

1.2 FIRE SAFETY

The building codes focus on preventing the spread of fire within and between buildings. A fire barrier is a tested and certified wall assembly that can withstand and contain a fire for a particular time duration.

A fire partition is a fire barrier that prevents the spread of fire between the sections of a building. A firewall is a structural fire

barrier between buildings that is designed to remain standing during and after a fire.

Flame spread is a tested value of how fast a material burns compared to red oak planks.

A thermal barrier is a sheeting material that protects the materials behind it from reaching a temperature of 250°F or breaching during a fire. Drywall is the most common thermal barrier and is rated for 15 minutes of protection. Fire partitions in multi-family buildings usually require a wall assembly with a 2-hour rating.

An ignition barrier is a material used with foam insulation to prevent the foam from igniting. The code specifies a number of materials that can serve as ignition barriers including drywall, plywood, fibrous insulation, galvanized steel, and intumescent paint.

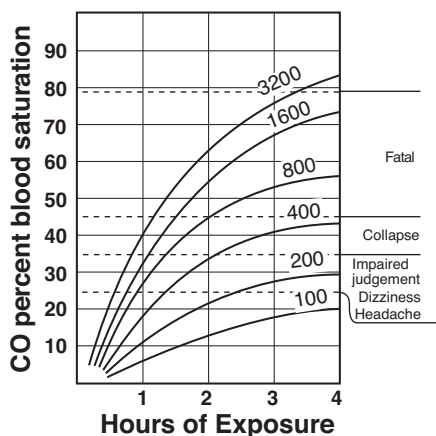
1.3 CARBON MONOXIDE (CO)

SWS Detail: 2.01 Safety Devices

Carbon monoxide is a colorless, odorless, poisonous gas. The two common terms for expressing measured CO concentration are these.

1. “as measured” which compares CO molecules to air molecules in parts per million (ppm).
2. “air free”, which is a value, calculated from the as measured CO and the measured oxygen in combustion gases. Air free denotes what the CO concentration would be in an air-free sample of combustion gases.

The EPA’s suggested maximum 8-hour CO exposure is 9 ppm as measured in room air. Malfunctioning combustion appliances, cigarette smoking, or auto exhaust are the most common CO sources. The EPA’s one-hour CO limit is 35 ppm as measured.



Effects of CO: This graph's 6 curves represent different CO exposure levels in PPM (parts per million).

1.3.1 Causes of Carbon Monoxide (CO)

CO is released by unvented gas space heaters, gas-fired domestic water heaters, kerosene space heaters, backdrafting vented space heaters, gas ranges, leaky wood stoves, and motor vehicles idling near the building. Central furnaces and boilers that backdraft may also lead to high levels of CO.

The following conditions cause CO.

- A combustion appliance is overfired compared to its rated fuel input.
- Backdrafting combustion gases smother the flame.
- An object interferes with the flame (a pan over a gas burner on a range top, for example).
- Too-little combustion air.
- Rapidly moving air interferes with the flame.
- Burner misalignment causes a distorted flame.
- Flue or heat exchanger blockage interferes with the flow of flue gases.

Measure CO at the exhaust port of the heat exchanger. Identify and correct CO problems.

Testing for Carbon Monoxide (CO)

The most common CO-test instruments use electronic sensors with a digital display showing parts per million (ppm). Read the manufacturer’s instructions on zeroing the meter — usually by calibrating the meter in outdoor air. CO test equipment must usually be re-calibrated every 6 months, using factory-specified procedures.

Air-free CO measurement includes both CO and O₂ sensing with a calculation to find the CO concentration in undiluted flue gases that contain no oxygen. Air-free CO measurement avoids the perception that moving the testing probe or diluting CO are solutions to elevated levels of CO.

Technicians must test for CO both before and after weatherization. Measure ambient CO levels outdoors and indoors. Investigate any CO levels that are higher indoors than what was measured outdoors. Use the following table for *Required Actions in Response to Ambient CO Measurements* per ANSI/BPI 1200.

Required Actions in Response to Ambient CO Measurements
(from ANSI/BPI-1200, Section 7.3.3.3)

70 ppm or greater	36 ppm-69 ppm	9 ppm- 35 ppm
<ul style="list-style-type: none"> • Terminate the inspection. • Notify the homeowner - occupant of the need for all building occupants to evacuate the building. • Leave the building and the appropriate emergency services shall be notified from outside the home. 	<ul style="list-style-type: none"> • Advise the homeowner - occupant that elevated levels of ambient CO have been detected. • Open windows and doors. Recommend that all possible sources of CO be turned off immediately. • Where it appears that the source of CO is a permanently installed appliance, recommend that the appliance be turned off and advise homeowner – occupant to contact a qualified professional. 	<ul style="list-style-type: none"> • Advise the homeowner - occupant that CO has been detected. • Recommend that all possible sources of CO be checked and windows and doors opened. • Where it appears that the source of CO is a permanently installed appliance, advise the homeowner - occupant to contact a qualified professional.

1.4 SMOKE AND CARBON MONOXIDE (CO) ALARMS

SWS Detail: 2.0101 Smoke Alarms; 2.0102 Carbon Monoxide (CO) Alarms

Every dwelling should have at least one working smoke alarm. CO detectors must be installed in any dwelling unit that doesn't have a working CO detector. Install these alarms on each conditioned level, near the bedrooms or combustion devices.

Install CO alarms and smoke alarms, or combination CO/smoke alarms, in dwellings that lack both smoke alarms and CO alarms.

