



Welcome! Thank you for participating in this webinar. We appreciate your initiative to learn more about carbon monoxide (CO) and the importance of CO alarms.

This training is brought to you by the National Safe and Healthy Housing Coalition and First Alert.

## Welcome

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## Objectives

- Understand carbon monoxide (CO), its effects and the importance of making sure residents have working CO alarms
- Learn about poisoning prevention measures and the types of CO alarms available
- Gain a working knowledge of the status of CO alarm requirements across the country



The objectives of this training are to help you understand carbon monoxide – from how it is produced and affects health to how state governments have worked to legislate the installation of alarms. The first and only line of defense from CO poisoning is a CO alarm. Proper CO alarm placement and alarm maintenance – combined with ongoing education – will help make communities safer from the threat of CO poisoning.



### What is CO?

- CO is a by-product of incomplete combustion produced when fossil fuels (e.g., oil, gas or coal) burn
- CO spreads evenly in the air, whereas smoke rises
- CO is especially dangerous because **you cannot see, smell or taste it**. The only way to detect CO is with an alarm.

\*Source: CDC CO FAQs



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Carbon monoxide is a potentially deadly threat to any household. Carbon monoxide alarms are the only way to detect the silent killer.

Carbon monoxide sources include common household appliances, such as the water heater, dryer and oven, as well as attached garages and portable generators.

According to the CDC, more than 400 Americans die from CO poisoning and more than 20,000 people visit the emergency room from exposure to CO every year.\*

Known as “the silent killer,” CO is a leading cause of accidental poisoning deaths in the U.S.




Source: <https://www.cdc.gov/co/faqs.htm>


**How can CO poisoning occur?**

- CO incidents occur throughout the year but are particularly common during:
  - Cold-weather months
    - 50% of CO incidents occur between November and February
  - Natural disasters resulting in power outages
    - Earthquakes
    - Major storms
    - Floods
    - Mudslides
- Whenever people turn to alternative sources of heat and power, the risk of CO poisoning increases
- CO alarms provide early warning in the event of an emergency.

**Sources of Carbon Monoxide**

CO can be produced by any fuel-burning device, such as a furnace, boiler, stove and cars.

-  Furnace
-  Dryer Vent
-  Chimney



During the winter months, many of us turn to alternative heating sources we might not use at other times of the year. While these devices may be effective at providing warmth, they also can pose great risks if not used properly. This is why it is crucial to have your fuel-burning appliances, such as the furnace, inspected annually to detect any CO leaks.

Generators should never be used in or near the home, and cars should never be left running in the garage. This can be extremely problematic during natural disasters, when the power goes out. For instance, in the aftermath of Hurricane Irma, 14 individuals died from carbon monoxide poisoning following the hurricane.

Source: <https://www.nfpa.org/News-and-Research/Fire-statistics-and-reports/Fire-statistics/Non-fire-incident/Carbon-monoxide-incident>

## U.S. CO Statistics

- Fire departments responded to an average of **nine CO incidents every hour** in 2010
- This corresponds to an estimated **80,100 CO incidents**
- According to the NFPA, this is a **96% increase** from reported incidents in 2003, likely due to an increase in CO alarm installation and/or legislation
- There has also been an **increase in CO deaths from 1999 to 2009**, likely caused by an increase in deaths involving generators
- A survey found that **40% of Americans** do not have even one working CO alarm
- **Most homes** do not have the recommended number of CO alarms

\*Sources: NFPA "Non-Fire Carbon Monoxide Incidents" Report; CPSC "Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products - 2012 Annual Estimates"

Every year in the United States, there are

# 80,000

carbon monoxide incidents.



Carbon monoxide is the **#1 cause of accidental poisoning** in the U.S.



### At Risk

- All people and pets are at risk for CO poisoning
- Anyone living in a home with fuel-burning appliances, a fireplace or an attached garage
- Children and older adults are more susceptible
- Unborn babies, infants and people with conditions affecting the heart, lungs and circulatory system

The silent killer cannot be seen, heard or smelled.



Having CO alarms in your home is an important way to **protect** your loved ones.



