

# What You Didn't Know About Alarms

Smoke alarms and CO alarms are more nuanced than most people realize

BY GLENN MATHEWSON

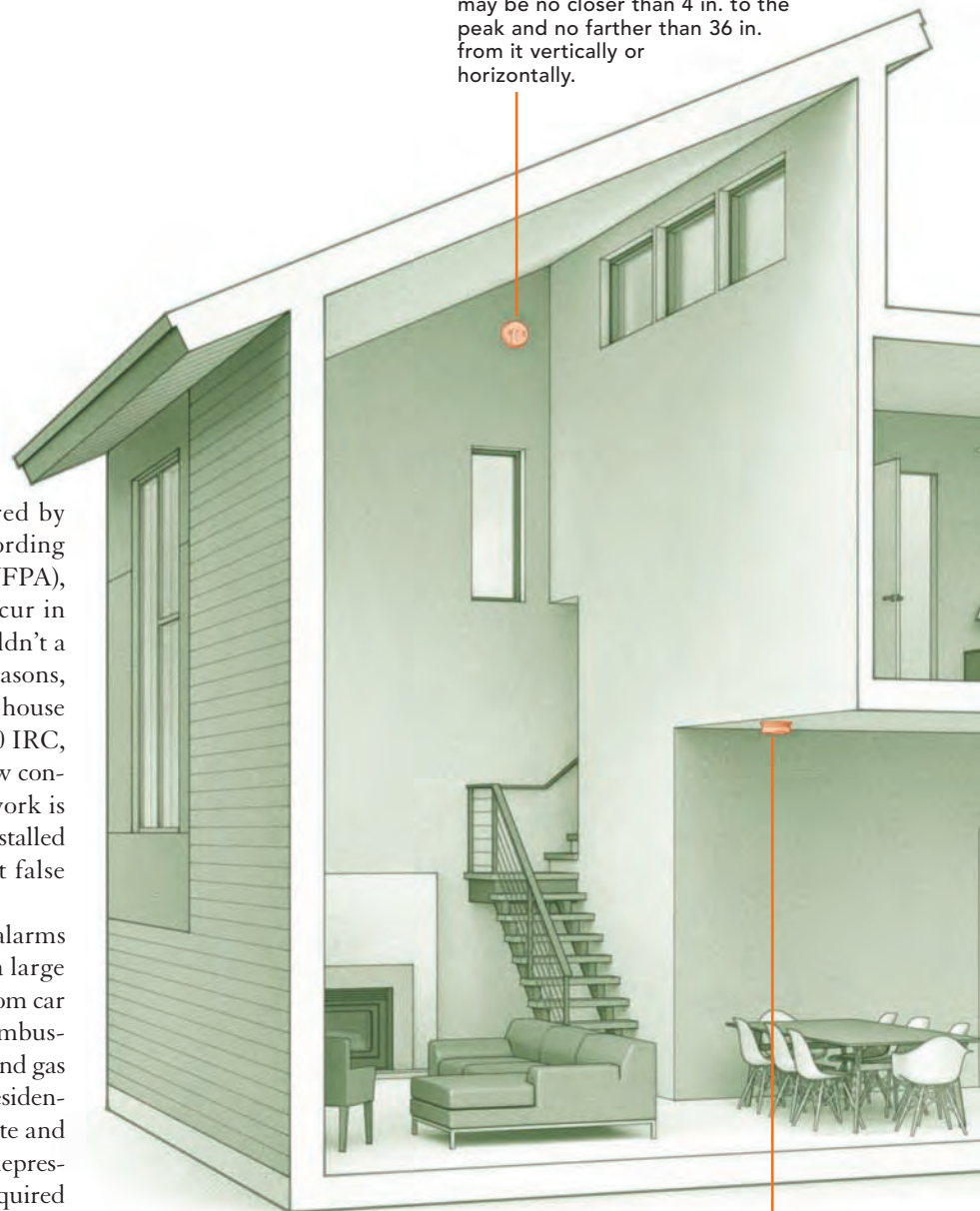
**R**esidential smoke alarms have been required by national building codes for decades, yet according to the National Fire Protection Association (NFPA), approximately 60% of home fire deaths occur in houses without functioning smoke alarms. Why wouldn't a home have functioning alarms? There are several reasons, including the increasingly unlikely one that an older house hasn't undergone a remodeling project since the 2000 IRC, when interconnected alarms were required both in new construction and when virtually any permitted interior work is done. In other cases, it could be that the alarms were installed in poor locations, were disabled because of frequent false alarms, or were beyond their useful life span.

