AGENDA

NFPA TECHNICAL COMMITTEE ON TESTING AND MAINTENANCE

Report on Proposal Meeting
January 18-20, 2011
Hard Rock Hotel
San Diego, CA

Item No.	Subject
11-1-1	**Call to Order**
11-1-2	**Introduction of Members and Guests**
11-1-3	**Staff Remarks**
11-1-4	**Chair Remarks**
11-1-5	**Approval of Pre-ROP Meeting Minutes**
11-1-6	**Task Group Reports**
11-1-7	**Processing of Proposals** [Enclosure]
11-1-8	**Other Business**
11-1-9	**Adjournment**

Sort Listing

Proposal #	Log#	Comm. Action	Tech. Comm.	Section
72-9	CP9		SIG-TMS	- (Entire Document):
72-17	436a		SIG-TMS	- (3.3.xx Deficiency, 10.19, 14.2.1.2, and Chapter):
72-28	498f		SIG-TMS	- (3.3.52 Condition, 3.3.228 Response, and 3.3.240):
72-65	117f		SIG-TMS	- (Chapter 4):
72-74	333f		SIG-TMS	- (Chapter 8):
72-80	325		SIG-TMS	- (10.4.xx (New)):
72-81	326		SIG-TMS	- (10.4.xx (New)):
72-84	327		SIG-TMS	- (10.4.3):
72-86	516		SIG-TMS	- (10.4.3):
72-87	541		SIG-TMS	- (10.4.3.1 and 10.4.3.2):
72-173	482		SIG-TMS	- (Chapter 13, 14, and 15):
72-174	25		SIG-TMS	- (Chapter 14):
72-175	543		SIG-TMS	- (14.2.1 (New)):
72-176	87		SIG-TMS	- (14.2.1.2.4 (New)):
72-177	429		SIG-TMS	- (14.2.2.2):
72-178	323		SIG-TMS	- (14.2.2.4):
72-179	271		SIG-TMS	- (14.2.9 and A.14.2.9 (New)):
72-180	135		SIG-TMS	- (Table 14.3.1):
72-181	442		SIG-TMS	- (Table 14.3.1, Item 15):
72-182	443		SIG-TMS	- (Table 14.3.1, Item 15):
72-183	566a		SIG-TMS	- (Table 14.3.1, Table 14.4.2.2, and Table 14.4.5):
72-184	46		SIG-TMS	- (14.4.1.1.1):
72-185	47		SIG-TMS	- (14.4.1.2.1):
72-186	27		SIG-TMS	- (14.4.1.2.2):
72-187	542		SIG-TMS	- (Table 14.4.2.2 and Table 14.4.5):
72-187a	583		SIG-TMS	- (14.4.2.2(14)(j)):
72-188	258		SIG-TMS	- (Table 14.4.2.2 Item12(e)):
72-189	273		SIG-TMS	- (Table 14.4.2.2 Item12(e)):
72-190	237		SIG-TMS	- (Table 14.4.2.2 Item 13(b)):
72-191	251		SIG-TMS	- (Table 14.4.2.2 Item 14(d)(1)):
72-192	142		SIG-TMS	- (Table 14.4.2.2 Item 14(d)(3)):
72-193	252		SIG-TMS	- (Table 14.4.2.2 Item 14(d)(5)):
72-194	290		SIG-TMS	- (Table 14.4.2.2 Item 14(g)):
72-195	427		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(1)):
72-196	253		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(1)):
72-197	254		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(2)):
72-198	275		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(2)):
72-199	291		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(2)):
72-200	255		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(5)):
72-201	256		SIG-TMS	- (Table 14.4.2.2 Item 14(g)(6)):

Sort Listing

Proposal #	Log#	Comm. Action	Tech. Comm.	Section
72-202	257		SIG-TMS	- (Table 14.4.2.2 Item 14(h)):
72-203	276		SIG-TMS	- (Table 14.4.2.2 Item 15):
72-204	507		SIG-TMS	- (Table 14.4.2.2 Item 15):
72-205	139		SIG-TMS	- (Table 14.4.2.2 Item 15(i)):
72-206	277		SIG-TMS	- (Table 14.4.2.2 Item 17(f)):
72-207	161		SIG-TMS	- (Table 14.4.2.2 Item 18(b)):
72-208	444		SIG-TMS	- (Table 14.4.2.2 Item 18(b)):
72-209	438		SIG-TMS	- (Table 14.4.2.2 Item 18(f) (New)):
72-210	439		SIG-TMS	- (Table 14.4.2.2 Item 18(f) (New)):
72-211	440		SIG-TMS	- (Table 14.4.2.2 Item19(g) (New)):
72-212	278		SIG-TMS	- (Table 14.4.2.2 Item 21(b), Table 14.4.5 Item):
72-213	131		SIG-TMS	- (Table 14.4.2.2 Item 23):
72-214	274		SIG-TMS	- (Table 14.4.2.2 Item 23 and A.14.4.2.2):
72-215	136		SIG-TMS	- (Table 14.4.2.2 Item 26(2)):
72-216	44		SIG-TMS	- (14.4.3 and 14.4.4):
72-217	45		SIG-TMS	- (14.4.3 and 14.4.4):
72-218	441		SIG-TMS	- (Table 14.4.5 Item 24(h)):
72-219	426		SIG-TMS	- (Table 14.4.5.1 Item 1 and 2):
72-220	8		SIG-TMS	- (14.4.5.3):
72-221	43		SIG-TMS	- (14.4.5.5.3):
72-222	141		SIG-TMS	- (14.4.7.1):
72-223	289		SIG-TMS	- (14.4.8.1 and A.14.4.8.1 (New)):
72-224	42		SIG-TMS	- (14.4.9):
72-225	41		SIG-TMS	- (14.4.12.1):
72-226	195		SIG-TMS	- (14.5.1 (New)):
72-227	196		SIG-TMS	- (14.5.2 (New)):
72-228	9		SIG-TMS	- (14.6.2.4):
72-229	88		SIG-TMS	- (14.6.2.4):
72-230	421		SIG-TMS	- (Figure 14.6.2.4):
72-231	506		SIG-TMS	- (Figure 14.6.2.4 and A.14.6.2.4):
72-262	505a		SIG-TMS	- (18.4.10.4, 18.4.10.5 (New) and D.2.4.1):
72-565	539		SIG-TMS	- (A.10.4.3.1(2)):
72-575	531		SIG-TMS	- (A.14.4.2.2):
72-576	18		SIG-TMS	- (A.14.4.12.1.3, A.14.4.12.1.4, and A.14.4.12.1.5):
72-577	420		SIG-TMS	- (Figure A.14.6.2.4):
72-604	546		SIG-TMS	- (D.3.4 (New)):
72-605	508		SIG-TMS	- (D.3.6.1):
72-606	504		SIG-TMS	- (D.4.1.2):
72-609	489		SIG-TMS	- (Annex G):
72-614	24c		SIG-TMS	- (H.1.2.1):

72-9 Log #CP9 SIG-TMS Final Action:
(Entire Document)

Submitter: Technical Committee on Testing and Maintenance of Fire Alarm Systems,
Recommendation: Review entire document to: 1) Update any extracted material by preparing separate proposals to do so, and 2) review and update references to other organizations documents, by preparing proposal(s) as required.
Substantiation: To conform to the NFPA Regulations Governing Committee Projects.

72-17 Log #436a SIG-TMS Final Action:

(3.3.xx Deficiency, 10.19, 14.2.1.2, and Chapter 15 (New))

Submitter: Robert P. Schifiliti, R. P. Schifiliti Associates, Inc.

Recommendation: This proposal delete section 10.19 in its entirety, revises 14.2.1.2, adds new definitions and adds a new **Chapter 15 Impairments**.

It is proposed that the definitions and the new chapter be the responsibility of SIG-TMS.

Revise 14.2.1.2 as follows:

14.2.1.2 Impairments

14.2.1.2.1 * The requirements of ~~Section 10.19~~ Chapter 15 shall be applicable when a system is impaired.

14.2.1.2.2 System ~~defects and malfunctions~~ deficiencies shall be corrected.

14.2.1.2.3 * If a ~~defect or malfunction~~ critical deficiency is not corrected at the conclusion of system inspection, testing, or maintenance, the system owner or the owner's designated representative shall be informed of the impairment in writing within 24 hours.

A.14.2.1.2.1 See 3.3.x for definitions of critical and non-critical deficiencies and 3.3.y for the definition of impairment.

A.14.2.1.2.3 Every effort should be made to correct all deficiencies as soon as possible and to avoid extended impairments. Notification of impairments at the end of testing should not be construed to allow a delay in notification for more that than one day where system testing takes days or weeks to be completed.

Add new definitions and annex text:

3.3.x * Deficiency. A condition of that interferes with the service or reliability for which the part, system or equipment was intended.

3.3.x.1 Critical Deficiency. A deficiency that could cause a threat to life, property or mission if the part, system or equipment fails to operate as intended when required.

3.3.x.2 Non-critical Deficiency. A deficiency that would not cause a threat to life, property or mission if the part, system or equipment fails to operate as intended when required.

A3.3.x A critical deficiency is one that might cause a system to fail its life safety, property protection or mission continuity goals. A Non-critical Deficiency is an inconvenience or might result in a degraded mode of operation that would not affect life safety, property protection or mission protection. A deficiency in a supplementary might be non-critical. The failure of a circuit board that controls occupant notification would be a critical deficiency and would require emergency impairment procedures. A failure of a loudspeaker in a large space with many loudspeakers would probably be a non-critical failure and would not require impairment management procedures.

3.3.y* Impairment. A condition where a system or unit or portion thereof is out of order, and the condition can result in the system or unit not functioning when required.

A.3.3.y Impairment. Temporarily shutting down a system as part of performing the routine inspection, testing, and maintenance on that system while under constant attendance by qualified personnel, and where the system can be restored to service quickly, should not be considered an impairment. Good judgment should be considered for the hazards presented.

3.3.y.1 Emergency Impairment. A condition where a system or portion thereof is out of order due to an unexpected deficiency, such as physical damage to a control unit or wiring.

3.3.y.2 Preplanned Impairment. A condition where a system or a portion thereof is out of service due to work that has been planned in advance, such as the addition of new devices or appliances or reprogramming of system software.

Add a new **Chapter 15 Impairments**

Chapter 15 Impairments

15.1 * General. This chapter shall provide the minimum requirements for a fire alarm or signaling system impairment management program. Measures shall be taken during the impairment to ensure that increased risks are minimized and the duration of the impairment is limited.

**15.1.1 ***An impairment management program shall be implemented immediately upon discovery of a critical deficiency.

A. 15.1 See 3.3.y for definitions of different types of impairments.

A. 15.1.1 See 3.3.x for definitions of critical and non-critical deficiencies.

15.1.2 The impairment management program shall remain in effect until all critical deficiencies have been corrected.

15.1.3 Non-critical deficiencies shall be corrected.

15.1.4 Where explicit written permission of the authority having jurisdiction is sought and obtained, supplemental, non-required equipment or features may be removed to eliminate non-critical deficiencies.

15.1.5 Where required by the authority having jurisdiction, impairment management programs shall be submitted for review and approval.

15.1.6 Impairment management programs or procedures required by other governing laws, codes, or standards shall be followed.

15.1.7 A record of the impairment and all work done to correct the impairment and to inspect and test the repairs shall be maintained by the system owner or designated representative for a period of 1 year from the date the impairment is corrected.

15.2 Impairment Coordinator.

15.2.1 The property owner shall assign an impairment coordinator to comply with the requirements of this chapter.

15.2.2 In the absence of a specific designee, the property owner shall be considered the impairment coordinator.

15.2.3 Where the lease, written use agreement, or management contract specifically grants the responsibility and the authority for inspection, testing, and maintenance of the fire alarm or signaling system(s) to the tenant, management firm, or managing individual, the tenant, management firm, or managing individual shall assign a person as impairment coordinator.

15.3 Tag Impairment System.

15.3.1* A tag shall be used to indicate that a system, or part thereof, is impaired or has been removed from service.

A.15.3.1 A clearly visible tag alerts building occupants, authorities and emergency forces that all or part of a system is out of service. The tag should be plainly visible, and of sufficient size [typically 4 in. × 6 in. (100 mm × 150 mm)]. The tag should identify which system or part thereof is impaired, the date and time the impairment began, and the name of the Impairment Coordinator. Figure A.15.3.1 illustrates a typical impairment tag.

Figure A.15.3.1 [PLACEHOLDER FOR SAMPLE TAG]

15.3.2 The tag shall be posted at the main control unit and at each remote annunciator and each emergency services interface indicating which system, or part thereof, has been impaired or removed from service.

15.3.3 The authority having jurisdiction shall be permitted to specify where tag(s) are to be placed.

15.4* Preplanned Impairment Programs.

15.4.1 All preplanned impairments shall be authorized by the impairment coordinator.

15.4.2 Before authorization is given, the impairment coordinator shall be responsible for verifying that the following procedures have been implemented:

(1) The extent and expected duration of the impairment have been determined.

(2) The areas or buildings involved have been inspected and the increase in risk resulting from the impairment has been determined.

(3) Recommendations for risk reduction during the impairment have been submitted to management or the property owner/manager.

(4) Where a required system is out of service for more than 10 hours in a 24-hour period, the impairment coordinator shall arrange for one of the following:

(a) Evacuation of the building or portion of the building affected by the system out of service

(b)*An approved fire watch

(c)*Establishment of a system or procedure to perform the function of the impaired system

(5) The affected fire department or emergency team has been notified.

(6) The insurance carrier, the alarm company, property owner/ manager, and other authorities having jurisdiction have been notified.

(7) The supervisors in the areas to be affected have been notified.

(8) A tag impairment system has been implemented. *(See Section 15.3.)*

(9) All necessary personnel, tools and materials have been assembled on the impairment site.

A.15.4 The need for temporary protection, termination of hazardous operations, and increased frequency of inspections in the areas involved should be determined. All work possible should be done in advance to minimize the length of the impairment. Where possible, temporary systems or procedures should be used to mitigate the impairment. For example, the use of roving fire watch personnel equipped with bullhorns could mitigate an impairment to a detection and alarm system. Fire detection and alarm systems should not be removed from service just because a building is not in use. However, for buildings that undergo season changes, the authority having jurisdiction might permit changes to the system to allow it to function in a degraded mode for the unoccupied season. For example a system might be allowed to use heat detectors in place of smoke detectors in areas where the heat can be turned off safely. Where a system that has been out of service for a prolonged period, such as in the case of idle or vacant properties, is returned to service, qualified personnel should be retained to inspect and test the systems.

15.5 Emergency Impairments.

15.5.1 Emergency impairments include but are not limited to loss of primary power that might last more than 12 hours, lightning, surge or transient voltage damage to equipment, and faults on circuits or pathways.

15.5.2 When emergency impairments occur, emergency action shall be taken to minimize potential injury and damage.

15.5.3 The Impairment Coordinator shall implement the steps outlined in Section 15.5.

15.6 Restoring Systems to Service. When all impaired equipment is restored to normal working order, the impairment coordinator shall verify that the following procedures have been implemented:
(1) All inspections and tests, including acceptance and reacceptance tests, have been conducted to verify that affected systems are operational.
(2) Supervisors have been advised that protection is restored.
(3) The fire department or emergency team has been advised that protection is restored.
(4) The property owner/manager, insurance carrier, alarm company, and other authorities having jurisdiction have been advised that protection is restored.
(5) The impairment tag has been removed.

Substantiation: This new chapter is modeled on Chapter 15 in NFPA 25. The purpose is to provide owners, operators and contractors with specific guidance and minimum requirements for commonly accepted impairment management procedures. In many cases the text is identical to that in NFPA 25, but is not being extracted so that this committee will be able to change it as needed. In many locations additional requirements have been added to be specific to fire alarm and signaling systems. New definitions are proposed to make specific requirements in the new chapter clear and meaningful. The new definitions are modeled on the preferred definitions from the NFPA Glossary of terms, but changed slightly to be more exact or to be more generic. The requirements of existing 2010 section 10.19 are all incorporated in the proposed new chapter. The proposal includes revisions to existing 2010 section 14.2.1.2 to coordinate with the new chapter.

This is not original material; its reference/source is as follows:

Staff Note: This proposal has also been sent to SIG-FUN for their action and statement.

72-28 Log #498f SIG-TMS Final Action:

(3.3.52 Condition, 3.3.228 Response, and 3.3.240 Signal)

Submitter: Andrew G. Berezowski, Honeywell Inc.

Recommendation: Add new text to read as follows:

3.3.52 (new) *Condition.*

The state of an environment, fire alarm, or signaling or system

3.3.52.1 *Abnormal (Off-normal) Condition.*

A situation, environmental state, or equipment state that warrants some type of signal, notification, communication, response, action or service.

3.3.52.1.1 *Alarm Condition.*

An environment that poses an immediate threat to life, property, or mission.

3.3.52.1.2 *Pre-Alarm Condition.*

A potential threat to life or property may be present and time is available for investigation.

3.3.52.1.3* *Supervisory Condition.*

The complete failure of a protection system (e.g. fire system inoperable, ECS inoperable, sprinkler system inoperable, etc.), or an event causing the activation of a supervisory initiating device used to monitor an environmental element, system element, component, or function, whose failure poses a high risk to life, property or mission (e.g. sprinkler valve closed, water tank low water level, low building temperature, etc.), or the absence of a guard's tour supervisory signal within prescribed timing requirements, or the presence of a guards' tour supervisory signal outside of prescribed sequencing requirements, or the presence of a delinquency signal.

A.3.3.52.1.3 High risk elements, components, and functions should be identified using risk analysis.

3.3.52.1.4 *Trouble Condition.*

A fault in a portion of a system monitored for integrity that does not render the complete system inoperable.

3.3.52.2 *Normal Condition.*

The environment is within acceptable limits, circuits, systems, and components are functioning as designed and no abnormal condition exists.

3.3.228 (new) *Response.*

Actions taken on the receipt of a signal and the results of those actions

3.3.228.1 *Alarm Response.*

Actions taken on receipt of an alarm signal or of multiple alarm signals and the results of those actions such as: the actuation of alarm notification appliances, elevator recall, smoke control measures, emergency responder dispatch, deployment of resources in accordance with a risk analysis and emergency action plan, etc.

3.3.228.2 *Pre-Alarm Response*

Actions taken on receipt of a pre-alarm signal or of multiple pre-alarm signals and the results of those actions such as: the actuation of notification appliances, dispatch of personnel, investigation of circumstances and problem resolution in accordance with a risk analysis and action plan, etc.

3.3.228.3 *Supervisory Response.*

Actions taken on receipt of a delinquency signal or of a supervisory signal that indicates the presence of a supervisory condition or of multiple supervisory signals that indicate multiple supervisory conditions, and the results of those actions such as: the actuation of supervisory notification appliances, the shutdown of appliances, fan shutdown or activation, dispatch of personnel, investigation of circumstances and problem resolution in accordance with a risk analysis and action plan, etc.

3.3.228.4 *Trouble Response.*

Actions taken on receipt of a trouble signal or multiple trouble signals and the results of those actions such as: the activation of trouble notification appliances, dispatch of service personnel, deployment of resources in accordance with an action plan etc.

3.3.240 *Signal.*

A message ~~status indication~~ indicating a condition, communicated by electrical, visible, audible, wireless, or other means. (SIG-FUN)

3.3.240.1 *Alarm Signal.*

~~A signal indicating an emergency condition or an alert that requires action.~~ A message (in any form) that results from the manual or automatic detection of an alarm condition including: outputs of activated alarm initiating devices, the light and sound from actuated alarm notification appliances, etc. (SIG-FUN)

3.3.240.2 *Delinquency Signal.*

A signal indicating the need for action in connection with the supervision of guards or system attendants. (SIG-PRO)

3.3.240.3 *Evacuation Signal.*

A distinctive alarm signal intended to be recognized by the occupants as requiring evacuation of the building. (SIG-PRO)

3.3.240.4 *Fire Alarm Signal.*

~~A signal initiated by~~ An alarm signal that results from the manual or automatic detection of a fire alarm condition including: outputs from ~~a~~ activated fire alarm-initiating device~~s~~ such as a manual fire alarm box, automatic fire detector, waterflow switch, or other device ~~in which activation is indicative of the presence of a fire or fire signature~~. (SIG-FUN)

3.3.240.5 *Guard's Tour Supervisory Signal.*

A supervisory signal monitoring the performance of guard patrols indicating that a guard has activated a guard's tour reporting station. (SIG-PRO)

3.3.240.6 (new) *Pre-Alarm Signal.*

A message (in any form) that results from the detection of a pre-alarm condition including: outputs of analog initiating devices prior to reaching alarm levels, information regarding the activities of terrorists, the light and sound from actuated notification appliances, etc.

3.3.240.7 (new) *Restoration Signal.*

A message (in any form) that results from the return to normal (deactivation) of an activated initiating device or system indicating the absence of an abnormal condition at the location of the initiating device or system.

