

What Testing Do I Need To Do? - Part 4

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In the previous three issues, we have been answering the following question:

“My supervisor has recently placed me in charge of the fire alarm system maintenance for seven locations of our nursing home chain in the northwest part of the state. I really don’t know where to begin. Exactly what testing do I need to do on these systems?”

As I stated before, you have been given both an enormous challenge and an enormous opportunity. The challenge: to bring yourself up to speed on the requirements for properly inspecting, testing, and maintaining the fire alarm systems under your care. The opportunity: to significantly impact in assuring the long term reliability of these systems that provide such a vital service in protecting the lives of the clients using your facilities.

Recently, the National Fire Protection Association has adopted the 2002 edition of NFPA 72, *National Fire Alarm Code*. However, since I began this discussion with reference to the 1999 edition of the Code, I will continue using that edition as the reference. Many jurisdictions will continue to reference the 1999 edition until their statute revision process allows them to update their reference to the 2002 edition.

NFPA 72-1999, *National Fire Alarm Code*, provides numerous requirements relating to this subject in Chapter 7, “Inspection, Testing and Maintenance.” As we continue to consider these

requirements, we need to next look at Section 7.1.6. This section contains the following requirements:

7-1.6 System Testing.

7-1.6.1 Initial Acceptance Testing. All new systems shall be inspected and tested in accordance with the requirements of Chapter 7.

7-1.6.2* Reacceptance Testing.

7-1.6.2.1 Reacceptance testing shall be performed after any of the following:

- (1) Added or deleted system components
- (2) Any modification, repair, or adjustment to system hardware or wiring
- (3) Any change to site-specific software.

All components, circuits, systems operations, or site-specific software functions known to be affected by the change or identified by a means that indicates the system operational changes shall be 100 percent tested. In addition, 10 percent of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, also shall be tested, and correct system operation shall be verified. A revised record of completion in accordance with 1-6.2.1 shall be prepared to reflect any changes.

7-1.6.2.2 Changes to all control units connected or controlled by the system executive software shall require a 10 percent functional test of the system, including a test of at least one device on each input and output circuit to verify critical system functions such as notification appliances, control functions, and off-premises reporting.

This Section breaks the testing into three components: initial/acceptance testing, reacceptance testing, and periodic testing. It then proceeds to give a very detailed requirement for reacceptance testing. The purpose of these very restrictive requirements is to assure the operational integrity of the fire alarm system when someone makes changes to the system.

The requirements of this Chapter continue as follows:

7-2 Test Methods.

7-2.1* Central Stations. At the request of the authority having jurisdiction, the installation shall be inspected for complete information regarding the system, including specifications, wiring diagrams, and floor plans that have been submitted for approval prior to installation of equipment and wiring.

7-2.2* Fire alarm systems and other systems and equipment that are associated with fire alarm systems and accessory equipment shall be tested according to Table 7-2.2.

This portion of the Code makes specific reference to Table 7-2.2. If you review this Table in your copy of the Code, you will note that it contains very detailed requirements for the methods that a trained technician should use to perform initial/acceptance tests, reacceptance tests or periodic tests. The Code continues with the following requirements:

7-3 Inspection and Testing Frequency.

7-3.1* Visual Inspection. Visual inspection shall be performed in accordance with the schedules in Section 7-3 or more often if required by the authority having jurisdiction. The visual inspection shall be made to ensure that there are no changes that affect equipment performance.

Exception No. 1: Devices or equipment that is inaccessible for safety considerations (for example, continuous process operations, energized electrical equipment, radiation, and excessive height) shall be inspected during scheduled shutdowns if approved by the authority having jurisdiction. Extended intervals shall not exceed 18 months.

Exception No. 2: If automatic inspection is performed at a frequency of not less than weekly by a remotely monitored fire alarm control unit specifically listed for such application, the visual inspection frequency shall be permitted to be annual. The requirements of Table 7-3.1 shall apply.

Exception No. 2 contains some confusing information, principally because no one really knows what constitutes an "automatic inspection." We suspect that the Technical Committee added this Exception for consistency with similar wording that relates to the requirements for periodic testing, without considering the unlikely nature of such a requirement.