In the 2009 IRC, hardwired carbon monoxide (CO) alarms joined smoke alarms as a requirement. While CO is a large component of smoke in a house fire, it also can come from car exhaust in attached garages or from poorly vented combustion appliances such as boilers, furnaces, water heaters, and gas stoves. CO has no odor, color, or taste. Levels found in residential fires can render a person unconscious in one minute and dead in three. Low-level exposure can cause headache, depression, confusion, and memory loss. CO alarms are not required to connect with a house's smoke alarms, although they may.

Until the 2012 IRC, *interconnection* was understood to be a physical connection of all alarms in a building via wiring. Alarms that communicate wirelessly are now allowed. They are still required to be powered by house current, but wireless alarms can offer many more features.

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**Code** Alarms on sloped ceilings may be no closer than 4 in. to the peak and no farther than 36 in. from it vertically or horizontally.



**Best practice** Combination ionization and photoelectric alarms to provide broad protection

**Code** Photoelectric smoke alarms must be at least 6 ft., and ionization alarms at least 20 ft. (10 ft. if they have a silencing button), from permanent cooking appliances.

# LOCATING ALARMS

For alarms to function, they need to be where the smoke or CO goes. That's why codes specify certain locations, and the NFPA has even more best-practice recommendations. Because smoke distribution in buildings is uneven, some pockets, such as corners or areas near fans or supply ducts, remain clear longer than others. Therefore, alarms may not be mounted

in those spots. On the other hand, if smoke alarms frequently cry wolf, they will eventually be disregarded or disabled. Steam is a common cause of false alarms, so there are requirements about locating them around bathrooms and kitchens. CO is another matter. Its density is about equal to that of air, so it doesn't necessarily rise to the ceiling. That's why CO alarms are not required to be installed high up.

**Code** Alarms must be at least 36 in. from a supply register of a forced-air HVAC system or from the tip of a ceiling fan's blades.

**Code** Wall-mounted smoke alarms must be between 4 in. and 12 in. from the ceiling.

**Code** Smoke alarms must be mounted no closer than 3 ft. from bathroom doors.

**Code** There must be a smoke alarm on every level and inside and outside every bedroom.

**Code** There must be a CO alarm outside every bedroom and inside ones with fireplaces.

**Best practice** CO alarm on every level



**Best practice** CO alarm near garage entry

**Best practice** No CO alarm near combustion appliances due to potential false alarms

**Code** CO alarms don't have any height requirements but are otherwise subject to the same location restrictions as smoke alarms.

## SMOKE-ALARM TYPES

**Ionization alarms** have a tiny amount of radioactive americium 241 that induces an electrical current between two plates. Smoke particles between those plates interrupt the current, triggering the alarm. Ionization alarms are very responsive to fires that produce little smoke.

**Photoelectric alarms** are best at detecting smoky fires. They aim an LED light across a chamber, away from an internal photo sensor. Smoke particles in the chamber reflect the light back to the photo sensor, activating the sensor and triggering the alarm.

Both ionization and photoelectric alarms satisfy the code, but combination ionization and photoelectric alarms offer the best of both worlds.

**Wireless alarms** can be powered from any nearby unswitched circuit and don't require a three-conductor cable to connect all the units. This can save installation costs in remodeling work.

**Smart alarms**, such as the Nest system, alert occupants to smoke or CO with a voice that says what's been detected and where. If CO is detected, the system signals a Nest thermostat and automatically shuts off the furnace, a likely source of CO. Smart alarms also can alert mobile devices.

### NOTE

**Replace your alarms.** You know to test your alarms monthly and to replace the batteries every six months, right? But you might not know that alarms wear out. Replace smoke alarms themselves every decade and CO alarms every two to six years depending on the manufacturer's instructions.