3.3.240.8 ~~3.3.240.6~~ *Supervisory Signal.*

~~A signal indicating the need for action in connection with the supervision of guard tours, the fire suppression systems or equipment, or the maintenance features of related systems.~~ In systems other than those supporting guard's tour supervisory service, a message (in any form) that results from the manual or automatic detection of a supervisory condition including: activated supervisory signal-initiating device outputs, transmissions to supervising stations, the light and sound from actuated supervisory notification appliances, etc. In systems supporting guard's tour supervisory service, a message indicating that a guard has activated a guard's tour reporting station (not in itself an indication of a supervisory condition) or a delinquency signal indicating a supervisory condition. (SIG-FUN)

3.3.240.9 ~~3.3.240.7~~ *Trouble Signal.*

~~A signal initiated by a system or device indicative of a fault in a monitored circuit, system, or component.~~ A message (in any form) that results from the manual or automatic detection of a trouble condition including: off-normal outputs from integrity monitoring circuits, the light and sound from actuated trouble notification appliances, etc. (SIG-FUN)

Substantiation: This proposal is the result of the work of the SIG-ACC Alarm Trouble and Supervisory Task Group (ATS TG) charged with developing definitions for the use of the terms alarm, trouble and supervisory in the context of their three forms of use (as a condition or state, as a signal indicating the presence of a state, and as a response or action in association with receiving a signal). Those participating in the task group were: Larry Shudak, Wayne Moore, Frank Van Overmeiren, Ray Grill, and Andrew Berezowski. These proposed definitions and revised definitions are provided for use by other TCs in the ROP meetings so that they might develop proposals to clarify the use of terms within their chapters and improve the flow/understanding of the code. New definitions and sub-definitions have been developed for the terms Condition and Response. The term Pre-Alarm has been introduced for possible use in place of "supervisory smoke detection" and "supervisory carbon monoxide" so that the original meaning of the term Supervisory might be clarified and preserved. The proposed definitions and revised definitions have been presented as a group so that they may be evaluated collectively.

This is not original material; its reference/source is as follows:

Staff Note: This proposal has been sent to all 72 Technical Committees for action on items within their jurisdiction.

72-65 Log #117f SIG-TMS **Final Action:**
(Chapter 4)

Submitter: Merton W. Bunker, Jr., US Department of State
Recommendation: (1) Add new Chapter 4 as follows:

****Insert Include 72_L117_R Here****

2. Insert existing Figure 10.18.2.1.1 as new Figure 4.3.2.2.3.2.

3. Insert existing Figure A.10.2.1.1 as Figure A.4.3.2.2.3.2

4. Delete existing Section 10.18 in its entirety, to include Sections A.10.18.1.4, A.10.18.2.1.1, A.10.18.2.3(1), and A.10.18.2.4.

5. Renumber existing Section 10.19 as Section 10.18.

6. Delete existing Sections 14.6.1.2 and A.14.6.1.2.

Substantiation: 1. The items required by the proposed sections are necessary to assist technicians in the proper installation, programming, and maintenance of the system. Good shop drawings will facilitate a better installation, resulting in a more reliable and more easily maintained system.
2. These items can, and sometimes do, appear in fire alarm specifications. However, many systems are installed without the benefit of specifications. In this case, there is no requirement to provide adequate drawings.
3. NFPA 13 contains a similar list of requirements for working drawings in the body of the standard. NFPA 72 should also contain these requirements.
4. National and local building codes require some of the items added by this proposal. This proposal seeks to place these requirements in NFPA 72, rather than in a building code.

This is not original material; its reference/source is as follows:
Staff Note: This proposal has been sent to all 72 Technical Committees for action on items within their jurisdiction.

Chapter 4 – Approvals and Documentation

4.1 Application. All system approvals and documentation shall comply with the minimum requirements of this chapter.

4.2 Approvals.

4.2.1 Notification. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring.

4.2.2 Required Documentation. At the authority having jurisdiction's request, complete information as required by Section 4.3 shall be submitted for approval.

4.3 Documentation.

4.3.1 Working Plans (Shop drawings). Working plans (shop drawings) shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor.

4.3.1.1 General. Shop drawings for fire alarm systems shall provide basic information and shall provide the basis for the record (as-built) drawings required elsewhere in this Code.

4.3.1.2 Content. Working plans (*s*hop drawings) shall include the following information:
(1) Name of protected premises, owner, and occupant (where applicable)
(2) Name of installer or contractor
(3) Location of protected premises
(4) Device legend in accordance with NFPA 170, *Standard for Fire Safety and Emergency Symbols*
(5) Date of issue and any revisions

4.3.1.3 Floor Plans. Floor plan drawings shall be drawn to an indicated scale and shall include the following information:
(1) Floor identification
(2) Point of compass (indication of north)
(3) Graphic scale
(4) All walls and doors
(5) All partitions extending to within 10 percent of the ceiling height (where applicable)
(6) Room descriptions
(7) Fire alarm device/component locations
(8) Locations of fire alarm primary power connection(s)
(9) Locations of monitor/control interfaces to other systems
(10) Riser locations
(11) Type and number of fire alarm system components/devices on each circuit, on each floor or level
(12) Type and quantity of conductors and conduit (if used) used for each circuit
(13) Location of all supply and return air diffusers (where automatic detection is used)

(14) Identification of any ceiling over 10 feet in height where automatic fire detection is being proposed.
(15) Details of ceiling geometries, including beams and solid joists, where automatic fire detection is being proposed.

4.3.1.4 Riser Diagrams. Fire alarm system riser diagrams shall include the following information:
(1) General arrangement of the system in building cross-section
(2) Number of risers
(3) Type and number of circuits in each riser
(4) Type and number of fire alarm system components/devices on each circuit, on each floor or level
(5) Type and quantity of conductors and conduit (if used) for each circuit.

4.3.1.5 Control Unit Diagrams. Control unit wiring diagrams shall be provided for all control equipment (i.e., equipment listed as either a control unit or control unit accessory), power supplies, battery chargers, and annunciators and shall include the following information:
(1) Identification of the control equipment depicted
(2) Location(s)
(3) All field wiring terminals and terminal identifications
(4) All circuits connected to field wiring terminals and circuit identifications
(5) All indicators and manual controls, including the full text of all labels
(6) All field connections to supervising station signaling equipment, releasing equipment, and fire safety control interfaces

4.3.1.6 Typical Wiring Diagrams. Typical wiring diagrams shall be provided for all initiating devices, notification appliances, remote indicators, annunciators, remote test stations, and end-of-line and power supervisory devices.

4.3.1.7* Matrix of Operation. A matrix of operation shall be provided on all working drawings.

4.3.1.8 Calculations. System calculations shall be provided with all shop drawings as follows:

(1) Battery calculations
(2) Loop resistance calculations (if required)
(3) Notification appliance circuit voltage drop calculations

4.3.2 Completion Documents.

4.3.2.1 General. Before requesting final approval of the installation, the installing contractor shall furnish a written statement stating that the system has been installed in accordance with approved plans and tested in accordance with the manufacturer's published instructions and the appropriate NFPA requirements.

4.3.2.2 Documentation Required. Every system shall include the following documentation, which shall be delivered to the owner or the owner's representative upon final acceptance of the system:

(1)An owner's manual and manufacturer's published instructions covering all system equipment, as described in Section 4.3.2.2.1

(2) Record (as-built) drawings, as described in Section 4.3.2.2.2
(3) A record of completion
(4) For software-based systems, record copy of the site-specific software
(5) A contractor's statement as described in Section 4.3.2.1.

4.3.2.2.1 Owner's Manual. An owner's manual shall contain the following documentation:

(1**)** A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations
(2) A written sequence of operation for the system.
(3) Operator instructions for basic system operations, including alarm acknowledgment, system reset, interpretation of system output (LEDs, CRT display, and printout), operation of manual evacuation signaling and ancillary function controls, and change of printer paper
(4**)** A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed. This information shall include the following:
(a**)** Listing of the individual system components that require periodic testing and maintenance
(b**)** Step-by-step instructions detailing the requisite testing and maintenance procedures, and the intervals at which these procedures shall be performed, for each type of device installed
(c**)** A schedule that correlates the testing and maintenance procedures that are required by this section
(5**)** Detailed troubleshooting instructions for each trouble condition generated from the monitored field wiring, including opens, grounds, and loop failures. These instructions shall include a list of all trouble signals annunciated by the system, a description of the condition(s) that causes such trouble signals, and step-by-step instructions describing how to isolate such problems and correct them (or how to call for service, as appropriate).]
(6**)** A service directory, including a list of names and telephone numbers of those who provide service for the system.

4.3.2.2.2 Record (As-Built) Drawings. Record drawings shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor.

4.3.2.2.21.1 General. Record drawings for fire alarm systems shall provide basic information and shall reflect the actual installation of all equipment, components, and wiring.

4.3.2.2.2.1.2 Content. Record drawings shall include the following information:
(1) Name of protected premises, owner, and occupant (where applicable)
(2) Name of installer or contractor
(3) Location of protected premises
(4) Device legend in accordance with NFPA 170, *Standard for Fire Safety and Emergency Symbols*

(5) Date of issue and any revisions

4.3.2.2.2.1.3 Floor Plans. Floor plan drawings shall be drawn to an indicated scale and shall include the following information:
(1) Floor identification
(2) Point of compass (indication of north)
(3) Graphic scale
(4) All walls and doors
(5) All partitions extending to within 10 percent of the ceiling height (where applicable)
(6) Room descriptions
(7) Fire alarm device/component locations
(8) Locations of fire alarm primary power connection(s)
(9) Locations of monitor/control interfaces to other systems
(10) Riser locations
(11) Type and number of fire alarm system components/devices on each circuit, on each floor or level
(12) Type and quantity of conductors and conduit (if used) used for each circuit
(13) Location of all supply and return air diffusers (where automatic detection is used)

4.3.2.2.2.1.4 Riser Diagrams. Fire alarm system riser diagrams shall include the following information:
(1) General arrangement of the system in building cross-section
(2) Number of risers
(3) Type and number of circuits in each riser
(4) Type and number of fire alarm system components/devices on each circuit, on each floor or level
(5) Type and quantity of conductors and conduit (if used) for each circuit.

4.3.2.2.2.1.5 Control Unit Diagrams. Control unit wiring diagrams shall be provided for all control equipment (i.e., equipment listed as either a control unit or control unit accessory), power supplies, battery chargers, and annunciators and shall include the following information:
(1) Identification of the control equipment depicted
(2) Location(s)
(3) All field wiring terminals and terminal identifications
(4) All circuits connected to field wiring terminals and circuit identifications
(5) All indicators and manual controls, including the full text of all labels
(6) All field connections to supervising station signaling equipment, releasing equipment, and fire safety control interfaces

4.3.2.2.2.1.6 Typical Wiring Diagrams. Typical wiring diagrams shall be provided for all initiating devices, notification appliances, remote indicators, annunciators, remote test stations, and end-of-line and power supervisory devices.

4.3.2.2.2.1.7* Matrix of Operation. A matrix of operation shall be provided on all record drawings to reflect actual programming at the time of completion.

4.3.2.2.3 Record of Completion.

4.3.2.2.3.1* The record of completion form, Figure 4.2.2.2.3.3, shall be permitted to be a part of the written statement required in 4.3.2.1. When more than one contractor has been responsible for the installation, each contractor shall complete the portions of the form for which that contractor had responsibility.

4.3.2.2.3.2* The record of completion form, Figure 4.3.2.2.3.2, shall be permitted to be a part of the documents that support the requirements of 4.3.3.

4.3.2.2.3.3* The preparation of a record of completion, Figure 4.3.2.2.3.2, shall be the responsibility of the qualified and experienced person described in 10.4.2.

4.3.2.2.3.4* The preparation of a record of completion, Figure 4.3.2.2.3.2 shall be in accordance with 4.3.2.2.3.5 through 4.3.2.3.12.

4.3.2.2.3.5 Parts 1 through 14 of the record of completion shall be completed after the system is installed and the installation wiring has been checked.

4.3.2.2.3.6 Parts 15 and 16 of the record of completion shall be completed after the operational acceptance tests have been completed.

4.3.2.2.3.7 A preliminary copy of the record of completion shall be given to the system owner and, if requested, to other authorities having jurisdiction after completion of the installation wiring tests.

4.3.2.2.3.8 A final copy of the record of completion shall be provided after completion of the operational acceptance tests.

4.3.2.2.3.9 One copy of the record of completion shall be stored at the fire alarm control unit or other approved location.

4.3.2.2.3.10 This copy shall be updated to reflect all system additions or modifications and maintained in a current condition at all times.

4.3.2.2.3.11 Where not stored at the main fire alarm control unit, the location of these documents shall be identified at the main fire alarm control unit.

4.3.2.2.3.12 If the documents are located in a separate enclosure or cabinet, the separate enclosure or cabinet shall be prominently labeled FIRE ALARM DOCUMENTS.

4.3.2.2.3.13 Revision. All fire alarm system modifications made after the initial installation shall be recorded on a revised version of the original record of completion.

4.3.2.2.3.13.1 All changes from the original information shall be shown.

4.3.2.2.3.13.2 The revised record of completion shall include a revision date.

4.3.2.2.3.14 Alternatives to Record of Completion. A document containing the required elements of the Record of Completion shall be permitted to be used as an alternative to the Record of Completion where the installed system contains only certain elements found in the Record of Completion.

4.3.2.2.3.15 Electronic Record of Completion. Where approved by the authority having jurisdiction, the Record of Completion shall be permitted to be filed electronically instead of on paper. If filed electronically the document must be in a format that cannot be modified and that has been approved by the AHJ.

4.3.2.2.4* Site Specific Software.

4.3.2.2.4.1 For software-based systems, a copy of the site-specific software shall be provided to the system owner or owner's designated representative.

4.3.2.2.4.2 A copy of the site-specific software shall be stored on-site in non-volatile, non-erasable, non-rewritable memory.

4.3.2.2.4.3 The system 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.

4.3.3* Verification of Compliant Installation. Where required by the authority having jurisdiction, compliance of the completed installation with the requirements of this Code, as implemented via the referring code(s), specifications, and/or other criteria applicable to the specific installation, shall be certified by a qualified and impartial third-party organization acceptable to the authority having jurisdiction.

4.3.3.1 Verification shall ensure that the installed system includes all components and functions, that those components and functions are installed and operate as required, that the system has been 100 percent acceptance tested in accordance with Chapter 14, and that all required documentation has been provided to the system owner.

Exception: Where the installation is an extension, modification, or reconfiguration of an existing system, the verification shall be required for the new work only, and reacceptance testing in accordance with Chapter 14 shall be acceptable.

4.3.3.2 For supervising station systems, the verification shall also ascertain proper arrangement, transmission, and receipt of all signals required to be transmitted off-premises.

Exception: Where the installation is an extension, modification, or reconfiguration of an existing system, the verification shall be required for the new work only, and reacceptance testing in accordance with Chapter 14 shall be acceptable.

4.3.3.3 Verification shall include written confirmation that any required corrective actions have been completed.

4.3.4 Records.

4.3.4.1 A complete record of the tests and operations of each system shall be kept until the next test and for 1 year thereafter.

4.3.4.2 The record shall be available for examination and, if required, reported to the authority having jurisdiction. Archiving of records by any means shall be permitted if hard copies of the records can be provided promptly when requested.

4.3.4.3 If off-premises monitoring is provided, records of all signals, tests, and operations recorded at the supervising station shall be maintained for not less than 1 year.

2. Add related Annex A sections as follows:

A. 4.3.1.7 See A.14.6.2.4(9) for an example for a matrix of operation.

A. 4.3.2.2.2.1.7 See A.14.6.2.4(9) for an example for a matrix of operation.

A.4.3.2.2.3.1 Protected premises fire alarm systems are often installed under construction or remodeling contracts and subsequently connected to a supervising station alarm system under a separate contract. All contractors should complete the portions of the record of completion form for the portions of the connected systems for which they are responsible. Several partially completed forms might be accepted by the authority having jurisdiction provided that all portions of the connected systems are covered in the set of forms.

A.4.3.2.2.3.3 The requirements of Chapter 14 should be used to perform the installation wiring and operational acceptance tests required when completing the record of completion. The record of completion form shall be permitted to be used to record decisions reached prior to installation regarding intended system type(s), circuit designations, device types, notification appliance type, power sources, and the means of transmission to the supervising station. An example of a completed record of completion form is shown in Figure A.4.3.2.2.3.3.

A.4.3.2.2.3.4 The requirements of Chapter 14 should be used to perform the installation wiring and operational acceptance tests required when completing the record of completion. The record of completion form shall be permitted to be used to record decisions reached prior to installation regarding intended system type(s), circuit designations, device types, notification appliance type, power sources, and the means of transmission to the supervising station. An example of a completed record of completion form is shown in Figure A.4.3.2.2.3.2.

A.4.3.3 This section is intended to provide a basis for the authority having jurisdiction to require third-party verification and certification that the authority having jurisdiction and the system owner can rely on to reasonably assure that the fire alarm system installation complies with the applicable requirements.

A.4.3.2.2.4 With many software-based fire systems, a copy of the site-specific software is required to restore system operation if a catastrophic system failure should occur. Without a back-up copy readily available on site, recovery of system operation by authorized service personnel can be substantially delayed. The intent of this requirement is to provide authorized service personnel with an on-site copy of the site-specific software. The on-site copy should provide a means to recover the
last installed and tested version of the site-specific operation of the system. This typically would be an electronic copy of the source files required to load an external programming device with the site-specific data. This requirement does not extend to the system executive software, nor does it require that the external programmer software if required be stored on site. It is intended that this copy of the software be an electronic version stored on a non-rewritable media containing all of the file(s) or data necessary to restore the system and not just a printed version of the operation stored on electronic media. One example of a non-rewritable media is a CD-R.

72-74 Log #333f SIG-TMS Final Action:
(Chapter 8)

Submitter: Scott Lacey, Lacey Fire Protection Engineering
Recommendation: It was suggested that ECS consider a new chapter for “Documentation." Chapter 8 is currently reserved. This number was used only to maintain a chapter sequence.

Include 72_L333_R.docx here

Substantiation: Currently there are several sections related to documentation within the code. There are also a number of problem areas that are not addressed. The draft provided is an effort to pull criteria into one chapter and to address new areas.

Several states have tried to address engineering quality problems through licensing boards. This move has been pushed by the installers. We often hear that more needs to be done to address engineering bid documents. Is it appropriate that it be addressed in the code as well? There are also many other issues that we regularly hear about and see more and more in specs because they are good ideas. This is an attempt to introduce many of these areas into the code so that the AHJ and the bidders can get better documents up front. Language is also provided so that contractors can get the CAD files necessary to prepare shop drawings. Once proposed, it may be good to run this by AIA to see how architects feel before it gets pushed too far. AIA may provide assistance in language and/or contract issues.

If this proposal is accepted then the corresponding current documents sections need to be removed from other areas of the code.

This is not original material; its reference/source is as follows:
Staff Note: This proposal has been sent to all 72 Technical Committees for action on items within their jurisdiction.

72-80 Log #325 SIG-TMS Final Action:
(10.4.xx (New))

Submitter: Thomas J. Parrish, Telgian
Recommendation: Add new text to read as follows:

10.4.xx Inspection Personnel. (SIG-TMS)

10.4.xx* Inspection personnel shall be qualified and experienced in the inspection of systems addressed within the scope of this Code. Qualified personnel shall include, but not be limited to, one or more of the following:

(1)* Personnel who are factory trained and certified for the specific type and brand of system being serviced

(2)* Personnel who are certified by a nationally recognized certification organization acceptable to the authority having jurisdiction

(3)* Personnel who are registered, licensed, or certified by a state or local authority to perform service on systems addressed within the scope of this Code

(4) Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of systems within the scope of this Code.

Substantiation: There's a definition of inspection personnel in 3.3.177.1 that has no qualifications listed. Removing the testing and service personnel from this section is to allow them to be listed under separate qualifications as there are instances that inspection activities may be conducted by persons not qualified to test or service the system.

Proposed new Chapter 8 Documentation by ECS Task Group on Documentation
(Currently, Chapter 8 is a reserved chapter so picked for concept)

8.1 Application.
8.1.1 Systems covered by this standard shall be provided with documentation as outlined by this chapter**.**
8.1.2 This chapter outlines a minimum level of documentation that shall be provided for systems covered under this standard. This chapter does not prohibit additional documentation from being provided**.**
8.1.3 The requirements of other chapters shall also apply unless they are in conflict with this chapter.
8.1.4 Unless required by other governing laws, codes, or standards, the requirements of this chapter shall not apply to one and two family residences covered by Chapter 29.

8.2 Security of Documentation
8.2.1 It is recognized that there are circumstances in which the security and protection of some system documents may require measures other than that prescribed in this standard.
8.2.1.1 Security for mass notification, and other such system documentation shall be determined by the stakeholders. Where such conditions have been identified, the stakeholders shall clearly identify what and how system documents shall be maintained to satisfy the integrity of this section with regards to, reviews, future service, modifications, and system support.
8.2.1.2 Due to freedom of information laws allowing for public access to documents submitted to and retained by code officials, it may be necessary for secure documents to be reviewed by code officials at alternate locations. Such conditions shall be identified by the stakeholders and discussed with the authorities having jurisdiction(s) in advance.
8.2.1.2.1 Where such documents can not be protected from public access, it shall be acceptable to remove sensitive information from submitted documents as long as the owner retains complete documents that will be made accessible to the authority having jurisdiction at an owner designated location.
{Since a common expectation of MNS is to function during security and/or terrorist events, it may be critical that system design be protected. The new language is intended to reinforce this deviation from previous practice as necessary.}

8.3 Approval and Acceptance.
8.3.1 The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring.
8.3.2* At the authority having jurisdiction's request, complete information regarding the system or system alterations, shall be submitted for approval. Upon request, such documents shall also be submitted to the owner or owners authorized agent.
8.3.3 Neither approval nor acceptance by an authority having jurisdiction, owner, or owner's agent shall relieve a designer(s) or installer(s) from providing a system compliant with governing laws, codes, standards, or preliminary plan requirements specified by an engineer.
8.3.4 Deviations from requirements of governing laws, codes, standards, or preliminary plan requirements specified by an engineer, shall be clearly identified and documented as such. Documentation of equivalency shall be provided in accordance with 1.5.
8.3.5* When a system or component is required to be installed in accordance with performance based criteria as specified by a registered engineer, such systems shall be reviewed and accepted by the respective engineer.
A.8.3.5 Due to unique design and construction challenges, fire protection concepts are often established on performance based engineering practices. When such practices have been approved by the AHJ, the engineer of record needs to sign off on the final installation documents to ensure that all conditions have been satisfied. Such engineering analysis may be beyond the qualifications of the code authority. As such, it is imperative that the engineer of record review and accept final concepts as accepted by the AHJ.
8.3.6 Alternate means of submittals and reviews shall be permitted as outlined in 8.2.

