## Fire Safety Research: Standard Smoke Alarms Are Not Enough

When residential smoke alarms were first developed and widely distributed in the 1970s, the focus was on technology to detect smoke and/or heat, and little attention was paid to the nature of the signal. Many people – including people with hearing loss, older adults and children – do not wake up to the sound of a standard smoke alarm due to its high pitch. A 520 Hz square-wave signal – about the same frequency as a tornado siren – has been tested in six different studies and has been found to be most effective in waking people at risk.

Research published recently and over the last decade suggests that the 520 Hz square-wave signal is at least 4 to 12 times more effective than the current signal used in standard smoke alarms. In recent studies sponsored by the National Fire Protection Association and the U.S. Fire Administration:

- A 520 Hz square-wave T-3 sound was the single most effective signal, awakening 92 to 100 percent of participants with hearing loss, depending on the volume of the signal.
- The 3100 Hz pure tone T-3 sound, which is the tone in most standard smoke alarms, awoke only 56 percent of participants with hearing loss.
- Visual and tactile devices used alone were not as effective in waking most people at risk. Strobe lights awoke only 27 percent of participants with hearing loss, while bed shakers awoke 80 to 83 percent of participants with hearing loss.
- The low-pitch T-3 sound awoke children (aged 6 to 10) 96 percent of the time. The high-pitch standard alarm awoke children only 57 percent of the time.
- Ninety-four percent of children aged 6 to 15 years did not awake reliably to a standard alarm installed in their hallway.
- All of the older adult participants awoke to a lower volume for the 520 Hz square-wave signal.

The data presented showed that the current high-pitched smoke alarm was consistently the least effective at waking people.

### Fire Alarm Research Studies


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