Everyone is at risk for carbon monoxide poisoning.

as they may have a weaker immune system

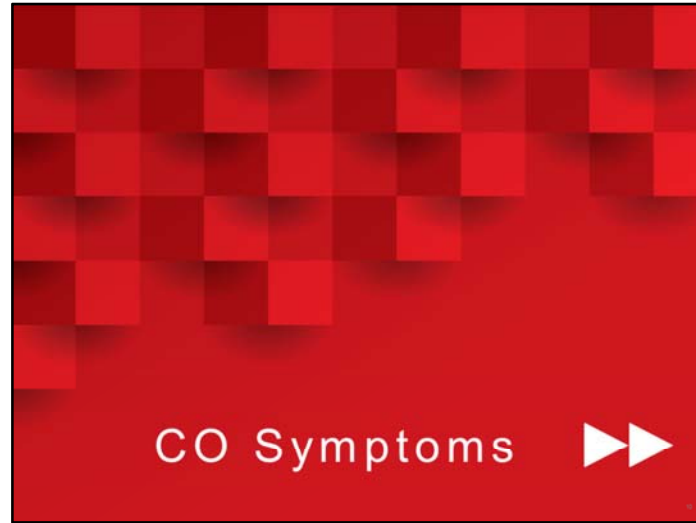


## Common Confusion

- CO (carbon monoxide) is poisonous and potentially fatal
- CO<sub>2</sub> (carbon dioxide) is what we exhale and is not harmful



This notation is important when providing education materials.



## CO Poisoning on the Body

- According to the CDC, **red blood cells** pick up CO more quickly than they pick up oxygen
- If there is a lot of CO in the air, the **body may replace oxygen** in the blood with poisonous CO
- This **blocks oxygen** from getting into the body, which can damage tissues and result in illness or even death
- Exposure to CO produces **flu-like symptoms** such as nausea, dizzy spells, fatigue and vomiting
- People often treat this like the flu, which is the **last thing** one should do

The diagram shows two red blood cells. The left cell contains hemoglobin (red) carrying oxygen (red) and carbon dioxide (green). The right cell contains hemoglobin (red) bound to carbon monoxide (blue), which has displaced the oxygen and carbon dioxide. A legend identifies Oxygen (red), Hemoglobin (red), Carbon Dioxide (green), and Red blood cell (white). Text labels state: 'Hemoglobin carries oxygen & carbon dioxide', 'Carbon Monoxide binds very tightly to hemoglobin', and 'Oxygen and carbon dioxide can no longer be carried'. The 'FIRST ALERT' logo is at the bottom right.

Carbon monoxide poisons the body by replacing oxygen in our blood stream.

Hemoglobin is the molecule in red blood cells that carries oxygen from the lungs to tissues all over the body, and it brings carbon dioxide (CO<sub>2</sub>) back from the tissues. Carbon monoxide binds to the hemoglobin over 200 times more easily than oxygen does, so if CO is present, oxygen will not be able to find space to get into the hemoglobin. This is because the space is occupied with CO.

As a result, parts of the body will be starved of oxygen, and the affected parts will die. As you know, the human body needs oxygen, but it has no use for CO. If we breathe in CO, it provides no benefit, but it deprives the blood of oxygen. Mild exposure causes flu-like symptoms, which can lead to individuals misinterpreting what the actual problem is.

## Symptoms of CO

- The initial symptoms of low to moderate CO poisoning are similar to the flu but without the fever, including:
  - Headache
  - Fatigue
  - Shortness of breath
  - Nausea
  - Dizziness
- High-level CO poisoning results in progressively more severe symptoms, including:
  - Mental confusion
  - Vomiting
  - Loss of muscular coordination
  - Loss of consciousness
  - Ultimately death



Symptoms of carbon monoxide poisoning vary depending on concentration of parts per million. [read through symptoms on slide]

This is why it is crucial to have carbon monoxide alarms in the home.





Carbon monoxide alarms come in a variety of options – wired with battery back-up, battery only and plug-in with battery back-up. This enables families to choose what best fits their needs.