8.4 Design Documents.
{Currently there is no requirement within 72 for design documents to be prepared before installation. Only that they be submitted to the AHJ if the AHJ requests them. If the AHJ does not request them then the contractor can install the system without preparing any design documents or calculations. Tries to address on-going problem of engineers putting a few devices on bid documents and telling contractor to provide a compliant system. }

8.4.1 Prior to installing new systems, replacing an existing system, or upgrading a system, design documents shall be prepared.
8.4.2 Design documents shall contain information related to the system which shall include specifications, shop drawings, input/output matrix, battery calculations, notification appliance voltage drop calculations for strobes and speakers, and product cut-sheets, shall be prepared prior to installation of any new system.
8.4.2 Systems that are altered shall have design documents prepared that are applicable to the portion(s) of the system being altered.
8.4.3 Design documents may include preliminary plans issued as guidance and direction, shop drawing submittals, risk assessment, emergency response plan, or a combination of these.
8.4.4 Design documents shall be revised as necessary following installation to represent as-built conditions and include record drawings.

8.4.5 CAD Files

8.4.5.1 Unless approved otherwise by the authority having jurisdiction and with technical justification, the architect, engineer, or owner shall make available electronic Computer Aided Drafting (CAD) files to the individual preparing final shop drawings, and record drawings, when such files exist.

8.4.5.1.1 At minimum, available files shall include base floor plans, elevation details, structural floor/roof framing for exposed spaces, and details necessary to coordinate for unique protection schemes.

8.4.5.1.2 Any fees for providing electronic files or for converting such files shall be included in preliminary documents, or shall be provided upon request during the solicitation stage.

8.4.5.1.3 Written agreements, such as contracts limiting or preventing further distribution, shall be permitted.

8.4.5.1.4 Electronic files shall allow for drawings to be at required scale.

8.4.5.1.5 Electronic files shall allow for un-related text, notes, equipment, etc. to be isolated or removed for clarity.

8.4.5.1.6 Electronic file floor plans and details shall be consistent with those used in drawings issued or revised for building permits.

8.4.5.2 If electronic files can not or will not be made available in accordance with 8.4.5.1, solicitation documents shall indicate such.

8.4.6 Preliminary Plans

{When poor shop drawings are submitted for review, or systems are improperly installed, investigations frequently find that the lack of information, inconsistent information, or non-compliant information such as device spacing within bid documents contribute to system problems. To be competitive in getting a job, contractors regularly must bid device counts based on devices shown. Engineers often show a few devices on drawings and then hold the installing contractor accountable for providing a code compliant system with a drawing note. Prior to now, the requirements within this standard are developed and targeted around the installing contractor. The purpose of this section is to assign initial design accountability where it belongs when an engineer prepares bid documents. Providing this section provides the AHJ the ability to enforce accountability at the top level. Language does not require that an engineer be involved, only what is required when an engineer is involved.}

8.4.6.1 Unless required otherwise by governing laws, codes, standards, or an enforcing authority, preliminary plans such as those used for bidding, solicitation, or for obtaining a building permit, shall comply with section 8.4.6.

8.4.6.2 Performance criteria required in support of alternative means and methods for other codes, standards, or construction features shall be clearly identified. Such information shall reference applicable waivers, appeals, variances, or similarly approved deviations from prescriptive criteria.

8.4.6.3 When issued by a registered architect or engineer, the architect or engineer shall provide information outlined by 8.4.6 as a minimum.

8.4.6.3.1 Such information shall be in compliance with criteria of this standard, listings of the equipment, or performance criteria.

8.4.6.4 When preliminary documents for bidding or solicitation are prepared and issued by a qualified designer other than a registered architect or engineer, the documents shall contain information outlined in 8.4.6.

8.4.6.4.1 The qualifications of the designer shall be found acceptable to the authority having jurisdiction prior to preparation of preliminary documents.

8.4.6.5 Preliminary documents shall include the following:

(1) Specifications applicable to the project

(2) When devices are shown on preliminary drawings, the devices shall be located in accordance with standards, listings, and limitations of the equipment specified around. When no particular product limitations are specified around, the prescriptive criteria of applicable standards shall be used.

(3) Interface between systems such as fire alarm, mass notification, security, HVAC, smoke control, paging, background music, audio visual equipment, elevators, access control, other fire protection systems, etc.

(4) Sequence of operation

(5) Survivability of system circuits and equipment

(6) Notification zones, when applicable

(7) Message content for voice systems

(8) Off-site, proprietary, or other means of system monitoring to be provide (as applicable)

(9) Codes and editions applicable to the system(s)

(10) Any specific requirements of the owner, governing authority, or insurance carrier.

(11) Any specific voice delivery components beyond standard industry products required to achieve intelligibility.

8.4.6.6 Acoustic properties of spaces shall be considered with respect to speaker selection and placement to ensure intelligibility can be met.

A.8.4.6.6 Achieving intelligibility in certain spaces such as large open or hard surfaced spaces often requires evaluation of the environmental acoustic properties. The burden of speech intelligibility is frequently placed on the installing fire alarm contractor. However, this contractor has no control over the architectural acoustic aspects of a space. Speaker selection and/or placement frequently have limited effect in such spaces. Therefore, it is essential that the architects and engineers account for the necessary acoustic treatments and intended speaker placement during the physical design of the space. It is not practical to expect a sub contractor to account for such architectural implications during construction.

8.4.6.6.1 The architect, engineer, and/or preliminary design professional shall identify the need for, and provide provisions for acoustical treatments required to achieve speech intelligibility. The burden to provide an intelligible acoustic environment beyond the limitations of the voice delivery components shall be independent of the installer responsible for providing final system shop drawing submittal package.
8.4.6.6.2 Acoustical treatments shall include, but not be limited to sound baffles, sound absorption materials, or other such physical treatments to a space. Voice delivery components such as speakers, amplifiers, circuiting, etc. shall not be considered acoustical treatments.

8.4.7 Risk Assessment
8.4.7.1 When a risk assessment is required to be prepared, such as for a mass notification system, findings of the risk assessment shall be documented.
8.4.7.2 When identified by the stakeholders, security and protection of the risk assessment shall be in accordance with 8.2.1.
8.4.7.3 The risk assessment shall identify the various scenarios evaluated, and the anticipated outcomes.
8.4.7.3.1 The stakeholders shall identify the worthiness of a respective scenario and shall identify if the scenario and outcome shall be included in documentation.
8.4.7.4 [Provide additional info here]

8.4.8 Emergency Response Plan
8.4.8.1 When an emergency response plan is required to be prepared, such as for a mass notification system, findings of the plan shall be documented.
8.4.8.2 When identified by the stakeholders, security and protection of the emergency response plan shall be in accordance with 8.2.1.
8.4.8.3 The emergency response plan shall identify the various scenarios evaluated, and the anticipated outcomes.
8.4.8.3.1 The stakeholders shall identify the worthiness of a respective scenario and shall identify if the scenario and outcome shall be included in documentation.
8.4.8.4 [Provide additional info here]

8.4.9 Shop Drawing Submittal Package
8.4.9.1 Shop drawings shall be prepared to scale.
8.4.9.1.1 Floor plan scale shall be not smaller than 1/8" = 1' and shall include a bar scale on the respective sheets.
8.4.9.1.2 Drawing package shall include:
(1) Floor plans to scale
(2) Riser details showing all panels, devices, interconnections with other systems, and interconnections between components
(3) Input/Output matrix showing sequence of operation between actions
(4) Battery calculations
(5) Voltage calculations for strobes and speakers
8.4.9.2 Product cut sheets
8.4.9.2.1 Product cut sheets or data sheets shall be provided which include manufacture, model, limitations, listings, and other features outlining product features.
8.4.9.2.2 Product cut sheets shall be bound and organized as required by the authority having jurisdiction.
8.4.9.3* Calculations.
A.8.4.9.3 [Provide sample calculations in annex]
8.4.9.3.1 Calculations not included on drawings shall be bound and included with submittal.
8.4.9.3.2 Voltage drop calculations on 24 Volt systems shall use a nominal starting voltage of 20.4 volts DC, and an ending voltage of 16 volts DC, unless listed otherwise.
8.4.9.3.3 Voltage drop calculations for strobes shall be provided in a lump-sum / end-of-line method.
8.4.9.3.4 Voltage drop calculations for strobes prepared using point-to-point method shall allow for a 1 volt safety margin.
8.4.9.3.5 Calculations for speaker circuits shall maintain at least 85% of the starting voltage per circuit.
{Research provided by submitter sponsored by the Phoenix Fire Department and the Arizona Chapter of the Automatic Fire Alarm Association validated that when point-to-point calculations are used a safety factor is required to account for field conditions. Report can be made available.}

8.5* Verification of Compliant Installation.
8.5.1 Where required, compliance of the completed installation with the requirements of this Code, as implemented via the referring code(s), specifications, and/or other criteria applicable to the specific installation, shall be certified by a qualified and impartial third-party organization acceptable to the authority having jurisdiction.
8.5.2 Verification shall ensure that the installed system includes all components and functions, that those components and functions are installed and operate as required, that the system has been 100 percent acceptance tested in accordance with Chapter 14, and that all required documentation has been provided to the system owner.

Exception: Where the installation is an extension, modification, or reconfiguration of an existing system, the verification shall be required for the new work only, and reacceptance testing in accordance with Chapter 14 shall be acceptable.
8.5.3 For supervising station systems, the verification shall also ascertain proper arrangement, transmission, and receipt of all signals required to be transmitted off-premises.
Exception: Where the installation is an extension, modification, or reconfiguration of an existing system, the verification shall be required for the new work only, and reacceptance testing in accordance with Chapter 14 shall be acceptable.
8.5.4 Verification shall include written confirmation that any required corrective actions have been completed.

8.6 Completion Documents
8.6.1 Record of Completion
8.6.1.1 The preparation of a record of completion, similar to Figure 8.5.1.1, shall be the responsibility of the qualified and experienced person described in 10.4.2.
8.6.1.2 A customized form developed around the particular system which contains applicable information may be used. The form is not required to contain information or items that are not applicable to the particular system. The preparation of a record of completion, similar to Figure 8.5.1.1 shall be in accordance with ??? through ????.
{The current language implies that Figure 10.18.2.1.1 is required to be used. New language clarifies that the figure is a guide for intended information and not necessarily the only option while maintaining intended criteria of 10.18.2.1.2.1 through 10.18.2.1.2.8.)
8.6.1.3 All systems that are modified after the initial installation shall have the original, or latest overall system, record of completion revised or attached to show all changes from the original information and shall be identified with a revision date.
8.6.1.4* Where the original, or the latest overall system, record of completion can not be obtained, a new overall system record of completion shall be provided that documents the system configuration as discovered during the current projects scope of work.

A.8.6.1.4 It is the intent that if an original or current record of completion is not available for the overall system, the installer will provide a new record of completion that addresses items discovered about the system. The installer will complete the respective sections related to the overall system that have been discovered under the current scope of work. It is not the intent of this section to require an in-depth evaluation of an existing system solely for the purpose of completing a system-wide record of completion.
{Current language assumes that there is always an existing record of completion available, when in fact, it is seldom available. In addition the current language provides no alternatives. The proposed language is intended to provide direction towards the intent when no existing documentation is available.}

8.6.2 Record Drawings
8.6.2.1 Shop drawings used throughout installation shall be marked to reflect field variations.
8.6.2.2 Design documents shall be revised to reflect actual conditions of installation.
8.6.2.3 Record drawings shall be turned over to the owner with a copy placed inside the as-built cabinet.
8.6.2.3.1 When identified by the stakeholders and in accordance with 8.2, alternate locations shall be permitted.

8.7 Record Retention.
8.7.1 System Testing. A complete record of system tests and operations of each system shall be kept until the next test and for 1 year thereafter.
8.7.1.1 The test record shall be available for examination and, if required, reported to the authority having jurisdiction. Archiving of records by any means shall be permitted if hard copies of the records can be provided promptly when requested.
8.7.1.2 If off-premises monitoring is provided, records of all signals, tests, and operations recorded at the supervising station shall be maintained for not less than 1 year.
8.7.2 System Documents. Documents regarding system design and function shall be maintained for the life of the system.
8.7.2.1 Revisions and alterations to systems shall be recorded and records maintained with the original system design documents.
8.7.2.2 System documents shall include the following as applicable:
(1) Record Drawings
(2) Product data sheets
(3) Alternative means and methods, variances, appeals, etc.
(4) Risk Assessment
(5) Emergency Response Plan

8.7 As-Built Cabinet
8.7.1 With every new system or major renovation a cabinet shall be installed adjacent to the main control panels. This cabinet shall be sized to accommodate record drawings, product cut sheets, inspection records, and software media.
8.7.2 It shall be permitted to locate the as-built cabinet in an alternate location when such location is clearly identified at the system panel location.
8.7.3 Unless approved otherwise by the authority having jurisdiction, the as-built cabinet shall be provided with a lock keyed the same as the system panel.

8.8 Inspection, Testing, and Maintenance
8.8.1 [Provide additional info here]

8.9* Impairments.
8.9.1 The system owner or their designated representative shall be notified when a fire alarm system or part thereof is impaired. Impairments to systems shall include out-of-service events.
8.9.2 A record shall be maintained by the system owner or designated representative for a period of 1 year from the date the impairment is corrected.
8.9.3* Where required, mitigating measures acceptable to the authority having jurisdiction shall be implemented for the period that the system is impaired.
8.9.4 The system owner or owner's designated representative shall be notified when an impairment period is completed or discontinued.

72-81 Log #326 SIG-TMS Final Action:
(10.4.xx (New))

Submitter: Thomas J. Parrish, Telgian
Recommendation: Add new text to read as follows:
10.4.xx Inspection Personnel. (SIG-TMS)
10.4.xx* Inspection personnel shall be qualified and experienced in the inspection of systems addressed within the scope of this Code. Qualified personnel shall include, but not be limited to, one or more of the following:
(1)* Personnel who are factory trained and certified for the specific type and brand of system being serviced
(2)* Personnel who are certified by a nationally recognized certification organization acceptable to the authority having jurisdiction
(3)* Personnel who are registered, licensed, or certified by a state or local authority to perform service on systems addressed within the scope of this Code
(4) Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of systems within the scope of this Code.
Substantiation: There is a definition of testing personnel in 3.3.177.1 that has no qualifications listed. Removing the inspection and service personnel from this section is to allow them to be listed under separate qualifications, as there are instances that testing activities may be conducted by persons not qualified to service the system.

72-84 Log #327 SIG-TMS Final Action:
(10.4.3)

Submitter: Thomas J. Parrish, Telgian
Recommendation: Revise text to read as follows:
10.4.3 ~~Inspection, Testing, and Maintenance~~ ~~Service~~ Personnel. (SIG-TMS)
10.4.3.1* Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of systems addressed within the scope of this Code. Qualified personnel shall include, but not be limited to, one or more of the following:
(1)* Personnel who are factory trained and certified for the specific type and brand of system being serviced
(2)* Personnel who are certified by a nationally recognized certification organization acceptable to the authority having jurisdiction
(3)* Personnel who are registered, licensed, or certified by a state or local authority to perform service on systems addressed within the scope of this Code
(4) Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of systems within the scope of this Code.
Substantiation: There is no definition of maintenance personnel. There is a definition for service personnel that fits the qualifications. Removing the inspection and testing personnel for this section is to allow them to be listed under separate qualifications as there are instances that inspections and testing activities may be conducted by persons not qualified to service the system. Leaving the requirements for service personnel to be able to conduct inspection and testing is required as there are provisions within this document that require reacceptance testing after some system repairs and modifications.

72-86 Log #516 SIG-TMS Final Action:
(10.4.3)

Submitter: Joshua Elvove, U.S. General Services Administration
Recommendation: Revise as follows:
10.4.3 Inspection, Testing, and Maintenance Personnel. (SIGTMS)
10.4.3.1* Inspections shall be performed by personnel who have developed competence through training and experience.
10.4.3.2 Service and testing personnel shall be qualified and experienced in the ~~inspection,~~ testing, and maintenance of systems addressed within the scope of this Code. Qualified personnel shall include, but not be limited to, one or more of the following:
(1)*Personnel who are factory trained and certified for the specific type and brand of system being serviced
(2)*Personnel who are certified by a nationally recognized certification organization acceptable to the authority having jurisdiction
(3)*Personnel who are registered, licensed, or certified by a state or local authority to perform service on systems addressed within the scope of this Code
(4) Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of systems within the scope of this Code
A.10.4.3.1 It is not the intent to require personnel performing simple inspections or operational tests of initiating devices to require factory training or special certification provided such personnel can demonstrate knowledge in these areas.
Substantiation: There is a need to distinguish the qualifications for those responsible for conducting inspections and for those responsible for maintenance (i.e., service) and testing. The existing provisions of 10.4.3.1 apply to personnel who do inspection, testing and service and lists four distinct options. However, all four options require personnel to be certified in one form or another. This proposal intends to enable inspection be done by personnel who can demonstrate competence through training and experience without necessarily having to be certified, since inspections are visual in nature, and not necessarily complex in nature (see 3.3.177.1 for scope of inspections). Note: the new text proposed by 10.4.3.1 comes directly from NFPA 25, 4.1.1.2, and actually applies to inspection, testing and maintenance. However, the intent herein is to only apply the NFPA 25 language to inspections of fire alarm systems and require additional requirements (e.g., certification) for those conducting (text appears to be missing - not receive by NFPA).

72-87 Log #541 SIG-TMS Final Action:
(10.4.3.1 and 10.4.3.2)

Submitter: Frank L. Van Overmeiren, FP&C Consultants, Inc.
Recommendation: Add new text to read as follows:
10.4.3.1* Inspection personnel shall have knowledge of the inspection requirements for fire alarm and signaling equipment of this code.
10.4.3.2* Test personnel shall have knowledge of the testing requirements for fire alarm and signaling equipment of this code.
A.10.4.3.1 Inspection personnel knowledge should include equipment selection, placement and installation requirements of this code and the manufactures published documentation.
A.10.4.3.1 Testing personnel knowledge should include equipment selection, placement and installation requirements of this code and the manufactures published documentation.
Substantiation: Provide specific requirements for inspection and testing personnel.
Draft version of the NFPA 72 TMS Task Group for Qualifications.

72-173 Log #482 SIG-TMS **Final Action:**
(Chapter 13, 14, and 15)

Submitter: Michael A. Anthony, University of Michigan / Rep. APPA.ORG - Association of Education Facilities Executives

Recommendation: Break up existing Chapter 14 and separate into three different sections using the reserved chapters accordingly:

Chapter 13 – Inspection
Chapter 14 – Testing
Chapter 15 – Maintenance
Carry over all relevant paragraphs and tables.

Substantiation: This is obviously something that would best be handled by the technical correlating committee. Users of this document will find it easier to understand IT&M requirements and manage their technical and human resources if distinctions among these activities could be put into greater relief.