This portion of the Code introduces another Table. Table 7-3.1 provides a list of frequencies for visual inspection of the various components of a fire alarm system. In developing specific procedures for your seven nursing homes, you should use this Table 7-3.1 to guide you in determining how often you should make visual inspections.

The Code continues the requirements as follows:

7-3.2* Testing. Testing shall be performed in accordance with the schedules in Chapter 7 or more often if required by the authority having jurisdiction. If automatic testing is performed at least weekly by a remotely monitored fire alarm control unit specifically listed for the application, the manual testing frequency shall be permitted to be extended to annual. Table 7-3.2 shall apply.

Exception: Devices or equipment that are inaccessible for safety considerations (for example, continuous process operations, energized electrical equipment, radiation, and excessive height) shall be tested during scheduled shutdowns if approved by the authority having jurisdiction but shall not be tested more than every 18 months.

Once again, the Code makes reference to a Table. This time, Table 7-3.2 gives a list of frequencies for initial/acceptance testing and periodic testing of the various components of a fire alarm system. In addition to the requirements contained within the Table, the Code also provides some additional requirements as follows:

7-3.2.1* Detector sensitivity shall be checked within 1 year after installation and every alternate year thereafter. After the second required calibration test, if sensitivity tests indicate that the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked), the length of time between calibration tests shall be permitted to be extended to a maximum of 5 years. If the frequency is extended, records of detector-caused nuisance alarms and subsequent trends of these alarms shall be maintained. In zones or in areas where nuisance alarms show any increase over the previous year, calibration tests shall be performed.

To ensure that each smoke detector is within its listed and marked sensitivity range, it shall be tested using any of the following methods:

- (1) Calibrated test method
- (2) Manufacturer's calibrated sensitivity test instrument

- (3) Listed control equipment arranged for the purpose
- (4) Smoke detector/control unit arrangement whereby the detector causes a signal at the control unit where its sensitivity is outside its listed sensitivity range
- (5) Other calibrated sensitivity test methods approved by the authority having jurisdiction

Detectors found to have a sensitivity outside the listed and marked sensitivity range shall be cleaned and recalibrated or be replaced.

Exception No. 1: Detectors listed as field adjustable shall be permitted to be either adjusted within the listed and marked sensitivity range and cleaned and recalibrated, or they shall be replaced.

Exception No. 2: This requirement shall not apply to single station detectors referenced in 7-3.3 and Table 7-2.2.

The detector sensitivity shall not be tested or measured using any device that administers an unmeasured concentration of smoke or other aerosol into the detector.

7-3.2.2 Test frequency of interfaced equipment shall be the same as specified by the applicable NFPA standards for the equipment being supervised.

7-3.2.3 For restorable fixed-temperature, spot-type heat detectors, two or more detectors shall be tested on each initiating circuit annually. Different detectors shall be tested each year, with records kept by the building owner specifying which detectors have been tested. Within 5 years, each detector shall have been tested.

7-3.2.4* For testing addressable and analog-described devices, which are affixed to either a single, molded assembly or a twist-lock type affixed to a base, testing shall be conducted using the signaling style circuits (Styles 0.5 through 7).

Analog-type detectors shall be tested with the same criteria.

7-3.3 Single station smoke detectors installed in one- and two-family dwelling units shall be inspected, tested, and maintained as specified in Chapter 8. Single station detectors installed in other than one- and two-family dwelling units shall be tested and maintained in accordance with Chapter 7.

7-3.4 Test of all circuits extending from the central station shall be made at intervals of not more than 24 hours.

7-3.5 Public Fire Reporting Systems.

7-3.5.1 Emergency power sources other than batteries shall be operated to supply the system for a continuous period of 1 hour at least weekly. This test shall require simulated failure of the normal power source.

7-3.5.2 Testing facilities shall be installed at the communications center and each subsidiary communications center, if used.

Exception: If satisfactory to the authority having jurisdiction, those facilities for systems leased from a nonmunicipal organization that might be located elsewhere.

