Smoke Alarm Replacement

When you buy a VCR, radio or other electronic equipment, you don't typically expect that it will last forever. Eventually, one of the many components fails, rendering the device inoperative and usually requiring replacement. Smoke alarms too can stop working when either the power source is removed or a part breaks. Unlike your VCR, a smoke alarm is not used on a regular basis, making regular testing critical to maintaining protection. Even with proper care, smoke alarms eventually require replacement to prevent an unrecognized failure from leaving your home unprotected.

In the ten years from the mid 1970's to the mid 1980's, a tremendous number of smoke alarms were installed in homes throughout the country, an important contributor to the reduction in fire fatalities seen during this period. In 1976, less than 10% of all homes had a smoke alarm, while in 1986, nearly 80% did [1]. Over the next 14 years the increase in the number of protected homes slowed dramatically, so that today slightly over 90% of all homes have a smoke alarm. Many of the smoke alarms installed in homes are now over 20 years old, making it time to think about replacement.

A nationwide Consumer Product Safety Commission (CPSC) study of smoke alarms in 1992 showed that 25% of the installed smoke alarms failed to respond to the test button or an aerosol smoke test spray [2]. Since the average number of smoke alarms per household is 1.6, this means that 20% of the households with smoke alarms did not have a single alarm that worked. Add in the 10% of the homes without alarms and 30% of all homes in this country do not have a single operating smoke alarm! The 2002 Fire in Minnesota Report shows that 60% of all building fire fatalities in the state occurred with no smoke alarms or inoperable smoke alarms present [3]. While it is clearly necessary to continue pushing for smoke alarms in homes without them, it is also necessary to address the problem of why so many installed alarms are inoperative.

Requirements in the 2007 Minnesota State Fire Code

MSFC (07) Section 907.2.10 requires all dwelling units to have hardwired, interconnected smoke alarms with battery backup. These alarms must be installed in all sleeping rooms, outside of each sleeping area and on each level of the home.

MSFC (07) Section 907.3.6 does allow code compliant smoke alarms installed prior to July 9, 2007 to remain as long as they are properly maintained. It also states that homes built prior to August 1, 1989 may install battery alarms only.

Guidance from the 2002 edition of NFPA 72

New wording in Chapter 11 of the 2002 edition of NFPA 72 greatly clarifies the issue of smoke alarm replacement. Basically, in apartments and one and two family dwellings, smoke alarms shall be replaced when they fail to respond to tests, but shall not remain in service longer than 10 years after the date of installation. Additionally, most smoke alarm manufacturers now indicate a maximum service lifetime of 10 years for their product. In fact, the new long life battery powered

smoke alarms have a battery that doesn't need to be changed for 10 years. Since the battery is not designed to be changed, the directions with the alarm recommend that the entire unit (battery and alarm) be discarded and replaced at the end of 10 years.

Why was 10 years selected for replacement?

Although incomplete, the data for smoke alarms indicate that about 3% fail in a given year [4,5].

This is the rate of alarm failure based on statistically random equipment malfunction and does not represent alarms that do not operate because the power supply was removed. So at the end of one year, 97% of the alarms should still be functioning if supplied with power. In an ideal world, it would be desirable to replace alarms every year to minimize failures, but this would never happen due to cost. After 20 years, only 54% of the alarms could be expected to work, clearly not an acceptable level. Although it may seem like too many failures to allow, at 10 years about 73% of the alarms should still be operational when powered. Monthly testing and maintenance should catch failures much sooner, so that replacement at 10 years is simply a backup for people who do not test their alarms.

But don't most alarms fail because the power was removed?

By far, the most common reason why alarms do not work is because the power supply has been removed. The CPSC study found that 60% of the alarm failures were the result of disconnected AC power and dead or removed batteries [2]. Almost always, the power was intentionally removed because of problems with false alarms. But additional field studies by the CPSC discovered that approximately 50% of the inoperable alarms they found were over 10 years old. Several reasons lead to the discouraging fact why so many older alarms are disconnected:

- As alarms age, they experience sensitivity drifting that usually results in the alarm becoming more sensitive. The alarm may then alarm for no reason or more frequently when cooking, for example.
- In some cases, older alarms were manufactured to be more sensitive. Again, too many false alarms cause people to remove power from their alarm.
- Newer smoke alarms incorporate hush features that allow a false alarm to be silenced.

Clearly, this makes it important that older alarms, especially the ones that were installed in the 1970's and 1980's, need to be replaced. In addition to being more likely to fail, they are more likely to have the power removed.

Recommendations

Operating smoke alarms have been shown to cut your chance of dying in a home fire in half [1]. To improve the level of protection, smoke alarms should be replaced when any of the following occur:

- The alarm fails to respond by the test button or with an aerosol smoke spray. Check to make sure the alarm is powered and if necessary retest the alarm after power has been returned.
- The alarm has been painted, physically damaged or received water damage.

- The alarm has been exposed to a fire, or large accumulations of grease.
- The alarm frequently produces false alarms for no reason.
- The smoke alarm has exceeded the manufacturer's recommended service live, or has been in use for more than 10 years.

More information is available from the Minnesota State Fire Marshal Division at (651) 201-7219. You can also email questions to firecode@state.mn.us or visit our web page at www.dps.state.mn.us/fmarshal for the latest information on fire in Minnesota.

References

[1] Ahrens, Marty, "Batteries not Included," NFPA Journal. National Fire Protection Association, May/June 1998, pages 98-109.

[2] Smith, C. L., "Smoke Alarm Operability Survey: Report on Findings (revised)," U. S. Consumer Product Safety Commission, October 1994. Results published in the International Journal for Consumer Safety, Vol. 1, No. 1, March 1994.

[3] "Fire in Minnesota, Fire Reporting System" Minnesota Department of Public Safety, State Fire Marshal Division, 2007

[4] Ontario Canada Housing Corporation field study on smoke alarm performance.