72-174 Log #25 SIG-TMS **Final Action:**
(Chapter 14)

Submitter: Anthony Bloodworth, Siemens Industries, Inc.
Recommendation: (Note: # = New section in Chapter 14 or add to an appropriate existing section.)
Testing, Inspection, and Maintenance Labels and Tags. The use of labels and or tags is to provide a quick and consistent means for building owners and emergency responders to understand the most current condition of the alarm system.
#.1 At the conclusion of system maintenance, a fixed white label shall be placed in, on, or adjacent to the affected fire alarm control panel. The tag can only be removed if its date is at least two years old. The tag shall contain these elements, or, elements defined by the local AHJ.
(a) ONLY TO BE REMOVED BY QUALIFIED PERSONNEL OR AHJ (all capital letters in at least 10-point bold face type);
(b) SERVICE RECORD (all capital letters in at least 10-point bold face type);
(c) the registered firm's name, address, telephone number (either main office or branch office) and certificate of registration number of the firm performing the service;
(d) the date of service performed, the licensee's signature (a stamped signature is prohibited) and license number;
(e) a list of services performed; and
(f) the type of service performed, either general service or the correction of conditions that resulted in a red label or yellow label.
#.2 At the conclusion of system testing per NFPA 72, Section 14.4.5, a fixed blue label shall be placed in, on, or adjacent to the affected fire alarm control panel. The tag can only be removed if its date is at least five years old. The tag shall contain these elements, or, elements defined by the local AHJ.
(a) ONLY TO BE REMOVED BY QUALIFIED PERSONNEL OR AHJ (all capital letters in at least 10-point bold face type);
(b) TEST RECORD (all capital letters in at least 10-point bold face type);
(c) the registered firm's name, address, telephone number (either main office or branch office) and certificate of registration number of the firm performing the inspection/test;
(d) the date of the inspection performed, the licensee's signature (a stamped signature is prohibited) and license number;
(e) the type of inspection/test performed to be marked, new installation, semi- annual, quarterly or annual;
(f) the last date of sensitivity test, if known; and
(g) the status after the inspection/test of acceptable or yellow label attached, or red label attached.
#.3 If a defect or malfunction is not corrected at the conclusion of system inspection, testing, or maintenance, a removable red label or tag shall be placed on the front each affected fire alarm system and fire command center. The tag can only be removed by qualified personnel that has tested to insure the defect or malfunction is corrected. The tag shall contain these elements, or, elements defined by the local AHJ.
(a) ONLY TO BE REMOVED BY QUALIFIED PERSONNEL OR AHJ (all capital letters in at least 10-point bold face type);
(b) status of the system to be marked, inoperable or impaired or fault;
(c) the registered firm's name, address, telephone number (either main office or branch office) and certificate of registration number of the firm attaching the red label;
(d) the date the label was attached, the licensee's signature (a stamped signature is prohibited) and license number; and
(e) a list of conditions resulting in the red label.
#.4 If an system does not comply with applicable codes and standards adopted at the time the system was installed and not corrected at the conclusion of system inspection, testing, or maintenance, a removable yellow label or tag shall be placed on the front of each affected fire alarm system and fire command center. The tag can only be removed by qualified personnel that can insure the condition has been corrected. The tag shall contain these elements, or, elements defined by the local AHJ.
(a) ONLY TO BE REMOVED BY QUALIFIED PERSONNEL OR AHJ (all capital letters in at least 10-point bold face type);
(b) SYSTEM DOES NOT COMPLY WITH APPLICABLE CODES & STANDARDS (all capital letters in at least 10-point bold face type);
(c) the registered firm's name, address, telephone number (either main office or branch office) and certificate of

registration number of the firm attaching the yellow label;
(d) the date the label was attached, the licensee's signature (a stamped signature is prohibited) and license number; and
(e) a list of conditions resulting in the yellow label.

Substantiation: Although some NFPA chapters, such as NFPA 10 and 25, and some states have required impairment and service tagging, NFPA has yet to require this valuable feature on fire alarm systems. Building owners and emergency responding agents need a quick and reliable method to understand the condition of the system as it was last observed by qualified personnel. This information can be invaluable during an emergency situation and aid as a constant reminder when a system is impaired or does not meet minimum code requirements.

This is not original material; its reference/source is as follows:
NFPA 25, NFPA 10, and Texas Insurance Code Chapter 6002.

72-175 Log #543 SIG-TMS Final Action:
(14.2.1 (New))

Submitter: Robert P. Schifiliti, R. P. Schifiliti Associates, Inc.
Recommendation: Add new text to read as follows:
14.4.1 Purpose
14.2.1.1 *The purpose for initial and re-acceptance inspections is to ensure compliance with approved design documents and to ensure installation in accordance with this code and other required installation standards such as the National Electrical Code, NFPA 70.
A. 14.2.1.1 Initial and re-acceptance inspections are performed to ensure compliance with approved design documents – whatever the quality or origin. This involves inspection to ensure that the correct equipment has been used and properly located and installed. Ensuring compliance helps to assure both operational reliability and mission reliability. This concept applies to any type of system, not just fire alarm and signaling systems. At this stage of a system's life, the responsibilities for such inspections rest with the designers of the systems and with the various applicable authorities having jurisdiction.
14.2.1.2 *The purpose for initial and re-acceptance tests of fire alarm and signaling systems is to ensure system operation in accordance with the design documents.
A. 14.2.1.2 If a system is designed to meet a specific mission or set of goals, then operational testing will assure that the system has mission reliability. For example, during acceptance testing, the design ambient noise level might not be present. AHJs and technicians should not be trying to achieve the +5/15 dB or +5/10 dB requirements at acceptance as they might not know what the maximum average or peak noise levels are. They need only measure the system and determine if it meets the required design level. Therefore, the design level needs to be documented and communicated to them.
Acceptance and re-acceptance testing includes proper operation, and non-operation, of the fire alarm or signaling system's ability to properly interface to other systems. The best way to ensure a proper interface operation is to observe the actual operation of the interfaced system. However, exercising an emergency control function every time a related initiating device is activated might not be desirable or practical, or in some cases may not even be permitted. NFPA 72 permits testing of the fire alarm or signaling system up to the end point connection to the interfaced system or emergency control function. Complete end-to-end testing of the integrated systems should then be performed as the final step to ensure that the systems are left operational.
14.2.1.3 The purpose for periodic inspections is to assure that obvious damages or changes that might affect the system operability are visually identified.
A.14.2.1.3 Visual inspections contribute to the assurance of operational and mission reliability, but do not ensure either.
14.2.1.3 *The purpose for periodic testing is to statistically assure operational reliability.
A.14.2.1.3 Periodic testing of fire alarm and signaling systems is not necessarily done as a complete system test. NFPA 72 requires parts of the systems to be tested at different frequencies. At any one particular test only a fraction of the system may be tested. Periodic testing contributes to the assurance of operational and mission reliability, but does not ensure either.
Periodic testing of the interface between a fire alarm or signaling system in some other system or emergency control function is permitted by NFPA 72 to be performed without actually operating the interfaced system or function. However, the preferred method of testing is to perform an integrated end-to-end test of the combined systems. NFPA 72 requires that where any interfaced system or function is bypassed or disconnected to permit testing of the fire alarm or signaling system alone, a complete integrated end-to-end test or some other method of verification should be performed to ensure that the interfaced system or function is placed back in service at the end of testing of the fire alarm or signaling system.
Substantiation: These proposals are taken directly from the ITM Summit Standards Council Summary. They are intended to establish a framework that differentiates initial and reacceptance tests from periodic tests and that differentiates initial and reacceptance inspections from periodic inspections.

72-176 Log #87 SIG-TMS Final Action:
(14.2.1.2.4 (New))

Submitter: Anthony Bloodworth, Siemens Industries, Inc.
Recommendation: Add new text to read as follows:
14.2.1.2.4 If a defect or malfunction is not correctable before leaving the protected premise, the system owner or the owner's designated representative and the responding fire department shall be verbally informed of the impairment and be provided with written details within 24 hours.
Substantiation: It is believed that the local responding agency should be notified when a system cannot perform as it was designed to in an emergency situation. This action will allow the agency to properly prepare a contingency plan and monitor progress of the correction, even if the customer elects to use another contractor to make the correction. Taking such an action could also reduce the possibility of accidental death caused by a lack of follow-through by building owners or their representatives.

72-177 Log #429 SIG-TMS Final Action:
(14.2.2.2)

Submitter: Robert P. Schifiliti, R. P. Schifiliti Associates, Inc.
Recommendation: Add new 14.2.2.2 and renumber existing:
14.2.2.2 Where the property owner is not the occupant, the property owner shall be permitted to delegate the authority and responsibility for inspecting, testing, and maintaining the fire protection systems to the occupant, management firm, or managing individual through specific provisions in the lease, written use agreement, or management contract.
Keep existing 14.2.2.3, renumber existing 14.2.2.2 to be 14.2.2.4 and revise as follows:
Where the building or system owner has delegated any responsibilities for inspection, testing or maintenance, ~~The delegation of responsibility shall be in writing, with~~ a copy of the ~~such~~ written delegation required by 14.2.2.3 shall be provided to the authority having jurisdiction upon request.
Substantiation: The new text is similar to text in NFPA 25. Revising existing 14.2.2.2 and placing it after existing 14.2.2.3 provides a logical progression.

72-178 Log #323 SIG-TMS Final Action:
(14.2.2.4)

Submitter: Thomas J. Parrish, Telgian
Recommendation: Delete text as follows:
~~14.2.2.4 Testing and maintenance of central station service systems shall be performed under the contractual arrangements specified in 26.3.3.~~
Substantiation: This is a redundant requirement; the contractual requirements are clearly established in sections 10.2.2.1, 10.2.2.2, and 10.2.2.3.
These contractual arrangements of 26.3.3 are already covered by the above cited sections. Central station service has no bearing on these contractual requirements as it has its own requirements stated in 26.3.3.

72-179 Log #271 SIG-TMS Final Action:
(14.2.9 and A.14.2.9 (New))

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: Add new material as follows:

14.2.9* Test Plan:

14.2.9.1 For those systems with emergency control functions, releasing systems, or interfaced equipment, a test plan shall be written clearly establishing the scope of the testing for the emergency control functions, releasing systems, or interfaced equipment.

14.2.9.2 The test plan and results shall be documented with the testing records.

A.14.2.9 The test plan is intended to clarify exactly what is tested and how it is to be tested. For emergency control functions, the fire alarm system boundary ends at the fire alarm system control relay. However, fire alarm system testing often extends beyond the boundary of the fire alarm system and may verify the actual performance of an emergency control function, releasing system or interfaced equipment. The purpose is to document what devices were and were not actually tested.

Some test plans may indicate that the test was terminated at the fire alarm system control relay. This might be necessary where building operations must continue without interruption during the fire alarm testing or where the emergency control function is complicated such as a large smoke control system.

Other test plans may test the emergency control function. An elevator test plan may be written to verify all elevator functions such as recall, shunt trip, and illumination of the hat in the cab. Another example would be testing of smoke dampers. The test plan for a smoke damper may verify that the fire alarm system control relay activated, that the smoke damper actuator operated or that the smoke damper actually closed.

For a releasing system, the solenoid may be tested after the control head has been removed from a cylinder and the documentation would reflect this.

Some organizations may have existing testing protocols and procedures for equipment that may be used to meet the intent of this requirement without writing new plans.

Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. While the boundary of the fire alarm system is established by the fire alarm code, there is a need to establish the appropriate test all of the functions that cross the boundary that the fire alarm system may activate or control such as smoke control, fan shut down, damper control, elevator recall and power shunt trip etc., even though it isn't the responsibility as dictated by NFPA 72 of those persons tasked with testing the fire alarm system. This test plan requirement will document to what extent these interfaces are tested and establishes a requirement to document that extent.

This proposal goes along with the proposal to modify item 23 in Table 14.4.2.2.

The annex information also allows those organizations that already have written test plans to use them without having to generate addition plans.

72-180 Log #135 SIG-TMS Final Action:
(Table 14.3.1)

Submitter: Steve Carter, Orr Protection Systems, Inc.
Recommendation: Replace Table 14.3.1 Visual Inspection Frequencies with new Table 14.3.1 Visual Inspection Frequencies and Methods with the following:

****Insert 72_L135_Tbl 14.3.1_R Here****

Substantiation: This is a draft version of the work of the NFPA 72 TMS Technical Committee Task Group on table coordination. The Visual Inspection Frequencies table does not align with the Test Frequencies and Test Methods tables making it difficult for the user of this code to find the requirements for inspection and testing of a particular system component. This proposal along with others to revise the Test Methods table, will align these tables and improve the usability of chapter 14.

72-181 Log #442 SIG-TMS Final Action:
(Table 14.3.1, Item 15)

Submitter: Larry W. Mann, Central Station, Inc.
Recommendation: Revise text to read as follows:

	Seminannually	Annually
(a) DACT	✕	X
(b) DART	✕	X
(c) McCulloh	✕	X
(d) RAT	✕	X

Substantiation: Change the inspection time to annual based on the fact that each communication device is supervised for transmission at either a four minute poll or a 24 hour test period. Each communication device is located either inside the control panel or within a secured tamper resistant cabinet, therefore, an annual inspection should allow for adequate maintenance.

Table 14.3.1 Visual Inspection Frequencies

	Component	Initial/ Reacceptance	Periodic Frequency	Method	Reference
1.	All equipment	X		Visual inspection shall be made to ensure that there are no changes that affect equipment performance. Inspection for changes shall include building modifications, occupancy changes, changes in environmental conditions, device location, physical obstructions, device orientation, physical damage, and degree of cleanliness. [Previously only found in A.14.3.1]	14.3.4
2.	Control equipment: fire alarm systems monitored for alarm, supervisory, and trouble signals			Inspection shall include verification that illumination of lamps and/or LEDs indicate a system normal condition. Inspect that all electrical connections are in a good condition.	
	(a) Fuses	X	Annual		
	(b) Interfaced equipment	X	Annual		
	(c) Lamps and LEDs	X	Annual		
	(d) Primary (main) power supply	X	Annual		
	(e) Trouble signals [Previously separate item 5]	X	Semi-Annual		
3.	Control equipment: fire alarm systems unmonitored for alarm, supervisory, and trouble signals			Inspection shall include verification that illumination of lamps and/or LEDs indicate a system normal condition. Inspect that all electrical connections are in a good condition.	
	(a) Fuses	X	Weekly		
	(b) Interfaced equipment	X	Weekly		
	(c) Lamps and LEDs	X	Weekly		
	(d) Primary (main) power supply	X	Weekly		
	(e) Trouble signals [Previously separate item 5]	X	Weekly		
4.	Batteries			Batteries shall be inspected for corrosion or leakage. Tightness of connections shall be confirmed. Inspection shall confirm marking of the month/year of manufacturer. [Previously in Test Methods table 5a]	10.5.9
	(a) Lead-acid	X	Monthly	Electrolyte level shall be visually inspected. [Previously in Test Methods table 5a]	
	(b) Nickel-cadmium	X	Semi-Annual		

	(c) Primary (dry cell)	X	Monthly		
	(d) Sealed lead-acid	X	Semi-Annual		
5.	Transient suppressors	X	Semi-Annual		
6.	Fiber-optic cable connections	X	Annual		
7.	In-building fire emergency voice/alarm communications equipment	X	Semi-Annual		
8.	Remote annunciators	X	Semi-Annual		
9.	Notification appliance circuit power extenders	X	Annual	Inspection shall include verification of proper fuse ratings, if any. Lamps and LEDs shall be inspected to indicate normal operating status of the equipment. [Added to match other control equipment]	10.5
10.	Remote power supplies	X	Annual	Inspection shall include verification of proper fuse ratings, if any. Lamps and LEDs shall be inspected to indicate normal operating status of the equipment. [Added to match other control equipment]	10.5
11.	Initiating devices				
	(a) Air sampling				
	(1) General	X	Semi-Annual	Inspection shall verify that in-line filters, if any, are clean.	17.7.3.6
	(2) Sampling system piping and sampling ports	X	NR	Inspection shall verify that sampling system piping and fittings are installed airtight and are permanently fixed. Also, confirm that sampling pipe is conspicuously identified per the requirements of 17.7.3.6.8. Inspection shall also verify that sample ports are not obstructed from airflow.	17.7.3.6
	(b) Duct detectors				
	(1) General	X	Semi-Annual	Inspection shall verify that detector is rigidly mounted. Inspection shall also confirm that no penetrations in a return air duct exist in the vicinity of the detector. Inspection shall also confirm the detector is installed so as to sample the airstream at the proper location in the duct.	17.7.5.5
	(2) Sampling tube	X	NR	Inspection shall verify proper orientation. Inspection shall also confirm the sampling tube protrudes into the duct in accordance with system design.	17.7.5.5
	(c) Electromechanical releasing devices	X	Semi-Annual		

	(d) Fire extinguishing system(s) or suppression system(s) switches	X	Semi-Annual		
	(e) Manual fire alarm boxes	X	Semi-Annual		
	(f) Heat detectors	X	Semi-Annual		
	(g) Radiant energy fire detectors	X	Quarterly	Inspection shall verify that no point requiring detection is obstructed or outside the detector's field of view.	17.8
	(h) Video image smoke detectors	X	Quarterly	Same inspection method as Radiant energy fire detectors.	17.7.7; 17.11.5
	(h) Smoke detectors (excluding one- and two-family dwellings)	X	Semi-Annual		
	(i) Supervisory signal devices	X	Quarterly		
	(j) Waterflow devices	X	Quarterly		
10.	Guard's tour equipment	X	Semi-Annual		
11.	Combination systems				
	(a) Fire extinguisher electronic monitoring device/systems	X	Semi-Annual		
	(b) Carbon monoxide detectors/systems	X	Semi-Annual		
12.	Interface equipment	X	Semi-Annual		
13.	Notification appliances				
	(a) Audible devices	X	Semi-Annual		
	(b) Audible textual notification appliances	X	Semi-Annual		
	(c) Visible devices				
	(1) General	X	Semi-Annual	Appliance locations shall be verified to be per approved layout. [Previously in Test Method table 15c]	18.5.4
	(2) Candela rating	X	NR	It shall be verified that the candela rating marking agrees with the approved drawings. [Previously in Test Method table 15c]	18.5.4
14.	Exit marking audible notification appliances	X	Semi-Annual		
15.	Supervising station alarm systems — transmitters				
	(a) DACT	X	Semi-Annual		
	(b) DART	X	Semi-Annual		
	(c) McCulloh	X	Semi-Annual		
	(d) RAT	X	Semi-Annual		
16.	Special procedures	X	Semi-Annual		
17.	Supervising station alarm systems — receivers	X	Semi-Annual		
	(1) General	X	Semi-Annual		
	(2) Signal receipt	X	Daily	Inspection shall verify receipt of signal. [Moved from table footer]	

18.	Public emergency alarm reporting system transmission equipment			
	(a) Publicly accessible alarm box	X	Semi-Annual	
	(b) Auxiliary box	X	Annual	
	(c) Master box			
	(1) Manual operation	X	Semi-Annual	
	(2) Auxiliary operation	X	Annual	
19.	Mass notification system, monitored for integrity			Inspection shall include verification that illumination of lamps and/or LEDs indicate a system normal condition. Inspect that all electrical connections are in a good condition.
	(a) Control equipment			
	(1) Fuses	X	Annual	
	(2) Interfaces	X	Annual	
	(3) Lamps/LED	X	Annual	
	(4) Primary (main) power supply	X	Annual	
	(b) Secondary power batteries	X	Annual	
	(c) Initiating devices	X	Annual	
	(d) Notification appliances	X	Annual	
20.	Mass notification system, not monitored for integrity installed prior to adoption of this edition			Inspection shall include verification that illumination of lamps and/or LEDs indicate a system normal condition. Inspect that all electrical connections are in a good condition.
	(a) Control equipment			
	(1) Fuses	X	Semi-Annual	
	(2) Interfaces	X	Semi-Annual	
	(3) Lamps/LED	X	Semi-Annual	
	(4) Primary (main) power supply	X	Semi-Annual	
	(b) Secondary power batteries	X	Semi-Annual	
	(c) Initiating devices	X	Semi-Annual	
	(d) Notification appliances	X	Semi-Annual	
21.	Mass notification system Antenna	X	Annual	
22.	Mass notification system Transceivers	X	Annual	

*Reports of automatic signal receipt shall be verified daily.

72-182 Log #443 SIG-TMS **Final Action:**
(Table 14.3.1, Item 15)

Submitter: Larry W. Mann, Central Station, Inc.
Recommendation: Revise text to read as follows:
(a) ~~DACT~~ Digital alarm connunicator transmitter (DACT)
(b) ~~DART~~ Digital alarm radio transmitter (DART)
(c) McCulloh
(d) ~~RAT~~ Radio alarm transmitter (RAT)
(e) Other communicator
Substantiation: Change the description of each device to the full name of the device followed by the abbreviation. The change would match the nomenclature used in other sections of the standard.

72-183 Log #566a SIG-TMS **Final Action:**
(Table 14.3.1, Table 14.4.2.2, and Table 14.4.5)

Submitter: Dave Frable, U.S. General Services Administration
Recommendation: Revise as follows:
Chapter 14 (Revisons)
Table 14.3.1 Visual Inspection Frequencies
Add new 19 and renumber:
19. Area of Refuge Two-way Communication System. (Initial/reacceptance and annually)
Table 14.4.2.2 Test Methods
Add new 20 and renumber:
20. Area of Refuge Two-way Communication System. At a minimum, the two-way communication system shall be tested to verify operation and receipt of visual and audible alarm signals and the transmitting and receiving unit. System shall be operated with a minimum of five systems operating simultaneously. Voice quality and clarity shall be verified.
Table 14.4.5 Testing Frequencies.
Add new 26 and renumber:
26. Area of Refuge Two-way Communication System. (Initial/reacceptance and annually).
Substantiation: Currently all the applicable building codes (e.g., NFPA 500, IBC, and NFPA 101) have requirements regarding the two-way communication system for areas of refuge. In addition, each of these Codes also have requirements for a two-way communication to be installed at the elevator landing on each floor for communication between the elevator landing and the fire command center or central control point approved by the authority having jurisdiction. It appears the TC has not coordinated the subject two-way communication requirements stated in 24.5.3 with any of the requirements in the applicable building codes (e.g., NFPA 5000, IIBC, and NFPA 101). For example, the term “areas of rescue assistance” is not a defined term. In addition, to my knowledge there currently are no building code requirements for “areas” such as this to have direct access to an exit. Also, the requirements in Sections 24.5.3.1 thru 24.5.3.7 are covered in the applicable building code. In addition, it also appears that the TC may have overstepped their scope regarding specifying certain requirements in NFPA 72 for the subject two-way communication system. Key factors that the TC did not address include, but are not limited to; monitoring integrity of two-way communication circuits, common talk mode, etc. Based on the above stated reasons, I have deleted the existing text in Section 24.5.3 and provided new text to incorporate key factors that need to be addressed in NFPA 72 for these systems. In addition, I have proposed new text in Chapter 14 to coordinate the revisions made in Section 24.5.3.
Staff Note: A proposal has also been sent to SIG-ECS related to 24.5.3.

