



## ICC CODE CORNER

### 2012 IFC Code & Commentary

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#### SECTION 908

#### EMERGENCY ALARM SYSTEMS

908.1 Group H occupancies. Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided as required in Chapter 50.

◆ Emergency alarm systems provide indication and warning of emergency situations involving hazardous materials. An emergency alarm system is required in all Group H occupancies as indicated in Sections 5004.9 and 5005.4.4 as well as Group H-5 HPM facilities as indicated in Section 908.2. The Group H occupancy classification assumes

the storage or use of hazardous materials exceeds the maximum allowable quantities specified in Tables 5003.1.1(1) and 5003.1.1(2).

An emergency alarm system should include an emergency alarm-initiating device outside each interior door of hazardous material storage areas, a local alarm device and adequate supervision.

Even though ozone gas-generator rooms (Section 908.4), repair garages (Section 908.5) and refrigeration systems (Section 908.6) are not typically classified as Group H occupancies, the potential hazards associated with these occupancy conditions are great enough to

require additional means of early warning detection.

908.2 Group H-5 occupancy. Emergency alarms for notification of an emergency condition in an HPM facility shall be provided as required in Section 2703.12. A continuous gas detection system shall be provided for HPM gases in accordance with Section 2703.13.

◆ In addition to hazardous material storage areas as regulated by Section 5004.9, Section 2703.12.1 also requires emergency alarms for service corridors, exit of the potential transport of hazardous materials through these



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areas. Section 2703.13 requires a continuous gas detection system for early detection of leaks in areas where HPM gas is used. Gas detection systems are required to initiate a local alarm and transmit a signal to the emergency control station upon detection (see commentary, Sections 2703.12 and 2703.13).

908.3 Highly toxic and toxic materials. Where required by Section 6004.2.2.10, a gas detection system shall be provided for indoor storage and use of highly toxic and toxic compressed gases.

◆ A gas detection system in the room or area utilized for indoor

storage or the use of highly toxic or toxic gases provides early notification of a leak that is occurring before the escaping gas reaches hazardous exposure concentration levels. The exception recognizes that certain toxic compressed gases do not pose a severe exposure hazard. Those toxic gases whose properties under standard conditions are still below the 8-hour weighted average concentration for the permitted exposure limit (PEL) are exempt from the requirement for a gas detection system.

This section also specifies the discharge requirements for treatment system performance to

establish a maximum allowable concentration of highly toxic or toxic gases at the point of discharge to the atmosphere.

The concentration level of one-half the immediately dangerous to life and health (IDLH) limit represents a minimum acceptable level of dilution at the point of discharge where the location of discharge is away from the general public. Where the treatment system processes more than one type of compressed gas, the maximum allowable concentration must be based on the release rate, quantity and IDLH for the gas that poses the worst-case release scenario.

908.4 Ozone gas-



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generator rooms. A gas detection system shall be provided in ozone gas-generator rooms in accordance with Section 6005.3.2.

◆ To monitor the potential buildup of dangerous levels of ozone, a gas detection system is required to, upon actuation, shut off the generator and sound a local alarm. Ozone gas generators are commonly used in water treatment applications. The ozone gas-generator room should not be a normally occupied area or be used for the storage of combustibles or other hazardous materials.

Section 6005 contains additional requirements for ozone gas generators.

908.5 Repair garages. A flammable-gas detection system shall be provided in repair garages for vehicles fueled by nonodorized gases in accordance with Section 2311.7.2.

◆ As indicated in Section 2311.7.2, an approved flammable-gas detection system is required for garages used for repair of vehicles fueled by nonodorized gases, such as hydrogen and nonodorized LNG. To prevent a hazardous potential buildup of flammable gas caused by normal leakage and use conditions, the flammable-gas detection system is required to activate when the level of flammable gas exceeds 25 percent of the lower

explosive limit (LEL) (see commentary, Section 2311.7.2).

908.6 Refrigeration systems. Refrigeration system machinery rooms shall be provided with a refrigerant detector in accordance with Section 606.8.

◆ A refrigerant-specific detector is required for leak detection, early warning and actuation of emergency exhaust systems. Because most general machinery rooms are unoccupied for long periods of time, a refrigeration leak may go undetected, allowing a buildup of refrigerant that can pose a threat to building occupants and the maintenance personnel who must enter the machinery



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room. Also, the refrigerants may or may not be detectable by the sense of smell, depending on the chemical nature and concentration in the air of the refrigerant. This can be especially critical when a toxic refrigerant is used in the refrigeration system (see commentary, Section 606.8). Even where the refrigerant is not toxic, sufficient quantities can displace oxygen and create an untenable environment.

Detection is necessary to avoid a condition where the oxygen level drops below safe levels.