The first Section states the requirements for the sensitivity testing of smoke detectors. The requirements offer five alternative methods to perform this important test. Then the *Code* ties the testing of interfaced equipment to the NFPA code or standard that contains the requirements for the interfaced equipment itself. Next the *Code* provides requirements for testing restorable fixed temperature heat detectors, addressable/analog devices, single station smoke alarms used in one- and two-family dwelling units, and circuits extending from a central station. The *Code* concludes with some requirements specifically relating to public fire alarm reporting systems.

Having completed the requirements for inspection and testing, the *Code* completes Chapter 7 by presenting the requirements for maintenance of a fire alarm system. These requirements include the following:

7-4 Maintenance.

7-4.1 Fire alarm system equipment shall be maintained in accordance with the manufacturer's instructions. The frequency of maintenance shall depend on the type of equipment and the local ambient conditions.

7-4.2 The frequency of cleaning shall depend on the type of equipment and the local ambient conditions.

7-4.3 All apparatus requiring rewinding or resetting to maintain normal operation shall be rewound or reset as promptly as possible after each test and alarm. All test signals received shall be recorded to indicate date, time, and type.

7-4.4 The retransmission means as defined in Section 5-2 shall be tested at intervals of not more than 12 hours. The retransmission signal and the time and date of the retransmission shall be recorded in the central station.

Exception: If the retransmission means is the public switched telephone network, it shall be permitted to be tested weekly to confirm its operation to each public fire service communications center.

7-5 Records.

7-5.1* Permanent Records. After successful completion of acceptance tests approved by the authority having jurisdiction, a set of reproducible as-built installation drawings, operation and maintenance manuals, and a written sequence of operation shall be provided to the building owner or the owner's designated representative. The owner shall be responsible for maintaining these records for the life of the system for examination by any authority having jurisdiction. Paper or electronic media shall be permitted.

7-5.2 Maintenance, Inspection, and Testing Records.

7-5.2.1 Records shall be retained until the next test and for 1 year thereafter.

7-5.2.2 A permanent record of all inspections, testing, and maintenance shall be provided that includes the following information regarding tests and all the applicable information requested in Figure 7-5.2.2.

- (1) Date
- (2) Test frequency
- (3) Name of property
- (4) Address
- (5) Name of person performing inspection, maintenance, tests, or combination thereof, and affiliation, business address, and telephone number
- (6) Name, address, and representative of approving agency(ies)
- (7) Designation of the detector(s) tested, for example, "Tests performed in accordance with Section _____."
- (8) Functional test of detectors
- (9)* Functional test of required sequence of operations
- (10) Check of all smoke detectors
- (11) Loop resistance for all fixed-temperature, line-type heat detectors
- (12) Other tests as required by equipment manufacturers
- (13) Other tests as required by the authority having jurisdiction
- (14) Signatures of tester and approved authority representative
- (15) Disposition of problems identified during test (for example, owner notified, problem corrected/successfully retested, device abandoned in place)

7-5.3 For supervising station fire alarm systems, records pertaining to signals received at the supervising station that result from maintenance, inspection, and testing, shall be maintained for not less than 12 months. Upon request, a hard copy record shall be provided to the authority having jurisdiction. Paper or electronic media shall be permitted.

7-5.4 If the operation of a device, circuit, control panel function, or special hazard system interface is simulated, it shall be noted on the certificate that the operation was simulated, and the certificate shall indicate by whom it was simulated.

The *Code* makes reference to a sample Inspection Form that appears as Figure 7-5.2.2. The *Code* also provides very clear requirements for maintenance and record keeping in this Section.

As you can see, NFPA 72-1999, *National Fire Alarm Code*, will provide you with very precise guidance as you oversee the inspection, testing, and maintenance for the fire alarm systems in the seven nursing homes for which you have been given responsibility. If you adhere to this guidance, you will preserve the integrity of those systems, extend their useful life, and provide the level of protection that the patrons deserve to have.

Next issue, I plan to begin to explore the changes the Technical Committees have introduced into the 2002 edition of the *National Fire Alarm Code*.

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