72-184 Log #46 SIG-TMS **Final Action:**
(14.4.1.1.1)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Delete text as follows:
~~14.4.1.1.1 System Testing~~
Substantiation: Redundant comment not needed and complicates numerical sequence. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-185 Log #47 SIG-TMS **Final Action:**
(14.4.1.2.1)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Delete text to read as follows:
~~14.4.1.2.1 Reacceptance testing shall be performed as required in 14.4.1.2.1.1 through 14.4.1.2.1.4.~~
Substantiation: Redundant comment not needed and complicates numerical sequence. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-186 Log #27 SIG-TMS **Final Action:**
(14.4.1.2.2)

Submitter: William Wayman, Hughes Associates, Inc.
Recommendation: Revise text to read as follows:
When ~~c~~changes are made to the system executive software, 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.
Substantiation: Existing text is not clear as to whether a change to the control equipment or a change in the executive software triggers the reacceptance test requirement. Proposed text clarifies that a change in the executive software triggers the requirement.

72-187 Log #542 SIG-TMS **Final Action:**
(Table 14.4.2.2 and Table 14.4.5)

Submitter: Frank L. Van Overmeiren, FP&C Consultants, Inc.
Recommendation: Revise Table 14.2.2 to read as follows:

Insert 72_L542_Tbl 14.4.2.2 *

Substantiation: Combine test frequency and test methods tables. Draft version of the NFPA 72 TMS task group for tables.

Table 14.4.2.2 Testing

	Device	Initial Acceptance	Periodic	Method
1.	Control Equipment			
	(a) Functions	X	Annually	~~At a minimum, control equipment shall be tested to~~ verify correct receipt of alarm, supervisory, and trouble signals (inputs); operation of evacuation signals and auxiliary functions (outputs); circuit supervision, including detection of open circuits and ground faults; and power supply supervision for detection of loss of ac power and disconnection of secondary batteries.
	(b) Fuses	X	Annually	~~The~~ Verify rating and supervision ~~shall be verified~~.
	(c) Interfaced equipment	X	Annually	Verify Integrity of single or multiple circuits providing interface between two or more control units shall be verified. Interfaced equipment connections shall be tested by operating or simulating operation of the equipment being supervised. Signals required to be transmitted shall be verified at the control unit.
	(d) Lamps and LEDs	X	Annually	Lamps and LEDs shall be illuminated.
	(e) Primary (main) power supply	X	Annually	All secondary (standby) power shall be disconnected and tested under maximum load, including all alarm appliances requiring simultaneous operation. All secondary (standby) power shall be reconnected at end of test. For redundant power supplies, each shall be tested separately.
	(f) Transponders	X	Annually	
2	Fire Alarm Control Unit Trouble Signals	X	Annually	
	(a) Audible and visual			Operation of control unit trouble signals shall be verified, as well as ring-back feature for systems using a trouble-silencing switch that requires resetting.
	(b) Disconnect switches			If control unit has disconnect or isolating switches, performance of intended function of each switch shall be verified and receipt of trouble signal when a supervised function is disconnected shall also be verified.
	(c) Ground-fault monitoring circuit			If the system has a ground detection feature, the occurrence of ground-fault indication shall be verified whenever any installation conductor is grounded.
	(d) Transmission of signals to off-premises location			An initiating device shall be actuated and receipt of alarm signal at the off-premises location shall be verified. A trouble condition shall be created and receipt of a trouble signal at the off-premises location shall be verified. A supervisory device shall be actuated and receipt of a supervisory signal at the off-premises location shall be verified. If a transmission carrier is capable of operation under a single- or multiple-fault condition, an initiating device shall be activated during such fault condition and receipt of a trouble signal at the off-premises location shall be verified, in addition to the alarm signal.
3.	Supervising Station Alarm Systems— Transmission Equipment[g]	X	Annually	

(a) All equipment	Test shall be performed on all system functions and features in accordance with the equipment manufacturer's published instructions for correct operation in conformance with the applicable sections of Chapter 26. Initiating device shall be actuated. Receipt of the correct initiating device signal at the supervising station within 90 seconds shall be verified. Upon completion of the test, the system shall be restored to its functional operating condition. If test jacks are used, the first and last tests shall be made without the use of the test jack.
(b) Digital alarm communicator transmitter (DACT)	Connection of the DACT to two separate means of transmission shall be ensured. *Exception: DACTs that are connected to a telephone line (number) that is also supervised for adverse conditions by a derived local channel.* DACT shall be tested for line seizure capability by initiating a signal while using the primary line for a telephone call. Receipt of the correct signal at the supervising station shall be verified. Completion of the transmission attempt within 90 seconds from going off-hook to on-hook shall be verified. The primary line from the DACT shall be disconnected. Indication of the DACT trouble signal at the premises shall be verified, as well as transmission to the supervising station within 4 minutes of detection of the fault. The secondary means of transmission from the DACT shall be disconnected. Indication of the DACT trouble signal at the premises shall be verified as well as transmission to the supervising station within 4 minutes of detection of the fault. The DACT shall be caused to transmit a signal to the DACR while a fault in the primary telephone number is simulated. Utilization of the secondary telephone number by the DACT to complete the transmission to the DACR shall be verified.
(c) Digital alarm radio transmitter (DART)	The primary telephone line shall be disconnected. Transmission of a trouble signal to the supervising station by the DART within 4 minutes shall be verified.
(d) McCulloh transmitter	Initiating device shall be actuated. Production of not less than three complete rounds of not less than three signal impulses each by the McCulloh transmitter shall be verified. If end-to-end metallic continuity is present and with a balanced circuit, each of the following four transmission channel fault conditions shall be caused in turn, and receipt of correct signals at the supervising station shall be verified: (1) Open (2) Ground (3) Wire-to-wire short (4) Open and ground If end-to-end metallic continuity is not present and with a properly balanced circuit, each of the following three transmission channel fault conditions shall be caused in turn, and receipt of correct signals at the supervising station shall be verified: (1) Open (2) Ground (3) Wire-to-wire short

	(e) Radio alarm transmitter (RAT)			A fault between elements of the transmitting equipment shall be caused. Indication of the fault at the protected premises shall be verified, or it shall be verified that a trouble signal is transmitted to the supervising station.
4.	Emergency Communications Equipment	X	Annually	
	(a) Amplifier/tone generators			Correct switching and operation of backup equipment shall be verified.
	(b) Call-in signal silence			Function shall be operated and receipt of correct visual and audible signals at control unit shall be verified.
	(c) Off-hook indicator (ring down)			Phone set shall be installed or phone shall be removed from hook and receipt of signal at control unit shall be verified.
	(d) Phone jacks			Phone jack shall be visually inspected and communications path through jack shall be initiated.
	(e) Phone set			Each phone set shall be activated and correct operation shall be verified.
	(f) System performance			System shall be operated with a minimum of any five handsets simultaneously. Voice quality and clarity shall be verified.
5.	Engine-Driven Generator	X	Monthly ~~Weekly~~	If an engine-driven generator dedicated to the system is used as a required power source, operation of the generator shall be verified in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*, by the building owner.
6.	Secondary (standby) Power Supply[a]	X	Annually	All primary (main) power supplies shall be disconnected, and the occurrence of required trouble indication for loss of primary power shall be verified. The system's standby and alarm current demand shall be measured or verified, and, using manufacturer's data, the ability of batteries to meet standby and alarm requirements shall be verified. General alarm systems shall be operated for a minimum of 5 minutes, and emergency voice communications systems for a minimum of 15 minutes. Primary (main) power supply shall be reconnected at end of test.
7.	Uninterrupted Power Supply (UPS)			If a UPS system dedicated to the system is used as a required power source, operation of the UPS system shall be verified by the building owner in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*
~~7.~~	~~Public emergency alarm reporting system power supply~~	~~X~~	~~Annually~~	
	~~(a) Lead-acid type~~			~~Perform the battery tests in accordance with item 6(b)~~
	~~(1) Charger Test~~			
	~~(b) Nickel-cadmium type~~			~~Perform the battery tests in accordance with item 6(c)~~
	~~(c) Sealed lead-acid type~~			~~Perform the battery tests in accordance with item 6(d)~~
	~~(d) Wired system~~			~~Manual tests of the power supply for public reporting circuits shall be made and recorded at least once during each 24-hour period. Such tests shall include the following:~~
				~~(1) Current strength of each circuit. Changes in current of any circuit exceeding 10 percent shall be investigated immediately.~~
				~~(2) Voltage across terminals of each circuit inside of terminals of protective devices. Changes in voltage of any circuit exceeding 10 percent shall be investigated immediately.~~

				~~(3)[e] Voltage between ground and circuits. If this test shows a reading in excess of 50 percent of that shown in the test specified in (2), the trouble shall be immediately located and cleared. Readings in excess of 25 percent shall be given early attention. These readings shall be taken with a calibrated voltmeter of not more than 100 ohms resistance per volt. Systems in which each circuit is supplied by an independent current source (Forms 3 and 4) require tests between ground and each side of each circuit. Common current source systems (Form 2) require voltage tests between ground and each terminal of each battery and other current source.~~ ~~(4) Ground current reading shall be permitted in lieu of (3). If this method of testing is used, all grounds showing a current reading in excess of 5 percent of the supplied line current shall be given immediate attention.~~ ~~(5) Voltage across terminals of common battery, on switchboard side of fuses.~~ ~~(6) Voltage between common battery terminals and ground.~~ ~~Abnormal ground readings shall be investigated immediately.~~ ~~Tests specified in (5) and (6) shall apply only to those systems using a common battery. If more than one common battery is used, each common battery shall be tested.~~
8.	Batteries – General Tests	X	Annually	Prior to conducting any battery testing, the person conducting the test shall ensure that all system software stored in volatile memory is protected from loss.
	~~(a) Visual Inspection~~			~~Batteries shall be inspected for corrosion or leakage. Tightness of connections shall be checked and ensured. If necessary, battery terminals or connections shall be cleaned and coated. Electrolyte level in lead acid batteries shall be visually inspected.~~
	(a)~~(b)~~ Battery replacement			Batteries shall be replaced in accordance with the recommendations of the alarm equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations.
	(b)~~(c)~~ Charger Test			Operation of battery charger shall be checked in accordance with charger test for the specific type of battery.
	(c)~~(d)~~Discharge Test			With the battery charger disconnected, the batteries shall be load tested following the manufacturer's recommendations. The voltage level shall not fall below the levels specified. *Exception: An artificial load equal to the full fire alarm load connected to the battery shall be permitted to be used in conducting this test.*
	(d)~~(e)~~Load voltage test			With the battery charger disconnected, the terminal voltage shall be measured while supplying the maximum load required by its application. The voltage level shall not fall below the levels specified for the specific type of battery. If the voltage falls below the level specified, corrective action shall be taken and the batteries shall be retested. *Exception: An artificial load equal to the full fire alarm load connected to the battery shall be permitted to be used in conducting this test.*
9.	Battery Tests (specific types)			
	~~(a) Primary battery load voltage test~~			~~The maximum load for a No. 6 primary battery shall not be more than 2 amperes per cell. An individual (1.5 volt) cell shall be replaced when a load of 1 ohm reduces the voltage below 1 volt. A 6-volt assembly shall be replaced when a test load of 4 ohms reduces the voltage below 4 volts.~~

	(a)~~(b)~~Lead-acid type			
	(1) Charger test	X	Annually	With the batteries fully charged and connected to the charger, the voltage across the batteries shall be measured with a voltmeter. The voltage shall be 2.30 volts per cell ± 0.02 volts at 77°F (25°C) or as specified by the equipment manufacturer.
	(2) Load voltage test	X	~~Monthly~~Semi-Annually	Under load, the battery shall not fall below 2.05 volts per cell.
	(3) Specific gravity	X	Semi-Annually	The specific gravity of the liquid in the pilot cell or all of the cells shall be measured as required. The specific gravity shall be within the range specified by the manufacturer. Although the specified gravity varies from manufacturer to manufacturer, a range of 1.205- 1.220 is typical for regular lead-acid batteries, while 1.240 – 1.260 is typical for high-performance batteries. A hydrometer that shows only a pas or fail condition of the battery and does not indicate the specific gravity shall not be used, because such a reading does not give a true indication of the battery condition.
	(b)~~(c)~~ Nickel-Cadmium Type			
	(1) Charger test[b]	X	~~Quarterly~~ Annually	With the batteries fully charged and connected to the charger, an ampere meter shall be placed in series with the battery under charge. The charging current shall be in accordance with the manufacturer's recommendations for the type of battery used in the absence of specific information, 1/30 to 1/25 of the battery rating shall be used.
	(2) Load voltage test	X	Semi-Annually	Under load the float voltage for the entire battery shall be 1.42 volts per cell, nominal. If possible, cells shall be measured individually.
	(c)~~(d)~~ Sealed lead-acid Type			
	(1) Charger test	X	Annually	With the batteries fully charged and connected to the charger, the voltage across the batteries shall be measured with a voltmeter. The voltage shall be 2.30 volts per cell ± 0.02 volts at 77°C (25°C) or as specified by the equipment manufacturer.
	(2) Load voltage test	X	Semi-Annually	Under load, the battery shall perform in accordance with the battery manufacturer's specifications.
~~9.~~	~~Transient suppressors~~			~~Lightning protection equipment shall be inspected and maintained per the manufacturer's published instructions.~~ ~~Additional inspections shall be required after any lightning strikes.~~ ~~Equipment located in moderate to severe areas outlined in NFPA 780, *Standard for the Installation of Lightning Protection Systems*, Annex L, shall be inspected semiannually and after any lightning strikes.~~
10.	Remote Annunciators	X	Annually	The correct operation and identification of annunciators shall be verified. If provided, the correct operation of annunciator under a fault condition shall be verified.
11	Conductors — Metallic			
	(a) Stray voltage	X		All installation conductors shall be tested with a volt/ohmmeter to verify that there are no stray (unwanted) voltages between installation conductors or between installation conductors and ground. Unless a different threshold is specified in the published manufacturer's instructions for the installed equipment, the maximum allowable stray voltage shall not exceed 1 volt ac/dc.
	(b) Ground faults	X		All installation conductors, other than those intentionally and permanently grounded, shall be tested for isolation from ground per the installed equipment manufacturer's published instructions.

(c) Short-circuit faults	X		All installation conductors, other than those intentionally connected together, shall be tested for conductor-to-conductor isolation per the published manufacturer's instructions for the installed equipment. These same circuits also shall be tested conductor-to-ground.
(d) Loop resistance	X		With each initiating and indicating circuit installation conductor pair short-circuited at the far end, the resistance of each circuit shall be measured and recorded. It shall be verified that the loop resistance does not exceed the limits specified in the published manufacturer's instructions for the installed equipment.
(e) Supervision	X	Annually	Introduction of a fault in any circuit monitored for integrity shall result in a trouble indication at the fire alarm control unit. One connection shall be opened at not less than 10 percent of the initiating devices, notification appliances and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit.
12. Conductors — Nonmetallic			
(a) Circuit integrity	X	Annually	Each initiating device, notification appliance, and signaling line circuit shall be tested to confirm that the installation conductors are monitored for integrity in accordance with the requirements of Chapters 10 and 23.
(b) Fiber optics	X		The fiber-optic transmission line shall be tested in accordance with the manufacturer's published instructions by the use of an optical power meter or by an optical time domain reflectometer used to measure the relative power loss of the line. This relative figure for each fiber-optic line shall be recorded in the fire alarm control unit. If the power level drops 2 percent or more from the value recorded during the initial acceptance test, the transmission line, section thereof, or connectors shall be repaired or replaced by a qualified technician to bring the line back into compliance with the accepted transmission level per the manufacturer's published instructions.
(c) Supervision	X	Annually	Introduction of a fault in any supervised circuit shall result in a trouble indication at the control unit. One connection shall be opened at not less than 10 percent of the initiating device, notification appliance, and signaling line circuit. Each initiating device, notification appliance, and signaling line circuit shall be tested for correct indication at the control unit. All circuits shall perform as indicated in 23.5.2, 23.5.3, 23.6.2 through 23.6.5, 23.7.2 and 23.7.3.
13. Initiating Devices			
(a) Electromechanical releasing device	X	Annually	
(1) Nonrestorable-type link			Correct operation shall be verified by removal of the fusible link and operation of the associated device. Any moving parts shall be lubricated as necessary.
(2) Restorable-type link[d]			Correct operation shall be verified by removal of the fusible link and operation of the associated device. Any moving parts shall be lubricated as necessary.
(b) Fire extinguishing system(s) or suppression system(s) alarm switch	X	Annually	The switch shall be mechanically or electrically operated and receipt of signal by the fire alarm control unit shall be verified.
(c) Fire–gas and other detectors	X	Annually	Fire–gas detectors and other fire detectors shall be tested as prescribed by the manufacturer and as necessary for the application.
(d) Heat detectors	X	Annually	

(1) Fixed-temperature, rate-of-rise, rate of compensation, restorable line, spot type (excluding pneumatic tube type)			Heat test shall be performed with a heat source per the manufacturer's published instructions. A test method shall be used that is specified in the manufacturer's published instructions for the installed equipment, or other method shall be used that will not damage the nonrestorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element detector.
(2) Fixed-temperature, nonrestorable line type			Heat test shall not be performed. Functionality shall be tested mechanically and electrically. Loop resistance shall be measured and recorded. Changes from acceptance test shall be investigated.
(3) Fixed-temperature, nonrestorable spot type			After 15 years from initial installation, all devices shall be replaced or 2 detectors per 100 shall be laboratory tested. The 2 detectors shall be replaced with new devices. If a failure occurs on any of the detectors removed, additional detectors shall be removed and tested to determine either a general problem involving faulty detectors or a localized problem involving 1 or 2 defective detectors. If detectors are tested instead of replaced, tests shall be repeated at intervals of 5 years.
(4) Nonrestorable (general)			Heat tests shall not be performed. Functionality shall be tested mechanically and electrically.
(5) Restorable line type, pneumatic tube only			Heat tests shall be performed (where test chambers are in circuit), or a test with pressure pump shall be conducted.
(6) Single- and multiple-station heat alarms			Functional tests shall be conducted according to manufacturer's published instructions. Nonrestorable heat detectors shall not be tested with heat.
(e) Manual fire alarm boxes	X	Annually	Manual fire alarm boxes shall be operated per the manufacturer's published instructions. Key-operated presignal and general alarm manual fire alarm boxes shall both be tested.
(f) Radiant energy fire detectors	X	Semi-annually	Flame detectors and spark/ember detectors shall be tested in accordance with the manufacturer's published instructions to determine that each detector is operative. Flame detector and spark/ember detector sensitivity shall be determined using any of the following: (1) Calibrated test method (2) Manufacturer's calibrated sensitivity test instrument (3) Listed control unit arranged for the purpose (4) Other approved calibrated sensitivity test method that is directly proportional to the input signal from a fire, consistent with the detector listing or approval If designed to be field adjustable, detectors found to be outside of the approved range of sensitivity shall be replaced or adjusted to bring them into the approved range. Flame detector and spark/ember detector sensitivity shall not be determined using a light source that administers an unmeasured quantity of radiation at an undefined distance from the detector.
(g) Smoke detectors	X	Annually	
(1) In other than one- and two-family dwellings, system detectors and single- or multiple-station smoke alarms			[e]Smoke detectors/smoke alarms shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response. Testing with smoke or listed aerosol, acceptable to the manufacturer of the aerosol or the manufacturer of the smoke detector/smoke alarm and identified in their published instructions, shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted. Any of the following tests shall be performed to ensure that each smoke detector is within its listed and marked sensitivity range:

			(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 when its sensitivity is outside its listed sensitivity range (5) Other calibrated sensitivity test method approved by the authority having jurisdiction
(2) Smoke/carbon monoxide alarms in other than one- and two-family dwellings.			The smoke alarms shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response. Testing with real smoke or listed simulated aerosol or listed smoke particulate approved by the manufacturer shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted. Any of the following tests shall be performed to ensure that each smoke alarm is within its listed and marked sensitivity range: (1) Calibrated test method (2) Manufacturer's calibrated sensitivity test instrument (3) Other calibrated sensitivity test method approved by the authority having jurisdiction The carbon monoxide alarm shall be tested in accordance with NFPA 720.
(3) Single-and multiple-station smoke alarms connected to protected premises systems			A functional test shall be performed on all single-and-multiple station smoke alarms connected to a protected premises fire alarm system by putting the smoke alarm into an alarm condition and verifying that the protected premises system receives a supervisory signal and does not cause a fire alarm signal.
(4) Single- and multiple-station smoke alarms and system smoke detectors used in one- and two-family dwellings			Functional tests shall be conducted according to manufacturer's published instructions.
(5) Air sampling			Per test methods documented in the manufacturer's published instructions, detector alarm response shall be verified through the end sampling port on each pipe run; airflow through all other ports shall be verified as well.
(6) Duct type			In addition to the testing required in Table 14.4.2.2(g)(1), duct smoke detectors utilizing sampling tubes shall be tested by verifying the correct pressure differential (within the manufacturer's published ranges) between the inlet and exhaust tubes using a method acceptable to the manufacturer to ensure that the device will properly sample the airstream. These tests shall be made in accordance with the manufacturer's published instructions for the device installed.
(7) Projected beam type			The detector shall be tested by introducing smoke, other aerosol, or an optical filter into the beam path.
(8) Smoke detector with built-in thermal element			Both portions of the detector shall be operated independently as described for the respective devices.
(9) Smoke detectors with control output functions			It shall be verified that the control capability shall remain operable even if all of the initiating devices connected to the same initiating device circuit or signaling line circuit are in an alarm state.
(h) Carbon monoxide detectors/carbon monoxide alarms for the purposes of fire detection	X	Annually	The devices shall be tested in place to ensure CO entry to the sensing chamber by introduction of CO gas from the protected area, through the vents, to the sensing chamber.