To ensure every home is safe, it is important to remember these key steps:

- The NFPA recommends installing smoke and CO alarms on every level of the home, and in/near every sleeping area.
- Test your alarms regularly to ensure they are in working order.
- Alarms do not last forever. Replace CO alarms every 5 to 10 years, depending on the model. If you can't remember the last time you changed your alarms then it's time to replace!
- Make and practice an escape plan with your family.



There are multiple types of carbon monoxide alarms.

Alarms should always be listed by a nationally recognized testing laboratory as complying with **ANSI/UL 2034** (for CO alarms), **ANSI/UL 2075** (if combined with an explosive gas detector) and/or **ANSI/UL 217** (for combination smoke and CO alarms).

CO alarms are typically either battery-operated or plug-in with a battery backup, such as the CO400 and the CO615 respectively. Combination smoke and CO alarms may be hardwired or have a 10-year sealed battery. First Alert has a new carbon monoxide alarm, the CO710, that has a 10-year sealed battery.

It is imperative to understand your local regulations for carbon monoxide alarms. For the purpose of most installation efforts, battery-powered alarms are supplied to avoid the need to hire an electrician (in case wiring doesn't already exist). Consider checking with your state fire marshal's office, local building department or division of fire safety for local regulations.

### Recommended Placement

- The NFPA recommends installing CO alarms near **every sleeping area** and on **every level** of the home
- CO alarms may be **placed high or low** because carbon monoxide disperses evenly in the air
  - Combination smoke/CO alarms should be installed according to smoke alarm guidelines
- Install alarms **at least 15 feet away** from sources of CO to reduce the chance of false or "nuisance" alarms
- Refer to alarms' **user manuals** for specific instructions

**Smoke Alarm**  
One on every level and in every bedroom

**CO** Carbon Monoxide Alarm  
One on every level and in every bedroom

**Fire Extinguisher**  
One on every level, plus kitchen and garage

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**Placement Considerations:**

- CO alarms may be placed high or low because carbon monoxide disperses evenly in the air
  - Combination smoke/CO alarms should be installed according to smoke alarm guidelines
- Make sure every person in the home can hear the CO alarm from his or her sleeping areas
- Keep alarms clear from dust and debris
- Ensure CO alarms are plugged all the way into a working outlet or, if battery-operated, have working batteries
- Do not install alarms right next to furnaces and fuel-burning appliances to avoid false alarms



## Replacing Alarms

- Alarms don't last forever
  - Replace CO alarms every 5 to 7 years (unless it is a 10-year CO alarm)
- Always remove malfunctioning, outdated or defunct alarms
- First Alert CO alarms have end-of-life signals, letting residents know when it is time to replace.

**4 beeps and a pause**  
Emergency: Carbon Monoxide has been detected. Move to fresh air and call 911.

**1 beep every minute**  
Low battery: It's time to replace the batteries in your carbon monoxide alarm.

**5 beeps every minute**  
End of Life: It's time to replace your carbon monoxide alarm.

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Carbon monoxide alarms should be replaced every five to seven years, smoke alarms should be replaced every 10 years. Interestingly, few of the laws requiring installation of CO alarms address replacement, though some do specify installation “according to manufacturer’s instructions.”

Do not leave old alarms installed in the home. This will help avoid homeowner confusion about maintenance and testing and/or the belief that they have more working alarms.

Carbon monoxide alarms can be discarded in the garbage. Be sure to check to see if battery recycling programs exist or are required in your area. Also, prior to embarking on a CO alarm installation program, check with your local waste management authority to learn of any disposal requirements for the alarms.

## If a CO Alarm Sounds

- Operate the test/silence button
- Call local emergency services – the fire department or 911
- Move to fresh air immediately
- Do not re-enter the premises or move away from the fresh air until first responders have cleared the home for re-entry



Always ensure residents know what to do if the carbon monoxide alarm does sound. [read through steps on slide].



Many CO alarms can be plugged in with a battery back-up. For those that you need to mount, carbon monoxide alarms generally come with their own mounting template, as well as screws, plastic screw anchors and batteries.

