

## Fire Alarm System Inspection, Testing and Maintenance (ITM)

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Performing routing inspection, testing and maintenance (ITM) on fire alarm systems and fire warning equipment is essential to ensuring this important safety equipment will do its job when needed. This article will present an over view of some of the points to consider in implementing an ITM program.

NFPA 72, National Fire Alarm and Signaling Code, includes ITM requirements in Chapter 14, Inspection, Testing and Maintenance. A specific edition of NFPA 72 is usually adopted by reference from the building, occupancy or fire Code being enforced by the local jurisdiction. While the installation requirements of NFPA 72 are not generally retroactive, the ITM requirements in Chapter 14 are retroactive. What this means is that even older fire alarm system installations are required to conform to the ITM requirements of latest edition of NFPA 72 being enforced. The most recent edition of NFPA 72 is the 2013 edition. Previous editions include 2010, 2007, 2002, 1999, 1996 and 1993. Each of these editions includes a

specific chapter on ITM including requirements for ongoing periodic inspection, testing and maintenance.

A distinction is made in NFPA 72 between fire alarm systems and fire warning equipment. Commercial fire alarm systems are comprised of a fire alarm control unit (control panel) and system components such as manual fire alarm boxes (pull stations), smoke and heat detectors and sprinkler water-flow devices, as well as audible and visible notification appliances (speakers, horns and strobes). Fire warning equipment includes smoke alarms and household fire alarm systems. Household fire alarm systems are similar to commercial fire alarm systems but their application is more limited. By contrast, smoke alarms are not part of a fire alarm system and are self-contain detection/ alarm devices that can be either a stand-alone version (single-station) or an interconnect-able version (multiple-station). Fire alarm systems are generally installed in assembly, business, educational and other occupancies. They

are also installed to serve the building in general for hotels, dormitories, lodging and rooming houses, and apartment buildings. Smoke alarms are generally installed in one- and two-family dwellings; dwelling units (apartments) in apartment buildings; and guest/sleeping rooms and suites in hotels, dormitories, and lodging and rooming houses.

Inspection and testing is required both at the initial acceptance of the fire alarm system (including household fire alarm systems) and at periodic intervals throughout the life of the system. While periodic inspection and testing is often viewed to be an annual event, in reality inspection and testing for some components of the system are required monthly, quarterly or semi-annually. In fact some components are even required to have weekly or daily inspection. The specific inspection and testing methods and frequencies required for each component of the system are specified in two tables in the 2013 edition: Table 14.3.1, Visual Inspection; and Table 14.4.3.2, Test-

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ing. The manufacturer's instructions are also required to be followed. Inspection, testing and maintenance of smoke alarms will be addressed separately later in this article.

The inspection, testing and maintenance of fire alarm systems and fire warning equipment are the responsibility of property, building or system owner. The owner is permitted to delegate this responsibility but must do so by written agreement or contract.

Personnel conducting ITM activities are required to be qualified to do so. The personnel qualification requirements for service personnel have been updated in the 2013 of NFPA 72 to better tailor the level of qualification to the type of service activity being performed. While all service personnel must be qualified to perform the task at hand, the level of qualification needed to perform some routine inspections would not be the same as for the person involved in activities such as programming the system.

The purpose of periodic inspections is to make sure there are no changes since

the original equipment installation that would affect the equipment performance. This can occur when the building is remodeled or furnishings are changed. Detectors may have been covered or disabled during remodeling activities and not restored to normal once the activities are complete. The addition of walls or partitions could affect the basis of the original spacing of devices or appliances and thereby affect their performance. Visual inspections should also check for obvious impairment such as physical damage to equipment.

Prior to the performance of periodic testing anyone that may receive an alarm, supervisory or trouble signal must be notified in advance of testing to prevent unnecessary response. This includes building occupants and supervising station facilities.

The latest edition of NFPA 72 includes a new requirement to produce a written test plan that establishes the scope of testing for the system. Testing is often done in a segmented fashion to avoid operational and personnel disruption and accommodate personnel availability. The

test plan is intended to clarify exactly what is to be tested and how it is to be tested. Having a well documented test plan helps to keep track of individual testing segments and provide assurance that the entire system is tested. Where some portions of the system remain temporarily untested, the test plan/results provide a means to flag the untested segments so they don't fall through the cracks. The test plan and results are required to be documented with the testing records.