	(i) Initiating devices, supervisory	X	Annually	
	(1) Control valve switch			Valve shall be operated and signal receipt shall be verified to be within the first two revolutions of the handwheel or within one-fifth of the travel distance, or per the manufacturer's published instructions.
	(2) High- or low-air pressure switch			Switch shall be operated. Receipt of signal obtained where the required pressure is increased or decreased a maximum 10 psi (70 kPa) from the required pressure level shall be verified.
	(3) Room temperature switch			Switch shall be operated. Receipt of signal to indicate the decrease in room temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C) shall be verified.
	(4) Water level switch			Switch shall be operated. Receipt of signal indicating the water level raised or lowered a maximum 3 in. (70 mm) from the required level within a pressure tank, or a maximum 12 in. (300 mm) from the required level of a nonpressure tank, shall be verified, as shall its restoral to required level.
	(5) Water temperature switch			Switch shall be operated. Receipt of signal to indicate the decrease in water temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C) shall be verified.
	(j) Mechanical, electrosonic, or pressure-type waterflow device			Water shall be flowed through an inspector's test connection indicating the flow of water equal to that from a single sprinkler of the smallest orifice size installed in the system for wet-pipe systems, or an alarm test bypass connection for dry-pipe, pre-action, or deluge systems in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.
	(k) Multi-sensor fire detector or multi-criteria fire detector or combination fire detector			(1) Each of the detection principles present within the detector (e.g. smoke/heat/CO, etc.) shall be tested independently for the specific detection principle, regardless of the configuration status at the time of testing. Each detector shall also be tested in accordance with the published manufacturer's instructions. (2) Individual sensors shall be tested together if the technology allows individual sensor responses to be verified. (3) Tests shall be performed as described for the respective devices by introduction of the physical phenomena to the sensing chamber of element, and an electronic check (magnets, analogue values, etc.) is not sufficient to comply with this requirement. (4) The result of each sensor test shall be confirmed. This shall be through indication at the detector or control unit. (5) Where individual sensors cannot be tested individually, the primary sensor shall be tested (6) All tests and results shall be recorded.
14.	Special hazard equipment	X	Annually	
	(a) Abort switch (dead-man type)			Abort switch shall be operated. Correct sequence and operation shall be verified.
	(b) Abort switch (recycle type)			Abort switch shall be operated. Development of correct matrix with each sensor operated shall be verified.
	(c) Abort switch (special type)			Abort switch shall be operated. Correct sequence and operation in accordance with authority having jurisdiction shall be verified. Sequencing on as-built drawings or in system owner's manual shall be observed.

	(d) Cross-zone detection circuit			One sensor or detector on each zone shall be operated. Occurrence of correct sequence with operation of first zone and then with operation of second zone shall be verified.
	(e) Matrix-type circuit			All sensors in system shall be operated. Development of correct matrix with each sensor operated shall be verified.
	(f) Release solenoid circuit			Solenoid shall be used with equal current requirements. Operation of solenoid shall be verified.
	(g) Squibb release circuit			AGI flashbulb or other test light approved by the manufacturer shall be used. Operation of flashbulb or light shall be verified.
	(h) Verified, sequential, or counting zone circuit			Required sensors at a minimum of four locations in circuit shall be operated. Correct sequence with both the first and second detector in alarm shall be verified.
	(i) All above devices or circuits or combinations thereof			Supervision of circuits shall be verified by creating an open circuit.
15.	Combination Systems			
	(a) Fire extinguisher electronic monitoring device/system	X	Annually	Communication between the device connecting the fire extinguisher electronic monitoring device/system and the fire alarm control unit shall be tested to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.
16.	Interface Equipment	X	Annually	Interface equipment connections shall be tested by operating or simulating the equipment being supervised. Signals required to be transmitted shall be verified at the control unit. Test frequency for interface equipment shall be the same as the frequency required by the applicable NFPA standard(s) for the equipment being supervised.
17.	Guard's Tour Equipment	X	Annually	The device shall be tested in accordance with the manufacturer's published instructions.
18.	Alarm Notification Appliances	X	Annually	
	(a) Audible			(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters,* Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that they are in compliance with Chapter 18. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST). (2) Periodic testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters,* Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where building, system, or occupancy changes have occurred. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST).
	(b) Audible textual notification appliances (speakers and other appliances to convey voice messages)			(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters,* Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that they are in compliance with Chapter 18. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST).

				Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13. (2) Periodic testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters,* Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where building, system, or occupancy changes have occurred. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST). Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13 where building, system, or occupancy changes have occurred.
	(c) Visible			Test shall be performed in accordance with the manufacturer's published instructions. Appliance locations shall be verified to be per approved layout, and it shall be confirmed that no floor plan changes affect the approved layout. It shall be verified that the candela rating marking agrees with the approved drawing. It shall be confirmed that each appliance flashes.
19.	Exit Marking Audible Notification Appliances	X	Annually	Tests shall be performed in accordance with manufacturer's published instructions.
20.	Emergency Control functions[h]	X	Annually	Emergency control functions (i.e., fan control, smoke damper operation, elevator recall, elevator power shutdown, door holder release, shutter release, door unlocking, etc.) shall be tested by operating or simulating alarm signals. Testing frequency for emergency control functions shall be the same as the frequency required for the initiating device that activates the emergency control function.
21.	Special Procedures	X	Annually	
	(a) Alarm verification			Time delay and alarm response for smoke detector circuits identified as having alarm verification shall be verified.
	(b) Multiplex systems			Communications between sending and receiving units under both primary and secondary power shall be verified. Communications between sending and receiving units under open circuit and short circuit trouble conditions shall be verified. Communications between sending and receiving units in all directions where multiple communications pathways are provided shall be verified. If redundant central control equipment is provided, switchover and all required functions and operations of secondary control equipment shall be verified. All system functions and features shall be verified in accordance with manufacturer's published instructions.
22.	Supervising Station Alarm Systems— Receiving Equipment	X	Monthly	
	(a) All equipment			Tests shall be performed on all system functions and features in accordance with the equipment manufacturer's published instructions for correct operation in conformance with the applicable sections of Chapter 26. Initiating device shall be actuated. Receipt of the correct initiating device signal at the supervising station within 90 seconds shall be verified. Upon completion of the test, the system shall be restored to its functional operating condition.

		If test jacks are used, the first and last tests shall be made without the use of the test jack.
	(b) Digital alarm communicator receiver (DACR)	Each telephone line (number) shall be disconnected in turn from the DACR, and audible and visual annunciation of a trouble signal in the supervising station shall be verified. A signal shall be caused to be transmitted on each individual incoming DACR line at least once every 24 hours. Receipt of these signals shall be verified.
	(c) Digital alarm radio receiver (DARR)	The following conditions of all DARRs on all subsidiary and repeater station receiving equipment shall be caused. Receipt at the supervising station of correct signals for each of the following conditions shall be verified: (1) AC power failure of the radio equipment (2) Receiver malfunction (3) Antenna and interconnecting cable failure (4) Indication of automatic switchover of the DARR (5) Data transmission line failure between the DARR and the supervising or subsidiary station
	(d) McCulloh systems	The current on each circuit at each supervising and subsidiary station under the following conditions shall be tested and recorded: (1) During functional operation (2) On each side of the circuit with the receiving equipment conditioned for an open circuit A single break or ground condition shall be caused on each transmission channel. If such a fault prevents the functioning of the circuit, receipt of a trouble signal shall be verified. Each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment shall be caused; receipt of correct signals at the supervising station shall be verified: (1) RF transmitter in use (radiating) (2) AC power failure supplying the radio equipment (3) RF receiver malfunction (4) Indication of automatic switchover
	(e) Radio alarm supervising station receiver (RASSR) and radio alarm repeater station receiver (RARSR)	Each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment shall be caused; receipt of correct signals at the supervising station shall be verified: (1) AC power failure supplying the radio equipment (2) RF receiver malfunction (3) Indication of automatic switchover, if applicable
	(f) Private microwave radio systems	Each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment shall be caused; receipt of correct signals at the supervising station shall be verified: (1) RF transmitter in use (radiating) (2) AC power failure supplying the radio equipment (3) RF receiver malfunction (4) Indication of automatic switchover
23.	Public emergency alarm reporting system transmission equipment	

	(a) Publicly accessible alarm box	X	Semi-annually	Publicly accessible initiating device(s) shall be actuated. Receipt of not less than three complete rounds of signal impulses shall be verified. This test shall be performed under normal circuit conditions. If the device is equipped for open circuit operation (ground return), it shall be tested in this condition as one of the semiannual tests.
	(b) Auxiliary box	X	Annually	Each initiating circuit of the auxiliary box shall be tested by actuation of a protected premises initiating device connected to that circuit. Receipt of not less than three complete rounds of signal impulses shall be verified.
	(c) Master box			
	(1) Manual operation	X	Semi-annually	Perform the tests prescribed for 8(a).
	(2) Auxiliary operation	X	Annually	Perform the tests prescribed for 8(b).
24.	Low-Power Radio (wireless systems)	X	Annually	The following procedures describe additional acceptance and reacceptance test methods to verify wireless protection system operation: (1) The manufacturer's published instructions and the as-built drawings provided by the system supplier shall be used to verify correct operation after the initial testing phase has been performed by the supplier or by the supplier's designated representative. (2) Starting from the functional operating condition, the system shall be initialized in accordance with the manufacturer's published instructions. A test shall be conducted to verify the alternative path, or paths, by turning off or disconnecting the primary wireless repeater. The alternative communications path shall exist between the wireless control unit and peripheral devices used to establish initiation, indication, control and annunciation. The system shall be tested for both alarm and trouble conditions. (3) Batteries for all components in the system shall be checked monthly. If the control unit checks all batteries and all components daily, the system shall not require monthly testing of the batteries.
25.	Mass Notification Systems	X	Annually	
	(a) Functions			At a minimum, control equipment shall be tested to verify correct receipt of alarm, supervisory, and trouble signals (inputs); operation of evacuation signals and auxiliary functions (outputs); circuit supervision, including detection of open circuits and ground faults; and power supply supervision for detection of loss of ac power and disconnection of secondary batteries.
	(b) Fuses			The rating and supervision shall be verified.
	(c) Interfaced Equipment			Integrity of single or multiple circuits providing interface between two or more control units shall be verified. Interfaced equipment connections shall be tested by operating or simulating operation of the equipment being supervised. Signals required to be transmitted shall be verified at the control unit.
	(d) Lamps and LEDs			Lamps and LEDs shall be illuminated.
	(e) Primary (main) power supply			All secondary (standby) power shall be disconnected and tested under maximum load, including all alarm appliances requiring simultaneous operation. All secondary (standby) power shall be reconnected at end of test. For redundant power supplies, each shall be tested separately.

(f) Audible textual notification appliances (speakers and other appliances to convey voice messages)	Sound pressure level shall be measured with a sound level meter meeting ANSI S1.2a *Specifications for Sound Level Meters,* Type 2 requirements. Levels throughout protected area shall be measured and recorded. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal*, using the time-weighted characteristic F (FAST). The maximum output shall be recorded when the audible emergency evacuation signal is on. Audible information shall be verified to be distinguishable and understandable.
(g) Visible	Test shall be performed in accordance with manufacturer's published instructions. Appliance locations shall be verified to be per approved layout, and it shall be confirmed that no floor plan changes affect the approved layout. It shall be verified that the candela rating marking agrees with the approved drawing. It shall be confirmed that each appliance flashes.
(h) Control unit functions and no diagnostic failures are indicated	Review event log file, verify that the correct events were logged. Review system diagnostic log file; correct deficiencies noted in file. Delete unneeded log files. Delete unneeded error files. Verify that sufficient free disk space is available. Verify unobstructed flow of cooling air is available. Change/ clean filters, cooling fans, and intake vents.
(i) Control unit reset	Power down the central control unit computer and restart it.
(j) Control unit security	If remote control software is loaded onto the system, verify that it is disabled to prevent unauthorized system access.
(k) Audible/visible functional test	Send out an alert to a diverse set of predesignated receiving devices and confirm receipt. Include at least one of each type of receiving device.
(l) Software backup	Make full system software backup. Rotate backups based on accepted practice at site.
(m) Secondary power test	Disconnect ac power. Verify the ac power failure alarm status on central control equipment. With ac power disconnected, verify battery voltage under load.
(n) Wireless signals	Check forward/reflected radio power is within specifications.
(o) Antenna	Check forward/reflected radio power is within specifications. Verify solid electrical connections with no observable corrosion.
(p) Transceivers	Verify proper operation and mounting is not compromised.

[a]See A.14.4.2.2.

[b]Example: 4000 mAh × 1/25 = 160 mA charging current at 77°F (25°C).

[c]The voltmeter sensitivity has been changed from 1000 ohms per volt to 100 ohms per volt so that false ground readings (caused by induced voltages) are minimized.

[d]Fusible thermal link detectors are commonly used to close fire doors and fire dampers. They are actuated by the presence of external heat, which causes a solder element in the link to fuse, or by an electric thermal device, which, when energized, generates heat within the body of the link, causing the link to fuse and separate.

[e]Note, it is customary for the manufacturer of the smoke detector/smoke alarm to test a particular product from an aerosol provider to determine acceptability for use in smoke entry testing of their smoke detector/ smoke alarm.

[f]For example, it might not be possible to individually test the heat sensor in a thermally enhanced smoke detector.

[g]See A.14.4.2.2.

[h]See A.14.4.2.2.

72-187a Log #583 SIG-TMS **Final Action:**
(14.4.2.2(14)(j))

Submitter: Thomas P. Hammerberg, Automatic Fire Alarm Association, Inc.
Recommendation: Revise 14.4.2.2 (14)(j):

Water shall be flowed through an inspector's test connection indicating the flow of water. ~~equal to that from a single sprinkler of the smallest orifice size installed in the system for wet-pipe systems, or an alarm test bypass connection for dry-pipe, pre-action, or deluge systems in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.~~

Substantiation: A typical fire alarm inspector does not have the ability or knowledge to verify the orifice size, proper flow amount etc. Further, NFPA 25 does not require this in their testing section. NFPA 25, 2008 section 5.5.1 states "Operational test using inspector's test Connection," nothing further. Why do we impose the fire alarm inspector to test for something the sprinkler inspector is not required to do?

This is not original material; its reference/source is as follows:
AFAA and NEMA 2SB Section Codes and Standards Committee.

72-188 Log #258 SIG-TMS Final Action:
(Table 14.4.2.2 Item12(e))

Submitter: Carl F. Willms, Fire Security Technologies, Inc.
Recommendation: Add new text to read as follows:
Table 14.4.2.2
12. Conductors — metallic
(e) Supervision
Each initiating device, notification appliance, and signaling line circuit shall be tested for correct indication at the control unit. All circuits shall perform as indicated in 23.5, 23.6 and 23.7.
Substantiation: Text is presently included in Table 14.4.2.2 - 12. Conductors —nonmetallic (c) Supervision and should also be applicable to metallic conductors. References were revised editorially so all applicable provisions of referenced sections apply. Proposal developed by SIG-PRO Task Group (Carl Willms - Joshua Elvove).

72-189 Log #273 SIG-TMS Final Action:
(Table 14.4.2.2 Item12(e))

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: Take last paragraph of 13(c) and add to 12 (e). Change to 23.5, 23.6, and 23.7.
12(e) To read as follows:
Introduction of a fault in any circuit monitored for integrity shall result in a trouble indication at the fire alarm control unit. One connection shall be opened at not less than 10 percent of the initiating devices, notification appliances and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit.
Each initiating device, notification appliance, and signaling line circuit shall be tested for correct indication at the control unit. All circuits shall perform as indicated in 23.5, 23.6, and 23.7.
Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. The change requires a test to ensure the correct indication is provided at the control unit for faults for metallic conductors, the same and nonmetallic.

72-190 Log #237 SIG-TMS Final Action:
(Table 14.4.2.2 Item 13(b))

Submitter: Rodger Reiswig, SimplexGrinnell
Recommendation: Table 14.4.2.2
13. (b) Fiber Optics
The fiber-optic transmission line shall be tested in accordance with the manufacturer's published instructions by the use of an optical power meter or by an optical time domain reflectometer used to measure the relative power loss of the line. Test result data must meet or exceed the ANSI/EIA/TIA 568-C.3 industry standard related to fiber-optic lines and connection/splice losses as well as manufacturer's published specifications. This relative figure for each fiber-optic line shall be recorded in the fire alarm control unit. If the ~~power level drops 2 percent or more from the value recorded during the initial acceptance test,~~ fiber-optic line under test no longer meets industry standards or the manufacturer's published performance specifications, the transmission line, section thereof, or connectors shall be repaired or replaced by a qualified technician to bring the line back into compliance with the accepted transmission level per the manufacturer's published instructions. and meet or exceed the ANSI/EIA/TIA 568-C.3 standard.
Substantiation: A universally accepted standard is the EIA/TIA/ANSI 568-C.3 specification for losses, which is nationally accepted and is also mutually agreed upon in IEEE and ITU standards globally. For example, the current universally acceptable loss limits are .75dB/connector pair, .30dB/splice and the various losses per fiber type/wavelength as noted in these standards. There should be no penalty for degradation if all of the components can be clearly tested to these specifications. The "percentage" of degradation is difficult to calculate based on prior dBm values anyway. In some circumstances, the manufacturer may require specifications that are more stringent than these industry standards and therefore, should be used instead.

72-191 Log #251 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(d)(1))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:
Heat test shall be performed with a certified heat source acceptable to the manufacturer of the detector and ~~per the manufacturer's published instructions. A~~ the test method ~~shall be used that is specified in the manufacturer's published instructions~~ for the installed equipment~~, or other method~~ shall ~~be used that will~~ not damage the non restorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element detector.
Substantiation: 1. The heat source needs to be "certified" because the current situation permits use of all manner of uncontrolled, unprofessional and dangerous heat sources ranging from cigarette lighters through to hair driers. Their use can and does damage detectors and is a major danger to buildings and their occupants – particularly if used at height. Certification provides an independent and expert verification that the product is safe and suitable for purpose.
2. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.
3. A test product and method needs to be acceptable to the manufacturer of the product being tested but it is not practical to have the test product or method required to be noted in their published instructions. New products and methods become available after instructions are published (sometimes many years after) and it is neither practical nor cost effective for manufacturers to revise instructions (in particular where they form part of a listing for that detector). The requirement for more recent test products to be specified in published instructions is therefore a barrier to the introduction of new technologies and / or methods – particular if the desired goal (of suitability for purpose) can be achieved by the means proposed here (3rd party certification and acceptability to detector manufacturer).
4. The phrase "or other method" is encompassed naturally so long as it is a) certified, b) acceptable to the detector manufacturer.
5. The remaining proposed changes are to shorten the Code by removal of superfluous wording and should be self explanatory.

72-192 Log #142 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(d)(3))

Submitter: Jeffrey D. Zwirn, IDS Research & Development, Inc.
Recommendation: Revise text to read as follows:
After 15 years from initial installation, all devices shall be replaced. ~~or 2 detectors per 100 shall be laboratory tested. The 2 detectors shall be replaced with new devices. If a failure occurs on any of the detectors removed, additional detectors shall be removed and tested to determine either a general problem involving faulty detectors or a localized problem involving 1 or 2 defective detectors.~~
Substantiation: The concept of sending out chosen heat detectors to a laboratory for testing is not often used and there are not too many laboratories who will perform this test. Having said that, this is not the way to technically quantify the condition, functionality, and reliability of the detectors which were not removed. In other words, for the majority of the remaining detectors at the premises it's literally guesswork and not fire alarm science. At the same time, at 15 years all of the detectors should be required to be replaced, anyway, as the very small laboratory test sample is not sufficient enough to achieve any level of reliability for the remaining detectors, creates increased risk to the customer, and liability to the contractor. Finally, the concept of the "forever detector" should be stricken from any of the "acceptable requirements" of NFPA 72.

72-193 Log #252 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(d)(5))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:
Heat tests shall be performed (where test chambers are in circuit), with a certified heat source acceptable to the manufacturer of the detector or a test with pressure pump shall be conducted.
Substantiation: 1. The heat source needs to be "certified" because the current situation permits use of all manner of uncontrolled, unprofessional and dangerous heat sources ranging from cigarette lighters through to hair driers. Their use can and does damage detectors and is a major danger to buildings and their occupants. Certification provides an independent and expert verification that the product is safe and suitable for purpose
2. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.

72-194 Log #290 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g))

Submitter: Richard Jay Roberts, Honeywell Life Safety/System Sensor
Recommendation: Revise text of Item 14(g)(1) as follows:
In other than one- and two-family dwellings, system detectors and/or single- or multiple-station smoke alarms
[e]Smoke detectors and/or smoke alarms shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response. Testing with smoke or listed aerosol, acceptable to the manufacturer of the aerosol or the manufacturer of the smoke detector/smoke alarm and identified in their published instructions, shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted.
Substantiation: The intent of the section requires smoke entry into the sensing chamber for both smoke detectors and smoke alarms. As read in context, the requirement of this section is vague. This proposal provides clarity to the intent of the requirements.