Installation is simple, and specific details are included in each product's user manual.

If you need to install an alarm from scratch, you will need a pencil to trace holes from the mounting plate to the wall or ceiling, as well as a drill and drill bit. Once you've inserted the plastic screw anchors that come with the alarm, you can attach the mounting bracket.

If you are installing a carbon monoxide alarm with batteries, install the batteries before mounting the alarm. Push them in the battery chamber until they snap in completely.

Use a marker to indicate the date of installation on the back of the alarm.

Test the alarm and instruct the resident on how and when to test the alarm. Weekly tests are recommended.

**Legislation**

- Nearly all states have some sort of carbon monoxide alarm requirement, either through adoption of IRC 2009 or subsequent editions, or further state or local legislation.
- For instance, many states adopted new building codes that took effect in 2010-2012. One- and two-family homes and townhomes with not more than three stories built in these years feature carbon monoxide alarms that have a useful life of seven years.
- The code requires CO alarms in the immediate vicinity of bedrooms.

**Carbon Monoxide**

\*Key: States in blue have some form of CO legislation, either at the state or local level.

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**Read Slide**

Any state or jurisdiction that has adopted IRC 2009 or later versions requires CO alarms in newly constructed homes. Many states adopted IRC 2009 in 2011, meaning one- and two-family homes built in 2011 feature carbon monoxide alarms whose useful life of seven years is expiring or will expire soon. This is because most carbon monoxide alarms at that time only lasted 5-7 years.

The code typically requires that alarms be placed in the immediate vicinity of bedrooms. It does not follow the NFPA recommendations for whole home coverage. In many cases, amendments to the standard code have been made as part of the state’s adoption. For example, the State of Arkansas does require CO alarms on each floor of a newly constructed home.

For more information on carbon monoxide legislation, visit [firstalert.com/carbonmonoxide](http://firstalert.com/carbonmonoxide)

## Legislation Lacking

- Existing homes
- Apartment buildings
- Student housing
- Hotels
- Religious homes
- Daycares
- Senior housing
- Schools




### Read Slide

What adoption of IRC 2009 or subsequent editions – all of which contain the requirement for CO alarms in newly built one- and two-family homes – overlooks is the significant number of existing homes, apartment buildings, student dormitories, hotels any other types of dwellings where people lay their heads at night. These types of properties are not generally included but may, in some cases, be subject to commercial codes that may or may not require CO alarms.

**Is a single code enough?**

- Several states that have adopted IRC 2009 or later editions have gaps to fill.
  - AL
  - AZ
  - AR
  - FL
  - GA
  - ID
  - IA
  - KY
  - LA
  - MI
  - MS
  - MT
  - NV
  - NH
  - NM
  - NC
  - ND
  - OK
  - SC
  - SD
  - VA



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Read Slide

What does this mean for folks in one of these states?

If your home is older than 10 years, you are a renter (with caveats – NC required alarms in all rental properties in 2010, Montana requires them in all landlord-controlled properties), you live in a dorm and other scenarios, you probably don't have a CO alarm unless your municipal or county government requires it, perhaps at point of sale or the onset of a new lease.

Many state governments have worked to fill in the gaps, but there are few standout examples that aim to provide more widespread CO protection for constituents.

## Considerations

- Differences Abound
  - Type of dwelling
  - Location
  - Power source/date of construction
  - Owner-occupied vs. rental properties
  - Public gathering places vs. private dwelling
  - Enforceability




Read Slide

As states began adopting laws – some as early as the late '90s – lawmakers considered all types of issues, such as [READ LIST] .

What this creates is a patchwork of laws that don't ever truly cover every scenario.

### “Seeing” the Danger

- A number of states have some model legislation that aims to cover as many residents as possible.
  - AK
  - CA
  - CO
  - IL
  - IA
  - ME
  - MN
  - NE
  - NJ
  - NY
  - OH
  - OR
  - RI
  - UT
  - VT
  - WA
  - WV
  - WI



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Read Slide

As I said, what adoption of IRC 2009 or subsequent editions – all of which contain the requirement for CO alarms in newly built one- and two-family homes – overlooks is the significant number of existing homes, apartment buildings, student dormitories, hotels, and other types of dwellings where people lay their heads at night.

