exhaust hazardous combustion engine byproducts from the enclosed parking area. CO presents a special threat because it is poisonous, lighter than air, colorless, odorless, tasteless, non-irritating and has a narcotic effect on a human being. Previously, most of these enclosed garages have been ventilated with continuously operating exhaust fans. An increasing number of new projects are designed with CO sensors controlling the fan operation. Some continuously operating systems have been retrofitted with CO sensors to reduce energy costs or background noise levels. The requirements for these ventilation systems are listed in Section 406.4.2 of the Southern Nevada Amendments to the International Building Code. These requirements reflect federal occupational exposure limits established by the Occupational Safety and Health Administration (OSHA). The basic provisions are to maintain a maximum average CO concentration of less than 50 parts per million (ppm) during any 8-hour period and less than 200 ppm during any 1-hour period.

Revision History:

POLICY #	TITLE	Effective Date	Revised	Reviewed
AD-CI-IBC-004	Carbon Monoxide Sensors Used In Garage Ventilation Systems	May 1, 2007		
BD-CI-001	Carbon Monoxide Sensors Used In Garage Ventilation Systems			August 15, 2008

Approved by: Ronald L. Lynn, Director	Concurred by: Gregory J. Franklin, Assistant Director
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