72-195 Log #427 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(1))

Submitter: Robert P. Schifiliti, R. P. Schifiliti Associates, Inc.
Recommendation: Revise by adding the following after the 3rd sentence (…into the sensing chamber shall be permitted.):
Where the use of aerosols is not permitted by other governing laws, codes, standards or the Authority Having Jurisdiction, test buttons, magnets or other means provided by the manufacturer shall be permitted. Where such tests are done in lieu of smoke entry tests, a thorough visual examination shall be performed and documented and the test report will cite the test method employed.
Add new annex text as follows:
Test aerosols might not be permitted to be used in clean room, hospital operating rooms, patient care areas and other controlled environments. Where an aerosol entry test is not conducted, there needs to be some test or inspection that reasonably assures that the detector is not blocked and that smoke is capable of entering the detector.
Substantiation: Test aerosols might not be permitted to be used in clean room, hospital operating rooms, patient care areas and other controlled environments. Where an aerosol entry test is not conducted, there needs to be some test or inspection that reasonably assures that the detector is not blocked and that smoke is capable of entering the detector.

72-196 Log #253 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(1))

Submitter: William J. Rossiter, SDI

Recommendation: Revise text to read as follows:

Smoke detectors / smoke alarms shall be tested in place to ensure smoke entry from the protected area, through the vents into the sensing chamber and an alarm response~~: Testing~~ with certified smoke or ~~listed~~ aerosol, acceptable to the ~~manufacturer of the aerosol or the~~ manufacturer of the smoke detector / smoke alarm ~~and identified in their published instructions, shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted.~~

Substantiation: 1. A good proportion of the proposed changes are to shorten the Code by removal of superfluous and repetitious wording and should be self explanatory.

2. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.

3. The manufacturer of the aerosol is not, ideally, the body that should be the final arbiter on what is / not acceptable as the test aerosol. This can be (and is) achieved through 3rd party certifications and endorsement of the detector manufacturer.

4. A test product and method needs to be acceptable to the manufacturer of the product being tested but it is not practical to have the test product or method required to be noted in their published instructions. New products and methods become available after instructions are published (sometimes many years after) and it is neither practical nor cost effective for manufacturers to revise instructions (in particular where they form part of a listing for that detector). The requirement for more recent test products to be specified in published instructions is therefore a barrier to the introduction of new technologies and / or methods – particular if the desired goal (of suitability for purpose) can be achieved by the means proposed here (3rd party certification and acceptability to detector manufacturer).

5. The phrase "other methods" is encompassed naturally so long as they a) ensure smoke entry, b) are certified, and c) are acceptable to the detector manufacturer.

6. The remaining deletions are because they have been moved to the start of the clause.

72-197 Log #254 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(2))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:

The smoke alarms shall be tested in place to ensure smoke from the protected area, through the vents into the sensing chamber and an alarm response with certified smoke or aerosol, acceptable to the manufacturer of the smoke detector / smoke alarm ~~into the sensing chamber and an alarm response. Testing with real smoke or listed simulated aerosol or listed smoke particulate approved by the manufacturer shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted~~

Any of the following tests shall be performed to ensure that each smoke alarm is within its listed and marked sensitivity range:

(1) Calibrated test method
(2) Manufacturer's calibrated sensitivity test instrument
(3) Other calibrated sensitivity test method approved by the authority having jurisdiction

The carbon monoxide alarm shall be tested in accordance with NFPA 720.

Substantiation: 1. Text from the 2nd part of the clause has been moved to the first part of the clause to assist editing flow.

2. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.

3. A test product and method needs to be acceptable to the manufacturer of the product being tested but it is not practical to have the test product or method required to be noted in their published instructions. New products and methods become available after instructions are published (sometimes many years after) and it is neither practical nor cost effective for manufacturers to revise instructions (in particular where they form part of a listing for that detector). The requirement for more recent test products to be specified in published instructions is therefore a barrier to the introduction of new technologies and / or methods – particular if the desired goal (of suitability for purpose) can be achieved by the means proposed here (3rd party certification and acceptability to detector manufacturer).

4. The phrase "other methods" is encompassed naturally so long as they a) ensure smoke entry, b) are certified, and c) are acceptable to the detector manufacturer.

5. The remaining deletions are because they have been moved to the start of the clause.

72-198 Log #275 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(2))

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: (1) Revise the existing table note (e) as follows and add a superscript (e) to Item 14(g)(2).

eNote, it is customary for the manufacturer of the smoke detector/smoke alarm to test a particular product from an aerosol provider to determine acceptability for use in smoke entry testing of their smoke detector/ smoke alarm. Magnets are not acceptable for smoke entry tests.

(2) Add a superscript (f) to the sentence in Item 14(g)(1)and 14(g)(2) as shown below and provide the table footnote (f) as shown below while reorganizing the other existing table notes.

[f] Any of the following tests shall be performed to ensure that each smoke detector is within its listed and marked sensitivity range:

f Note, There are some detectors that use magnets as a manufacturers calibrated sensitivity test instrument.

Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. This is to clarify that magnets cannot be used for the smoke entry test but there are some that can be used to check the sensitivity.

72-199 Log #291 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(2))

Submitter: Richard Jay Roberts, Honeywell Life Safety/System Sensor
Recommendation: Revise text as follows:
Combination smoke/carbon monoxide alarms in other than one- and two-family dwellings.
The smoke alarms shall be tested in place to ensure smoke entry into the smoke sensing chamber and an alarm response. Testing with real smoke or listed simulated aerosol or listed smoke particulate approved by the manufacturer shall be permitted as acceptable test methods. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber shall be permitted. Any of the following tests shall be performed to ensure that each smoke alarm is within its listed and marked sensitivity range:
Substantiation: The intent of the section requires smoke entry into the smoke sensing chamber of combination smoke/carbon monoxide alarms. As read in context, the requirement of this section is vague. This proposal provides clarity to the intent of the requirements.

72-200 Log #255 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(5))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:
~~Per test methods documented in the manufacturer's published instructions, d~~ Detector alarm response shall be verified through the introduction of certified smoke or aerosol, acceptable to the manufacturer of the detector to the end sampling ~~port~~ point on each pipe run; airflow through all other ~~ports~~ points shall be verified as well.
Substantiation: 1. A test product and method needs to be acceptable to the manufacturer of the product being tested but it is not practical to have the test product or method required to be noted in their published instructions. New products and methods become available after instructions are published (sometimes many years after) and it is neither practical nor cost effective for manufacturers to revise instructions (in particular where they form part of a listing for that detector). The requirement for more recent test products to be specified in published instructions is therefore a barrier to the introduction of new technologies and / or methods – particular if the desired goal (of suitability for purpose) can be achieved by the means proposed here (3rd party certification and acceptability to detector manufacturer).
2. Certified smoke or aerosol is required to prove the ability of the air sampling detector to receive a smoke stimulus from the protected area and transport this along the entire length of the pipe to the detector.
3. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.
4. There are a number of other methods (eg: suction pressure testing) that can be used to test airflow through other points.
5. The word "ports" is a typographical error and needs to be replaced with "points".

72-201 Log #256 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(g)(6))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:

In addition to the testing required in Table 14.4.2.2(g)(1), duct smoke detectors ~~utilizing sampling tubes~~ shall be tested to ensure that they will properly sample the airstream in the duct using a method acceptable to the manufacturer conducted with certified test products ~~by verifying the correct pressure differential (within the manufacturer's published ranges) between the inlet and exhaust tubes using a method acceptable to the manufacturer to ensure that the device will properly sample the airstream. These tests shall be made in accordance with the manufacturer's published instructions for the device installed.~~

Substantiation: 1. The requirements of the test hold true whether the duct smoke detector utilizes sampling tubes or not.

2. The proposed change is one that specifies the goal of the test without specifying the means by which it is achieved. Pressure test differential measurement is one of several means that can be used to ensure that the air stream is being sampled.

3. A test product and method needs to be acceptable to the manufacturer of the product being tested but it is not practical to have the test product or method required to be noted in their published instructions. New products and methods become available after instructions are published (sometimes many years after) and it is neither practical nor cost effective for manufacturers to revise instructions (in particular where they form part of a listing for that detector). The requirement for more recent test products to be specified in published instructions is therefore a barrier to the introduction of new technologies and / or methods – particular if the desired goal (of suitability for purpose) can be achieved by the means proposed here (3rd party certification and acceptability to detector manufacturer).

4. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.

72-202 Log #257 SIG-TMS Final Action:
(Table 14.4.2.2 Item 14(h))

Submitter: William J. Rossiter, SDI
Recommendation: Revise text to read as follows:

The devices shall be tested in place to ensure CO entry to the sensing chamber by introduction of certified CO gas from the protected area, through the vents, to the sensing chamber.

Substantiation: 1. The gas needs to be certified by an independent 3rd party to ensure suitability for purpose.

2. The word "Certified" is proposed instead of "Listed" because UL (as a first) have decided that they can no longer offer listings for test equipment because there is no published standard against which to list. Instead they are offering "Classification" for Product and "Recognized" for component parts. Both of these are valid certifications. Use of the word "Certified" also allows for "Listed" in the event of the birth of a standard against which a test product can be listed.

72-203 Log #276 SIG-TMS Final Action:
(Table 14.4.2.2 Item 15)

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: Modify Item 15 as follows and add the annex material:

15*. Alarm notification appliances.

(a) Audible

(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that they are in compliance with Chapter 18. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST).

A(a)(1)Chapter 18 would require 15 db over average ambient sound for public mode spaces. Sometimes the ambient sound levels are different than what the design was based upon. Private operating mode would require 10 db over average ambient at the location of the device.

(2)* Periodic testing shall verify the operation of the notification appliances. ~~comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where building, system, or occupancy changes have occurred. The sound level meter shall be set in accordance with ANSI S3.41, American National Standard Audible~~

A(2) Where building, system, or occupancy changes have been observed, the owner should be notified of the changes. New devices may need to be installed and tested per the initial acceptance testing criteria.

(b) Audible textual notification appliances (speakers and other appliances to convey voice messages)

(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, *Specifications for Sound Level Meters,* Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that they are in compliance with Chapter 18. The sound level meter shall be set in accordance with ANSI S3.41, *American National Standard Audible Evacuation Signal,* using the time-weighted characteristic F (FAST). Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13.

(2) *Periodic testing shall verify the operation of the notification appliances. ~~comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where building, system, or occupancy changes have occurred. The sound level meter shall be set in accordance with ANSI S3.41, American National Standard Audible Evacuation Signal, using the time-weighted characteristic F (FAST). Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13 where building, system, or occupancy changes have occurred.~~

B(2) Where building, system, or occupancy changes have been observed, the owner should be notified of the changes. New devices may need to be installed and tested per the initial acceptance testing criteria.

(c) Visible

Initial and reacceptance testing shall comply with the following: Test shall be performed in accordance with the manufacturer's published instructions. Appliance locations shall be verified to be per approved layout, and it shall be confirmed that no floor plan changes affect the approved layout. It shall be verified that the candela rating marking agrees with the approved drawing. It shall be confirmed that each appliance flashes.

Periodic testing shall verify that each appliance flashes.

Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. For audible devices, annex material was added to help identify the differences between public mode and private mode.

Periodic testing was changed for all three types of notification appliances to indicate that the fire alarm testing was to verify operation of the device and not ensure compliance with any particular design.

Annex notes were added for periodic testing to suggest that the owner should be informed of missing devices if obvious to the alarm technician, but it is not the responsibility for the alarm technician to measure the operation against the original system design.

72-204 Log #507 SIG-TMS Final Action:
(Table 14.4.2.2 Item 15)

Submitter: Andrew G. Berezowski, Honeywell Inc.
Recommendation: Revise Text to read as follows:

Table 14.4.2.2
15. Alarm notification appliances
(a) Audible
(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals, shall be measured with sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that are in compliance with chapter 18. The sound level meter shall be set in accordance with ANSI S3.42, American National Standard Audible Evacuation Signal, using the time-weighted characteristic F (FAST).
(2) Periodic testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where ~~building~~, building contents, building furnishings, building floor plan or structural, notification system, or occupancy changes have occurred or when a change in perceived audibility has been observed. The sound level meter shall be set in accordance with ANSI S3.41, American National Standard Audible Evacuation Signal, using the time-weighed characteristic F (FAST).
(b) Audible textual notification appliances (speakers and other appliances to convey voice messages).
(1) Initial and reacceptance testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels throughout the protected area shall be measured to confirm that they are in compliance with Chapter 18. The sound level meter shall be set in accordance with ANSI S3.41, American National Standard Audible Evacuation Signal, using the time-weighted characteristic F (FAST). Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13.
(2) Periodic testing shall comply with the following: Sound pressure levels for signals shall be measured with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Sound pressure levels shall be measured for conformity to Chapter 18 where ~~building~~, building contents, building furnishings, building floor plan or structural, in -building fire emergency voice/alarm communications system or in-building mass notification system, or occupancy changes have occurred or when a change in perceived intelligibility has been observed. The sound level meter shall be set in accordance with ANSI S3.41, American National Standard Audible Evacuation Signal, using the time-weighted characteristic F (FAST). Audible information shall be verified to be distinguishable and understandable and shall comply with 14.4.13 where building contents, building furnishings, building floor plan or structural, in-building fire emergency voice/alarm communications system or in-building mass notification system, or occupancy changes have occurred or when a change in perceived intelligibility has been observed.
(c) Visible
Test shall be performed in accordance with the manufacturer's published instructions. Appliance locations shall be veriried to be per approved layout, and it shall be confirmed that no floor plan changes affect the approved layout. It shall be verified that the candela rating marking agrees with the approved drawing. It shall be confirmed that each appliance flashes.

Substantiation: Because of the strong relationship between environmental factors and acoustic behavior of an acoustically distinguishable space, audibility and intelligibility should be re-evaluated when building contents, building furnishings, building floor plan or structural, voice system, or occupancy changes have occurred. Because amplifiers and other system elements can degrade over time, intelligibility should also be re-evaluated whenever a change in perceived audibility/intelligibility has been observed.

72-205 Log #139 SIG-TMS Final Action:
(Table 14.4.2.2 Item 15(i))

Submitter: Jeffrey D. Zwirn, IDS Research & Development, Inc.
Recommendation: Revise text to read as follows:
15 (i) Smoke Detectors- sensitivity testing shall be performed in one and two-family dwellings and shall comply with NFPA 72 standards.
Substantiation: System detectors installed in residential occupancies are manufactured for sensitivity testing and should be tested by a qualified technician. From a customer's perspective understanding changes on the detectors light emitting diodes is not realistic and the customer would have to look at every smoke detector to recognize a change in detector sensitivity; even if this task was performed, they still would not have the enhanced information that a qualified technician could achieve in this regard. There are also obvious and substantial life safety benefits to having the contractor test household system smoke detectors for sensitivity, as part of the testing requirements of NFPA 72, as it is foreseeable that serious personal injury and/or lives could be saved by identifying smoke detector units whose internal sensitivity has been impaired and/or has drifted so far from its required range, that it could dramatically delay early warning detection time of a fire and smoke condition. Therefore, a typical "unoccupied" commercial occupancy gets a much more thorough test on its smoke detectors, through sensitivity testing, in accordance with NFPA 72, while the homeowner and other potential occupants such as children and the elderly, do not receive any benefits of sensitivity testing, ever.

72-206 Log #277 SIG-TMS Final Action:
(Table 14.4.2.2 Item 17(f))

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: Modify Table 14.4.2.2 item 17 (f) as follows:
(f) Release solenoid circuit ~~Solenoid shall be used with equal current requirements.~~ Operation of solenoid shall be verified.
Annex (f) There are numerous ways to test solenoids. Manufacturer's instructions should be consulted to ensure a proper operational test. No suppression gas or agent is expected to be discharged during the test of the solenoid. See Test Plan of 14.2.9.
Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. The language deleted was confusing and the annex material provides information to consult manufacturer's instructions. Reference is made to the new test plan in 14.2.9 which requires the extent of the test to be documented.

72-207 Log #161 SIG-TMS Final Action:
(Table 14.4.2.2 Item 18(b))

Submitter: Bob Elliott, FM Approvals
Recommendation: Add new text as follows:
"The primary line from the DACT shall be disconnected. Indication of the DACT trouble signal at the premises shall be verified, as well as transmission to the supervising station within 4 minutes of detection of the fault. Note: Reconnect/Restore the primary phone line, prior to disconnecting the second line."
Substantiation: Although this might seem obvious to most at the committee level, if one followed the instructions as worded, it is impossible to transmit signals off premises with both phone lines disconnected.

72-208 Log #444 SIG-TMS Final Action:
(Table 14.4.2.2 Item 18(b))

Submitter: Larry W. Mann, Central Station, Inc.
Recommendation: Revise text to read as follows:
Connection of the DACT to two separate means of transmission shall be ensured.
Exception: DACTs that are connected to a telephone line (number) that is also supervised for adverse conditions by a derived local channel.
DACT shall be test for line seizure capability by initiating a signal while using the primary line for a telephone call. Ensure that the call is interrupted and that the communicator connects to the digital alarm receiver. Receipt of the correct signal of the supervising station shall be verified. ~~Completion of~~ Each transmission attempt shall be completed within 90 seconds from going off-hook to on-hook. ~~Shall be verified.~~
The primary line from the DACT shall be disconnected. Indication of the DACT trouble signal at the premises shall be verified, ~~as well as transmission to the supervising station~~ at the fire alarm control panel and at each connected annunciator within 4 minutes of the detection of the fault. Verify the transmission and the receipt of the telephone line trouble signal at the supervising station. Restore the primary phone line, reset the fire alarm control panel and verify that the telephone line fault trouble signal returns to normal. Verify that the supervising station receives the restoral signal from the fire alarm communicator.
The secondary means of transmission from the DACT shall be disconnected. Indication of the DACT trouble signal at the ~~premises~~ fire alarm control panel and at each connected annunciator shall be verified ~~as well as transmission to the supervising station~~ within 4 minutes of detection of the fault. Verify the transmission and receipt of the second telephone line trouble signal at the supervising station. Restore the secondary phone line, reset the fire alarm control panel and verify that the telephone line fault trouble signal returns to normal. Verify that the supervising station receives the restoral signal from the secondary communicator.
The DACT shall be caused to transmit a signal to the DACR while a fault in the primary telephone number (line) is simulated. Utilization of the secondary ~~telephone number~~ communication path by the DACT to complete the transmission to the DACR shall be verified.
Substantiation: Text was added to clarify the operational procedure of the DACT transmission test, so that the receipt of both the trouble signal and the restoral signal will be verified for the primary as well as the secondary transmission path. It is important to note that when testing both parts, a trouble signal from the secondary path cannot be transmitted off premises until the primary path is restored.

72-209 Log #438 SIG-TMS Final Action:
(Table 14.4.2.2 Item 18(f) (New))

Submitter: Geoffrey Aus, Menlo Park Fire Protection District
Recommendation: Add an Item "f" under Item 18 to read as follows:
(f) Other
Those devices classified as "other" shall as part of the manufacturer's testing procedure and acceptance, demonstrate not less than a five (5) minute failure verification.
Substantiation: The 2010 code does not currently address other technologies: (i.e., cell cite facilities) In respect to supervision and transmission of signal failure to a central station. Addition of an item "f" " other" will address this question providing direction to those companies providing alarm supervsion outside those listed under current Table 14.3.2.2 requirements.

72-210 Log #439 SIG-TMS Final Action:
(Table 14.4.2.2 Item 18(f) (New))

Submitter: Anthony Mucci, ADT Security Services, Inc.
Recommendation: Add new text to read as follows:
18. Supervising station alarm systems - transmission equipment.
(f) other technologies
Tests shall be performed to ensure the monitoring of integrity of the transmission technology and technology path.
Where a Single Communications Technology is use, the communication line shall be disconnected. The premises unit shall annunciate the failure within 5 minutes of detecting the failure.
Where Multiple Communications Technologies are used, one of the communication lines shall be disconnected. The premises unit and the supervising station shall annunciate the failure within not more than 24 hours of the failure. Restore both lines and repeat this test by disconnecting the other line.
Substantiation: "Other" Transmission Technologies had been missing from Inspection, Testing, and Maintenance Supervising Station Alarm Systems Transmission Equipment.

72-211 Log #440 SIG-TMS Final Action:
(Table 14.4.2.2 Item19(g) (New))

Submitter: Anthony Mucci, ADT Security Services, Inc.
Recommendation: Add new text to read as follows:
19. Supervising station alarm systems - receiving equipment.
(g) "other" technologies Tests shall be performed to ensure the monitoring of integrity of the transmission technology and technology path.
Where a Single Communications Technology is use, the communication line shall be disconnected. The premises unit shall annunciate the failure within 5 minutes of detecting the failure.
Where Multiple Communications Technologies are used, one of the communication lines shall be disconnected. The premises unit and the supervising station shall annunciate the failure within not more than 24 hours of the failure. Restore both lines and repeat this test by disconnecting the other line.
Substantiation: "Other" Transmission Technologies had been missing from Inspection, Testing and Maintenance Supervising Station Alarm Systems Receiving Equipment.