Some lawmakers have seen these threats and addressed them. But while many state governments have worked to fill in the gaps, there are few overarching examples that would assure total protection from CO poisoning.

Of these states, some are very much tied to enforceability, which is the case of Nebraska’s requirement, or elements of Ohio’s CO alarm laws. In Nebraska, CO alarms are required in new multi-family dwellings, as well as existing dwellings that undergo renovation, rental properties that have a change in tenancy, and existing multi-family properties that are sold and bought. (*Effective date: January 2017*)

In the State of Ohio, CO alarms are required in newly constructed one- and two-family dwellings and townhomes not





more than three stories. (*Effective date: January 2013*) Also, CO alarms are required in existing multi-dwelling properties (hotels, motels, care facilities, multi-family housing, etc.) *Effective date: January 2019*

Not unique to Ohio, but some Ohio cities have made requirements of their own. For example, in Cleveland, a local ordinance, in effect since January 2017, requires CO alarms in all rental dwellings.

### A Model in Practicality

Breathe easy, Washington!

- Newly constructed one- and two-family dwellings and townhomes not more than three stories (effective January 2011)
- Owner-occupied single-family homes upon sale or transfer (effective July 2011)
- Existing R-1, R-2 and R-3 occupancies (effective January 2013)



#### Read Slide

The West Coast is an interesting case study for us. Neither California nor Washington was the first state to adopt a sweeping requirement for CO alarms, but their more recent laws provide good examples for review. Both of these states have sweeping laws that require CO alarms in almost all types of dwellings, which were implemented in stages. Further, they've passed the initial seven-year mark and have marked these "anniversaries" with outreach efforts, often with the support of alarm manufacturers and non-profit partners.





We always encourage residents to keep the manuals that come with the product. The manual provides a lot of useful information about what to do if a carbon monoxide alarm sounds, too. This is very valuable information that not everyone immediately understands. You can also reference manuals online at [www.firstalert.com](http://www.firstalert.com).

It's helpful to print and take educational information to leave with the resident during any CO alarm installation. There are many free resources available, including sample home escape plans, activity sheets for kids, safety tips, infographics and more. **Consider who is residing in the home (older adults, kids, pets, etc.) to help you determine what information is relevant to that household.** A list of these free resources is provided in your course materials.

The NFPA has a toolkit that can be a great source to help plan and implement a CO alarm installation program. This comprehensive guide provides everything from tips for families, community outreach ideas, a PSA and press materials to help publicize your program.

Source: <https://www.nfpa.org/public-education/resources/education-programs/community-tool-kits/keeping-your-community-safe-with-carbon-monoxide-alarms>

## For More Information

**First Alert**  
[www.firstalert.com](http://www.firstalert.com)  
[www.firstalert.com/carbonmonoxide](http://www.firstalert.com/carbonmonoxide)

**National Volunteer Fire Council**  
[www.nvfc.org](http://www.nvfc.org)

**National Fire Protection Association**  
[www.nfpa.org](http://www.nfpa.org)

**U.S. Consumer Product Safety Commission**  
<https://www.cpsc.gov/>

**U.S. Fire Administration**  
[www.usfa.fema.gov](http://www.usfa.fema.gov)



Here are list of organizations for more information. Be sure to check out their websites for tools and resources.

## Recap

- Understand carbon monoxide (CO), its effects and a key solution: making sure residents have working CO alarms
- Learn about poisoning prevention measures and the types of CO alarms available
- Gain a working knowledge of the status of CO alarm requirements across the country



We hope you now understand the strong need for community-based CO safety education and alarm installation programs, and feel that you have the tools to help your neighbors reduce the risk of fatalities from carbon monoxide poisoning. Remember, the first line of defense is a CO alarm. Proper CO alarm placement and alarm maintenance combined with providing education and resources will help make your community and those who answer the call safer.



Thank you for helping to make residents in your community safer and better prepared from the threats of CO poisoning!