The purpose of periodic testing is to verify the correct operation of the system/equipment. As an example, system smoke detectors are required to be tested to assure smoke can enter the sensing chamber and an alarm is produced in response. This required to be done on an annual basis. System smoke detectors are also required to be tested to verify that their operational sensitivity is still within its listed and marked range. This is required within one year of installation and then every other year thereafter. The two-year period can be extended to a maximum of 5 years if the re-

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sults of testing demonstrate that the sensitivity has remained within its listed and marked range.

Periodic inspection, testing and maintenance are also required for single- and multiple-station smoke alarms. This is especially important to keep in mind because these devices are often overlooked by dwelling unit and other building occupants and property/building owners. In addition this equipment is often the first line of defense for occupants in residential-type occupancies. It is important that a program for inspection, testing and maintenance of these devices is put in place by the property/building owner or delegated responsible party.

As a minimum smoke alarms need to be inspected and tested in accordance with the manufacturer's published instructions at least monthly. Manufacturer's usually recommend using the smoke alarm's built-in test feature and often specify weekly testing. Up until the 2013 edition of NFPA 72 smoke alarms in other than one- and two-family dwellings were also required to be functionally tested on an annual basis using smoke or listed aero-

sol acceptable to the smoke alarm manufacturer. In addition, these smoke alarms were also required to be tested for sensitivity in a similar fashion as required for commercial smoke detectors. For the 2013 edition of NFPA 72 the requirement for smoke/aerosol testing and sensitivity testing have been removed.

The plan established for inspection testing and maintenance of smoke alarms needs to assure that the unit's batteries are replaced in accordance with manufacturer's instructions. Smoke alarms are designed with an audible trouble signal (usually a chirp) when the battery needs to be replaced. A program that includes annual battery replacement should avoid the need to respond to a low-battery trouble signal.

The plan established for inspection testing and maintenance of smoke alarms also needs to address the replacement of smoke alarms. NFPA 72 requires the replacement of smoke alarms in one- and two-family dwellings every ten years. In addition some manufacturers require 10-year replacement regardless of the

type of occupancy involved. If combination smoke/carbon monoxide (CO) alarms are used, the replacement frequency will likely be shorter than 10 years due to the more limited life of the CO sensor. The replacement frequency for CO alarms is specified by the manufacturer.

When replacing smoke alarms there are some important things to consider. Interconnected smoke alarms need to be listed as being compatible with one another, especially when different manufacturers are involved. Manufacturers published instructions will specify a list of compatible smoke alarms. When selecting replacement smoke alarms, it is advisable to choose smoke alarms that include both ionization and photoelectric sensing technology. NFPA recommends the use of both technologies to provide the earliest warning. It is also important to note that older homes may not be up-to-date with the latest requirements for the installation of smoke alarms. To provide a minimum level of protection smoke alarms should be installed in all sleeping rooms, outside each sleeping area, and on every

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level. Where possible all smoke alarms should be interconnected. Some smoke alarms are now available with wireless interconnection technology so they can be more easily interconnected.

Another thing to consider in planning for the replacement of smoke alarms is their location relative to sources of nuisance activations. Nuisance alarms are most often caused by cooking activities. Smoke alarms that use ionization technology are generally more sensitive to these sources than those that use only photoelectric technology. While the installation of smoke alarms in kitchens has always been discouraged, restrictions on the

placement of smoke alarms near cooking appliances have been included in NFPA 72 beginning with the 2010 edition. No smoke alarms should be installed within 10 feet of a fixed cooking appliance (except in special circumstances defined in NFPA 72). Smoke alarms between 10 and 20 feet from a fixed cooking appliance should be of the photoelectric type or include an alarm silencing (hush) feature. The 2013 edition of NFPA 72 includes a new requirement, effective in 2016, that smoke alarms installed within 20 feet of a cooking appliance be resistant to common nuisance sources from cooking. Inspection, testing and maintenance of fire alarm systems and fire

warning equipment are essential to assure the proper operation of these systems. Programs should be established to assure that these systems and equipment are inspected, tested and maintained on an ongoing basis in accordance with the latest edition of NFPA 72 being enforced and in accordance with manufacturer's published instruction. While building and system owners are responsible to assure that systems and equipment are properly inspected, testing and maintained, building occupants would do well to make sure that ITM programs are in place since they may ultimately be the ones impacted if systems and equipment don't perform as intended.

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