Don't install alarms within 15 feet of gas ranges or combustion devices because small amounts of smoke or CO can cause nuisance false alarms.

Single-function alarms or combination alarms can interconnect electrically for whole-building protection. If one alarm sounds the other alarms sound too.

If hard wired, a licensed electrician must install the alarm.

1.4.1 Occupant Education about Alarms

- ✓ Educate occupants about what to do if the alarm sounds: evacuate or at least investigate.
- ✓ Alert residents to the possibility of false alarms from smoking, cooking, dust, and forest fires.
- ✓ If battery powered, select alarms that have sealed, non-replaceable, 10-year batteries.
- ✓ Discuss the low-battery or sensor-life alarm chirping sound and how to replace the battery or alarm.
- ✓ Tell residents that alarms last less than 10 years, and that a different sound alerts them when the alarm fails.

1.4.2 Smoke Alarms

*SWS Detail: 2.0101.1 Hardwired (interconnected) Smoke Alarms
2.0101.2 Battery-Operated Smoke Alarms*

Install smoke alarms labeled UL 217 in buildings where they don't exist, don't work, or are older than 10 years of age.

- ✓ Install one smoke alarm in each dwelling on each floor.
- ✓ If mounted on a wall, mount the alarm from 4 to 12 inches from the ceiling.
- ✓ If mounted on a ceiling, mount the alarm at least 6 inches from the nearest wall.
- ✓ Recommend alarms that utilize combined photoelectric and ionization technology.
- ✓ If battery powered, select alarms that have sealed, non-replaceable, 10-year batteries.
- ✓ If hard wired, connect the alarm to a circuit that is energized at all times.

Don't install smoke alarms in these situations.

- Within 12 inches of exterior doors and windows.
- Within 20 feet of a stove or oven.
- Within 3 feet of a bathroom door.
- With an electrical connection to a switched circuit.

1.4.3 CO Alarms

SWS Detail: 2.0102.1 CO Detection and Warning Equipment

Install at least one CO alarm on each habitable floor of all weatherized dwellings or weatherized apartments. CO alarms must comply with these specifications.

- ✓ Have a label with a UL 2034 listing.

- ✓ If battery powered, select an alarm that contains sealed non-replaceable batteries and must also have a minimum 10-year battery life.
- ✓ If hard wired, connect to a circuit that is energized at all times by plugging in to an electrical receptacle.
- ✓ Have a sensor-life alarm.

Don't install CO alarms in these situations.

- In a room that may get too hot or cold for alarm to function properly
- Within 5 feet of a combustion appliance, vent, or chimney
- Within 5 feet of a storage area for vapor-producing chemicals
- Within 12 inches of exterior doors and windows
- Within a furnace closet or room
- With an electrical connection to a switched circuit
- Less than 15 feet away from a gas range.

1.5 GAS RANGE-AND-OVEN SAFETY

SWS Detail: 6.0201.2 Kitchen Range Hoods

Gas ovens can release CO, natural gas, or propane into a kitchen. Test the burners for safe combustion with these steps and do these recommended improvements or else hire a professional gas-service person to make the improvements.

1. Test for gas leaks in the gas piping in and around the range and oven and seal leaks.
2. Check oven for stored items. Turn the oven burner and then range burners to high one-by-one. Inspect the flames and test them for CO. For the oven burner test at

its outlet. For range burners, hold the test probe at least 8 inches above the flame.

3. Turn the oven on to a bake temperature of 500°F. Don't turn the oven to the broil setting or self-cleaning setting.
4. Measure CO in the un-diluted flue products at the oven exhaust. After 5 minutes, the CO reading for the oven must not exceed 225 ppm as-measured.
5. Measure CO for the range-top burners approximately 8 inches above the burner. At 5 minutes, the CO reading for burners must not exceed 100 PPM as-measured.



AIR SHUTTERS



ORIFICE-CLEANING MULTITool

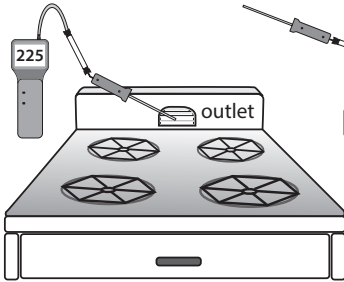


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6. Burner orifices can clog. Clean dirty orifices with a multi-tool designed for cleaning various sizes of orifices.
7. Adjust the burner's air shutters to stabilize and harden the flame and reduce yellow-tipping, which should also reduce the CO concentration.
8. If the CO reading remains over 100 ppm as measured for range burners or 225 ppm for oven burners, con-

sider two additional measures. 1) Install a kitchen fan if none currently exists 2) and/or install an additional CO alarm near the kitchen but at least 20 feet away from the range.

Caution: To protect yourself and the occupants, measure CO in the kitchen's ambient air during these tests. If the ambient CO reading is 70 ppm or more, discontinue the testing.



CO from range and oven: Measure CO at oven in undiluted flue gases. Measure ambient CO in the area of the range, but not directly above the burners or oven vent.

Flame observation: Unstable flames with yellow tips indicate poor combustion and possible CO production.



Client Education about Ranges

Educate clients to follow these safety practices when using their gas range.

- ✓ Never use a range burner or gas oven as a space heater.
- ✓ Open a window, and turn on the kitchen exhaust fan when using the range or oven.
- ✓ Never install aluminum foil around a range burner or oven burner because the foil could interfere with the flame.
- ✓ Keep range burners and ovens clean to prevent dirt from interfering with combustion.