908.7 Carbon monoxide alarms. Group I or R occupancies located in a building containing a

fuel-burning appliance or in a building which has an attached garage shall be equipped with single-station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in Chapter 2 of the International Building Code, or an enclosed parking garage ventilated in accordance with Section 404 of the International Mechanical Code shall not be considered an attached garage.

Exception: Sleeping units or dwelling units which do not

themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be equipped with single-station carbon monoxide alarms provided that:

1. The sleeping unit or dwelling unit is located more than one story above or below any story which contains a fuel-burning appliance or an attached garage;
2. The sleeping unit or dwelling unit is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is



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equipped with a common area carbon monoxide alarm system.

◆ Section 908.7 of both the 2012 code and the IBC contains requirements for carbon monoxide (CO) detectors in all residential (Group R) and institutional (Group I) occupancies. These provisions apply to new construction and a similar requirement was added into the IFC to deal with existing buildings. The retroactive provisions in Section 1106.1 apply to existing buildings classified as Group R or I in jurisdictions adopting the 2012 code.

These provisions were added to the IBC and the code to be

consistent with the requirements for carbon monoxide (CO) detectors in all new construction of one- and two-family dwellings that had been added to the IRC in the 2009 edition. Another reason for its approval was technical data in a 1998 article published by the Journal of the American Medical Association.

The particular paper stated that approximately 2,100 deaths occur annually as a result of CO poisoning.

That annual number is based on the findings of a paper prepared by the U.S. Department of Health Centers for Disease Control (CDC). The referenced paper documented

epidemiological research by two CDC physicians who examined 56,133 death certificates over a 10-year period. Excluding suicides, homicides, structure fires and deaths resulting from CO poisoning in motor vehicles, the death rate steadily decreased for the sample period, from a value of 1513 people in 1979 to 878 in 1988. The highest death rates occurred in winter and among males, African Americans, the elderly and residents in northern states.

CO is a colorless, tasteless, odorless gas that interrupts the attachment of oxygen molecules to hemoglobin in blood cells and can cause headaches, confusion



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and dizziness. At higher concentrations CO can cause loss of consciousness and eventual death.

Exposures above 100 parts/million are dangerous to human health. It is not a Toxic or Highly Toxic gas as defined in Chapter 2 but is classified as a Flammable gas.

Section 908.7 requires the installation of a CO alarm in any new Group I or R occupancy when it contains a fuel-burning appliance or it has an attached garage. As mentioned previously, Section

1103.9 retroactively prescribes the installation of CO alarms in existing Group I and R occupancies. CO alarms are not required

in open or enclosed parking garages ventilated in accordance with Section 404.

The wording of Sections 908.7 and Section 1106.1 do not require the installation of single-station CO alarms when the building does not contain fuel-burning appliances or have an attached garage. The exception indicates that a single-station CO alarm is not required in each sleeping or dwelling unit when they are located one or more stories above or below the floor or level housing the fuel-burning appliance or an attached garage and there are no ducts or ventilation shafts that connect between the unit and the fuel-

burning appliance or attached garage. However, in such a building, a common area CO detection system is required. Such a system would be required to comply with the requirements of NFPA 72 and NFPA 720, Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units, including the installation of listed detectors and occupant notification devices.

CO alarms installed in accordance with the code are listed in accordance with UL 2034, Standard for Single and Multiple Station Carbon Monoxide Alarms.

They are designed to initiate an audible alarm when the level of





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CO is below that which can cause a loss of the ability to react to the dangers of CO exposure.

UL specifies that CO alarms activate at a level where the CO concentration over a given period of time can achieve 10 percent carboxyhemoglobin (COHb) in the body. 10 percent COHb will not cause physiological injury, but is a level at which increases in the CO concentration will begin to affect the human body.

Unless listed as low-power wireless, CO alarms require a primary and secondary power supply. The primary power supply is utility power and secondary power supply is typically a battery. NFPA 720 requires a CO

alarm outside of each sleeping unit in the immediate vicinity of the bedroom and on every occupiable level of a dwelling, including basements. CO alarms are not required in attics or crawl spaces.

When a combination CO/smoke alarm is provided, the fire alarm signal takes precedence over any other alarm signals. NFPA 720 requires the CO alarm be capable of transmitting a distinct audible signal that is different than the smoke alarm signal.

908.7.1 Carbon monoxide detection systems. Carbon monoxide detection systems, which include carbon monoxide

detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075.

◆ The purpose of this section is simply to recognize that a carbon monoxide detection system can be used in lieu of carbon monoxide alarms. This is allowed when in compliance with NFPA 720 and the listing of the detectors is in compliance with UL 2075. Note that CO detectors have a different listing requirement than CO alarms.



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The International Code Council, a membership association dedicated to building safety and fire prevention, develops the codes used to construct residential and commercial buildings, including homes and schools. Most U.S. cities, counties and states that adopt codes choose the International Codes developed by the International Code Council.

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