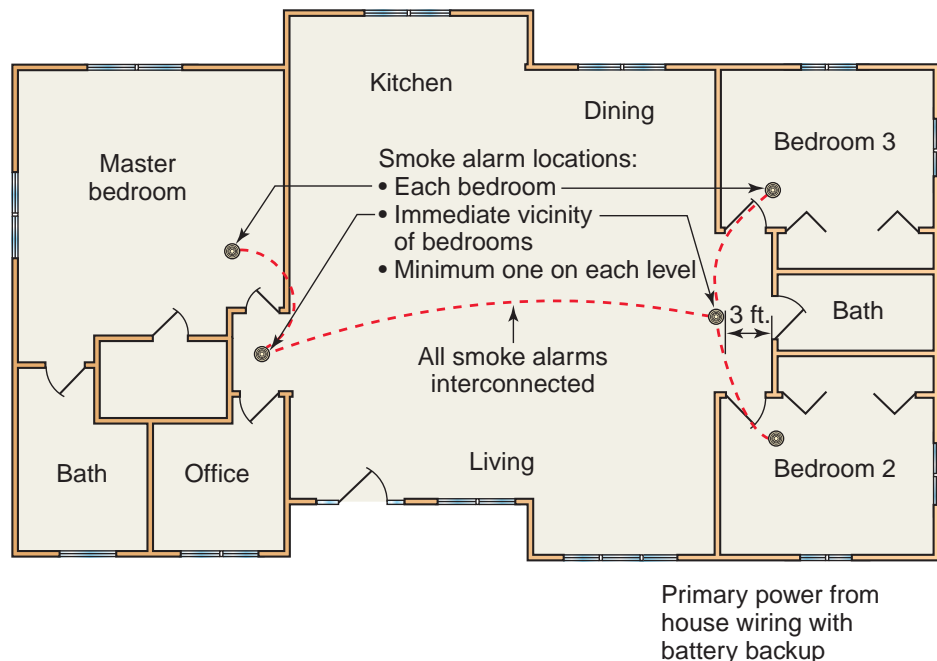




**FIGURE 9-1** Residential sprinkler in multipurpose loop system using PEX tubing  
*Courtesy of Uponor Inc.*

## SMOKE ALARMS

Occupants are most vulnerable to the hazards of fire while sleeping. Detection and notification in the early stages of a fire provide residents with needed time to escape before the interior environment becomes intolerable. The IRC requires a smoke alarm in each sleeping room, outside each sleeping area and on each additional story of the dwelling unit including basements and habitable attics (Figure 9-2). The code also stipulates that the building wiring system provide the primary power to the smoke alarms and that batteries supply backup power when primary power is interrupted. [\[Ref. R314\]](#)



**FIGURE 9-2** Smoke alarm locations

A smoke alarm is a self-contained device that provides both smoke detection and an alarm-sounding appliance. Smoke alarms must be listed as conforming to UL 217, Single and Multiple Station Smoke Alarms. The IRC requires interconnection of the devices such that when smoke is detected in one location, the alarms are activated in all locations. In addition to alerting residents on any story of the dwelling unit, interconnection ensures that the alarm is delivered to each bedroom at a sound-pressure level considered sufficient to wake a sleeping person. Wireless smoke alarms that communicate wirelessly through a host device are approved as satisfying the interconnection requirements. [Ref. R314.1, R314.4]

The IRC also regulates smoke alarms for existing dwellings when interior alterations or repairs requiring a permit occur or when an addition other than a deck or porch is constructed. In this case, the residence must be brought into conformance with the location requirements for smoke alarms in new construction. However, the power and interconnection provisions differ from those for new buildings. Because of the costs of installing electrical wiring in existing dwellings, the code allows battery-operated alarms without a connection to the house wiring. Interconnection of smoke alarms is still required in existing buildings unless there are practical difficulties in providing interconnection without damaging existing finishes. The retroactive provisions for updating smoke alarms do not apply to exterior renovations or to the addition of a deck or porch. Plumbing or mechanical work in existing dwellings also does not trigger the smoke alarm requirements. [Ref. R314.2.2, R314.4, R314.6]

As an alternative to smoke alarms, the IRC permits a fire alarm system installed in accordance with the household fire warning equipment provisions of NFPA 72, *National Fire Alarm Code*. A household fire alarm system typically has separate devices for smoke detection and alarm annunciation. Any such system must provide detection and notification equivalent to the IRC-prescribed requirements for smoke alarms. For example, a household fire warning system may have fewer notification devices placed in the building. When a detector in any of the prescribed locations activates the system, the alarm must be clearly audible in all bedrooms over background noise levels with all intervening doors closed. In general, the sound-pressure level at the pillow cannot be less than 70 decibels. [Ref. R314.7]

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## FIRE SPRINKLER SYSTEMS

An automatic fire sprinkler system conforming to IRC Section P2904, Dwelling Unit Fire Sprinkler Systems, or NFPA 13D, Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, aids in the detection and control of fires in dwellings and intends to prevent total fire involvement (flashover) in the room of fire origin for a period of time to allow the escape or evacuation of the dwelling occupants (Figure 9-3). The IRC requires an automatic fire sprinkler system installed in accordance with Section P2904 or NFPA 13D in all new one- and two-family dwellings and townhouses.