72-212 Log #278 SIG-TMS Final Action:
(Table 14.4.2.2 Item 21(b), Table 14.4.5 Item 17(b)(2) and A.14.4.8.2)

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: (1) Add test method to Table 14.4.2.2 Item 21(b) as follows:
21(b) Carbon monoxide device/system
Communication between the device connecting the carbon monoxide device/system and the fire alarm control unit shall be tested to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.
(2) Add reference 21(b) to test method to the last column of Table 14.4.5 item 17(b)(2)
(3) Add A.14.4.2.2 Item 21(b) as follows: Testing of CO device should be done to the requirements of NFPA 270.
(4) Add annex note A.14.4.8.2 as follows:
A.14.4.8.2 Carbon monoxide alarm replacement is covered under NFPA 720.

Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. This change is to clarify that carbon monoxide part of combinations detectors is covered by NFPA 720. The addition to Table 14.4.2.2 requires only that the communication to the fire alarm system is checked and not the testing of the CO part since that part is covered in NFPA 720.

72-213 Log #131 SIG-TMS Final Action:
(Table 14.4.2.2 Item 23)

Submitter: Bruce Fraser, Fraser Fire Protection Services
Recommendation: Add the following text to Table 14.4.2.2(23)
23. Emergency control functions
Emergency control functions (i.e., fan control, smoke damper operation, elevator recall, elevator power shutdown, elevator occupant evacuation operation, door holder release, shutter release, door unlocking, etc.) shall be tested by operating or simulating alarm signals. Testing frequency for emergency control functions shall be the same as the frequency required for the initiating device that activates the emergency control function.
Substantiation: To reflect the need to test emergency control functions for elevator occupant evacuation operation and to emphasize new terminology.
See 21.6 and proposed changes.

72-214 Log #274 SIG-TMS Final Action:
(Table 14.4.2.2 Item 23 and A.14.4.2.2)

Submitter: Peter A. Larrimer, US Department of Veterans Affairs
Recommendation: Modify Table 14.4.2.2 Item 23 and the annex material on Item 23 as follows:

Emergency control functions[h]
~~Emergency control functions (i.e., fan control, smoke damper operation, elevator recall, elevator power shutdown, door holder release, shutter release, door unlocking, etc.) shall be tested by operating or simulating alarm signals. Testing frequency for emergency control functions shall be the same as the frequency required for the initiating device that activates the emergency control function.~~

For initial, reacceptance, and periodic testing, verify emergency control function activation and emergency control function operation in accordance with the appropriate NFPA standard, unless testing is restricted; by the building owner, by the Authority Having Jurisdiction, or by state and/or local licensing and/or ordinances. Where restricted, the fire alarm system control relay operation serving the emergency control function shall be verified.

When emergency control function testing is done in segments, a single test shall be conducted at the end of the testing to verify control function activation.

Where emergency control function testing is disabled during fire alarm system initiating device testing, no less than one test shall be conducted at the end of the testing to verify control function activation.

A.14.4.2.2……Table 14.4.2.2, Item 23. ~~Initiating devices configured to operate an emergency control function are required to be tested per the test methods listed in Table 14.4.2.2, Item 14 and the test frequencies listed in Table 14.4.5, Item 15.~~
The testing of and extent of testing including devices and systems that were not tested are to be documented per the Test Plan in 14.2.9. {14.2.9 is part of a new proposal.}

Emergency control function activation is simply initiating the start of the emergency control function. Emergency control function operation is intended to include the overall performance of the emergency control function. The appropriate NFPA standard would provide the acceptance criteria for the overall emergency control function operation requirements including performance and test methods.

It is unlikely emergency control function operation would be tested for complex systems during routine periodic fire alarm system testing though in cases it may be easier to verify the emergency control function operation than to stop the testing at the control relay.

For instance, a building with an engineered smoke control system would have unique criteria for the smoke control system design and a special inspector would be responsible for the overall operation and performance of the smoke control system in accordance with the appropriate standard (NFPA 92A and NFPA 101) during the testing including measuring pressure differentials and ensuring proper fan and damper operation. Extract from NFPA 101 on smoke control:
"9.3.2 The engineer of record shall clearly identify the intent of the system, the design method used, the appropriateness of the method used, and the required means of inspecting, testing, and maintaining the system.
9.3.3 Acceptance testing shall be performed by a special inspector in accordance with Section 9.8."
Even though the fire alarm system initiating device may activate the smoke control system, the actual testing of the dampers and fan operation etc. would be as required by the smoke control design and not part of the fire alarm system acceptance test.

Other emergency control operation requirements may be as follows: For fan shut down and smoke damper operation, the fan and damper operations should be in accordance with NFPA 90A and NFPA 105 respectively and those equipment operations should be verified by those responsible HVAC systems in combination with the fire alarm system personnel.

For elevator systems, the recall function, elevator power shutdown, and hat illumination should be done with the elevator mechanics present during the test. This operational test is often accomplished during routine periodic fire alarm testing.

For fire door holder and fire shutter release, it would be expected that the emergency control function operation of the doors/shutters would be verified in accordance with NFPA 80 and NFPA 101 during the test. In some cases, door manufacturer representative may need to be present to reset the equipment.

Some emergency control functions have testing frequencies established within other NFPA standards that are more or less frequent than the fire alarm system initiating devices used to activate the emergency control function. Where emergency control function frequencies are not established by another standard, it should be tested at the same frequency as the fire alarm initiating device being tested.

For instance, NFPA 105 requires smoke dampers to be tested every 4 years even though the initiating device used to activate the smoke damper is tested on an annual basis. Fan shut down is required to be done annually in accordance with NFPA 90A.

Whenever an emergency control function is observed to not operate properly during a test of an emergency control function initiating device, the problem should be reported to the building owner or designated representative. The failure of the emergency control function should be reported as a possible failure of the fire safety feature and not necessarily of the fire alarm system.

Substantiation: This proposal is submitted as part of a task group from the pre-rop meeting. While the boundary of the fire alarm system is established by the fire alarm code, there is a need to establish the appropriate test all of the functions that cross the boundary that the fire alarm system may activate or control such as smoke control, fan shut down, damper control, elevator recall and power shunt trip etc., even though it isn't the responsibility as dictated by NFPA 72 of those persons tasked with testing the fire alarm system.

This proposal intends to have an end to end test of the emergency control functions when possible, but recognizes that there are times when the test must terminate at the fire alarm system relay. The proposal does not require the fire alarm technician to be responsible for the emergency control function operation. In those situations where emergency control function operation is to be verified, the code expects that those responsible for those system will be verifying those systems and not the fire alarm system technician.

Frequencies for testing the emergency control functions are per the other NFPA standards and they may be more or less often than the initiating device frequencies of NFPA 72 as identified in the annex material.

The accompanying task group proposal for a test plan (See 14.2.9) requires that the extent of the testing be documented so that it is clearly understood what part was tested as part of the NFPA 72 testing.

The existing annex note suggests that the fire alarm technician is not responsible for the emergency control function testing, but where some problem is identified, the owner is to be notified.

72-215 Log #136 SIG-TMS Final Action:
(Table 14.4.2.2 Item 26(2))

Submitter: Jeffrey D. Zwirn, IDS Research & Development, Inc.
Recommendation: Revise text to read as follows:
26. Low-power radio (wireless systems)
(2) Starting from the functional operating condition, the system shall be initialized in accordance with the manufacturer's published instructions. ~~A test shall be conducted to verify the alternative path, or paths, by turning off or disconnecting the primary wireless repeater.~~ The alternative communications path shall exist between the wireless control unit and peripheral devices used to establish initiation, indication, control, an annunciation. The system shall be tested for both alarm and trouble conditions.
Substantiation: This section of NFPA 72 implies that every low power radio wireless system has a wireless "repeater", when in fact a "repeater" is only used when the primary receiver is not sufficient enough to receive transmission signals from the wireless transmitters within the protected premises. Therefore, requiring an installer to turn off, or disconnect, a piece of equipment that may not be at the premises is inappropriate. Further, companies like Honeywell provide a "Go, No Go Test" which cuts the wireless receiver gain by fifty percent in order to test the functional operating condition of the communication path that exists between the wireless control unit, and the peripheral devices. Given that, the installer should be required to comply with the control panel's internal feature that quantifies this testing methodology. In closing, the "Go, No Go Test" verifies that each RF signal from each transmitter is received with the sufficient signal amplitude.

72-216 Log #44 SIG-TMS Final Action:
(14.4.3 and 14.4.4)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Remove Sections 14.4.3 and 14.4.4 "Video Image Smoke and Flame Detectors" and "Gas Detectors".
Substantiation: Incorporate as a part of Table 14.3.1 Inspections Table and Table 14.4.5 Testing Frequency Table. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-217 Log #45 SIG-TMS Final Action:
(14.4.3 and 14.4.4)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Delete text as follows:
~~14.4.3 Video Image Smoke and Flame Detectors. Video image smoke and flame detectors shall be inspected, tested, and maintained in accordance with the manufacturer's published instructions.~~
~~14.4.4 Gas Detectors. Gas detectors shall be inspected, tested, and maintained in accordance with the manufacturers' published instructions.~~
Substantiation: Incorporate as a part of Table 14.3.1 Inspections Table and Table 14.4.5 Testing Frequency Table. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-218 Log #441 SIG-TMS **Final Action:**
(Table 14.4.5 Item 24(h))

Submitter: Anthony Mucci, ADT Security Services, Inc.
Recommendation: Add new text to read as follows:
24. Supervising station alarm systems

Component	Initial/Reacceptance	Monthly	Quarterly	Semiannually	Annually	Table 14.4.2.2. Reference
(h) "Other" technologies	X	-	-	-	-	19

Substantiation: "Other" Transmission Technologies missing from Inspection, Testing, and Maintenance Testing Frequencies table, line 24. Supervising station alarm systems.

72-219 Log #426 SIG-TMS **Final Action:**
(Table 14.4.5.1 Item 1 and 2)

Submitter: Robert P. Schifiliti, R. P. Schifiliti Associates, Inc.
Recommendation: Revise Table 14.4.5 number 1 as follows:
1* Control equipment — building systems connected to a supervising station or Public Emergency Alarm Reporting System and monitored for alarm, trouble, and where required, supervisory signals
Revise Table 14.4.5 number 2 as follows:
2* Control equipment — building systems not connected to a supervising station or Public Emergency Alarm Reporting System
Add Annex Text 14.4.5 Some Public Emergency Alarm Reporting Systems do not accept trouble signals and therefore should be tested more frequently as required by number two in the table.
Substantiation: Some Public Emergency Alarm Reporting Systems do not accept trouble signals and therefore should be tested more frequently as required by number two in the table.

72-220 Log #8 SIG-TMS **Final Action:**
(14.4.5.3)

Submitter: Jon Nisja, Northcentral Regional Fire Code Development Committee
Recommendation: Revise text to read as follows:
14.4.5.3* In other than one- and two-family dwellings, sensitivity of smoke detectors ~~and single- and multiple-station smoke alarms~~ shall be tested in accordance with 14.4.5.3.1 through 14.4.5.3.7.
Substantiation: The cost-benefit to test single station smoke alarms is excessive. It would be cheaper to replace the alarm than it would to test them. There has been no technical justification as to the benefit of testing a smoke alarm that must be replaced every 10 years.

72-221 Log #43 SIG-TMS **Final Action:**
(14.4.5.5.3)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Revise text to read as follows:
14.4.5.5.3 Test records shall be kept by the building owner specifying which detectors have been tested.
Substantiation: Clarify that the detector test records are to be retained. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-222 Log #141 SIG-TMS Final Action:
(14.4.7.1)

Submitter: Jeffrey D. Zwirn, IDS Research & Development, Inc.
Recommendation: Add new text to read as follows:
Testing. Household fire alarm systems shall be tested by a qualified service technician at least annually according to the methods of Table 14.4.2.2. The installing contractor shall be required to provide this information in writing to the customer upon completion of the system installation. To the extent that the fire alarm system is monitored by a remote station, the contractor who is contracted to monitor the subject fire alarm system shall be required to provide notice of this requirement to the customer on a yearly basis.
Substantiation: The current text does not provide any requirements whatsoever on the installing contractor to provide this critical information to its customers, and without notice, the customer would have no reasonable way to know of this annual testing requirement. Having said that, to the extent that the system is monitored by a remote station, the contractor who is contracted to monitor the system, to the extent that it is not a local alarm, should also be required to provide this notice in writing, as there are too many fire alarm systems across the country today, that go for very extended periods of time, years and years, without ever being tested, of which, increases the risk to all occupants of the premises to heightened risks of serious personal injury and/or death, that with this annual testing can be minimized and the technical community of the fire alarm industry needs to help ensure that this yearly test requirement is being done, through the proper written notice, as life safety to all occupants of a household is mission critical.

72-223 Log #289 SIG-TMS Final Action:
(14.4.8.1 and A.14.4.8.1 (New))

Submitter: Richard Jay Roberts, Honeywell Life Safety/System Sensor
Recommendation: Revise text:
14.4.8 Replacement of Smoke Alarms ~~in One- and Two-Family Dwellings~~.
14.4.8.1* Unless otherwise recommended by the manufacturer's published instructions, single- and multiple-station smoke alarms ~~installed in one- and two-family dwellings~~ shall be replaced when they fail to respond to operability tests but shall not remain in service longer than 10 years from the date of manufacture.
Add text:
A.14.4.8.1 ANSI/UL 217 requires all smoke alarms to be replaced after ten years. This includes single- and multiple station alarms installed in one- and two-family dwellings and other than one- and two-family dwellings.
Substantiation: ANSI/UL 217 requires all smoke alarms to be replaced after ten years. This includes single- and multiple station alarms installed in one- and two-family dwellings and other than one- and two-family dwellings. This proposal provides correlates the requirements with ANSI/UL 217.

72-224 Log #42 SIG-TMS Final Action:
(14.4.9)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Revise text to read as follows:
~~14.4.9~~ 14.4.8.3 Battery Replacement Where batteries are used as a source of energy for combination smoke/carbon monoxide alarms as well as single and multiple station smoke alarms, they shall be replaced in accordance with the alarm equipment manufacturer's published instructions.
Substantiation: Clarify when batteries are to be replaced in combination units used in one and two family dwellings. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-225 Log #41 SIG-TMS Final Action:
(14.4.12.1)

Submitter: Robert E. Butchko, Siemens Industry, Inc.
Recommendation: Revise text to read as follows:
14.4.12.1 ~~Testing~~
Substantiation: Intent is to reduce non-required sections. This proposal was developed by the SIG-TMS Editorial Task Group Meeting during Pre-ROP Meeting.

72-226 Log #195 SIG-TMS Final Action:
(14.5.1 (New))

Submitter: Jack Parow, International Association of Fire Chiefs (IAFC) / Rep. FLSS of the IAFC and the CSAA
Recommendation: Add new text to read as follows:
14.5.1 All systems shall have a maintenance contract in place with a qualified service provider.
Substantiation: A number of proposals have been submitted to the NFPA 72® project for this cycle to assist in decreasing the number of unwanted or nuisance alarms. A key component of these proposals is the allowance of the supervising station to verify the alarm prior the to the notification of emergency forces. This proposal has been sent to SIG-TMS.
Fire alarm systems are mechanical and electronic in nature. As with any mechanical or electronic system, they need to be maintained so that they function as designed. So as to ensure that the fire alarm system is being maintained in accordance with NFPA 72®, a maintenance contact should be in place. The IAFC is seeing far too many cases in which a system is not being properly maintained by the owner, as required by NFPA 72®. This addition to the Standard would require that all system be under a maintenance contract by a qualified service provider.
The reduction of unwanted or nuisance alarms are a central point of the International Association of Fire Chiefs (IAFC) position statement on Eliminating Unwanted and Nuisance Fire Alarm Activations. A copy of this paper may be found at http://www.iafc.org/associations/4685/files/IAFCposition_EliminatingUnwantedandNuisanceFireAlarmActivations.pdf
This is not original material; its reference/source is as follows:
This Proposal was co-authored by the Fire Life Safety Section of the IAFC, the IAFC and CSAA.

72-227 Log #196 SIG-TMS Final Action:
(14.5.2 (New))

Submitter: Jack Parow, International Association of Fire Chiefs (IAFC) / Rep. FLSS of the IAFC and the CSAA
Recommendation: Add new text to read as follows:
14.5.2 The qualified service provider shall have personnel that meet the requirements of 10.4.3.
Substantiation: A number of proposals have been submitted to the NFPA 72® project for this cycle to assist in decreasing the number of unwanted or nuisance alarms. A key component of these proposals is the allowance of the supervising station to verify the alarm prior the to the notification of emergency forces.
Fire alarm systems are mechanical and electronic in nature. As with any mechanical or electronic system, they need to be maintained so that they function as designed. So as to ensure that the fire alarm system is being maintained in accordance with NFPA 72®, these systems need to be maintained by a qualified service provider. This provider in most cases in not a member of the buildings maintenance staff. The IAFC is seeing far too many cases in which a system is not being properly maintained by the owner, as required by NFPA 72®. This addition to the Standard would require that all system be under a maintenance by a qualified service provider.
The reduction of unwanted or nuisance alarms are a central point of the International Association of Fire Chiefs (IAFC) position statement on Eliminating Unwanted and Nuisance Fire Alarm Activations. A copy of this paper may be found at http://www.iafc.org/associations/4685/files/IAFCposition_EliminatingUnwantedandNuisanceFireAlarmActivations.pdf
This is not original material; its reference/source is as follows:
This Proposal was co-authored by the Fire Life Safety Section of the IAFC, the IAFC and CSAA.

72-228 Log #9 SIG-TMS Final Action:
(14.6.2.4)

Submitter: Eddie Phillips, Southern Regional Fire Code Development Committee
Recommendation: Add item to read:

(20) By physical location (i.e., heat detector in main kitchen, horn-strobe in room 115), a list of all initiating and notification devices and appliances tested

Substantiation: Building owners and AHJ Fire Code inspectors often do not have enough information from a typical fire alarm inspection report to determine if all of the devices and appliances have been tested. Pull stations on stages or in mechanical rooms can and are often missed. Horns, bells, and strobes occasionally are checked only in the corridors. Contractors will list the quantity of the items tested, but there is no assurance that all of the horns, bells, smoke detectors, heat detectors, duct detectors, pull stations, and similar devices and appliances were actually tested. A listing of each device by location gives the owner and inspector a better sense of what was tested, and it can be easily determined if items were missed during the inspection.

For example, the owner will be better informed and better able to tell if a remote mechanical room fire alarm devices were missed if they don't show up on the list by location on the fire alarm test report. The AHJ Fire Code inspector will also be better able to tell if the required report is complete.

AHJ Fire Code inspectors typically look in every room of a building. The typical inspector often finds fire alarm devices in remote locations that appear to not have been tested, but because the report doesn't have a device/appliance listed by location, it becomes impossible to determine from mere observation of the report.

This code change will result in better and more thorough inspections with minimal or no impact on inspection companies. They will be assured that everything has been tested, reducing their liability in the case where items are missed. Some companies, but not all, are already providing a list by location of what they tested.

When a pull station hasn't been tested in a long time, it can become difficult to activate in a fire situation. Smoke detectors which haven't been tested can either lose their sensitivity or become overly sensitive. If these detectors are missed on the report, a fire can burn longer without being detected in the former case resulting in more damage or possible deaths and injuries, and in the latter false alarms can result.

72-229 Log #88 SIG-TMS **Final Action:**
(14.6.2.4)

Submitter: Joe Scibetta, BuildingReports
Recommendation: Revise line items 1,5, 7, 8, and 10 of 14.6.2.4 as follows:
15* A 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 14.6.2.4:
(1) Start Date
(5) Name of person performing inspection, maintenance, tests, or combination thereof, ~~and~~ affiliation, business address, ~~and~~ telephone number, and, if applicable, certification(s) and/or license(s) required by the authority having jurisdiction.
(7)Designation of the ~~detector(s)~~ initiating device(s) tested
(8)Date and time of f~~F~~unctional test of ~~detectors~~ each initiating device.
(10) ~~Check~~ Inspection of all ~~smoke detectors~~ initiating devices.
Substantiation: Line item 1: Since many inspections take place over the course of more than one day, the date on which the inspection and testing commenced, compared with the date on which the inspection was completed, provides a more accurate picture of the inspection and testing time frame.
Line item 5: The addition of applicable certifications and/or licenses is in keeping with the Inspection and Testing form (Figure 14.6.2.4), which has a field for "Qualifications of technician or tester", and is in keeping with the criteria for qualified personnel in 10.4.3.1.
Line item 7: Use of the term "initiating devices" would encompass all the devices addressed in Chapter 17, including manual fire alarm boxes. The current wording limits this action item to designation of detectors only.
Line item 8: Recording the date and time for each device's test affirms and attests to the fact that the technician was at each device to perform functional testing, thus providing added reassurance to the building owner/facility manager and added protection for the service company. Including this data does not require special software or technology but can be recorded in any manner the service company deems best.
Line Item 10: The term "check" is not defined in Chapter 3 nor does it appear on the Inspection and Testing form (Figure 14.6.2.4). Use of the term "Inspection" correlates with the definition of "Inspection Personnel" outlined in 3.3.177.1 and with the term "Visual Inspection" on the Inspection and Testing form (Figure 14.6.2.4). Therefore, use of the term "Inspection" will clarify the difference between this activity and that of functional testing. Use of the term "initiating devices" would encompass all the devices addressed in Chapter 17, including manual fire alarm boxes. The current wording limits this action item to smoke detectors only.

72-230 Log #421 SIG-TMS **Final Action:**
(Figure 14.6.2.4)

Submitter: Scott Jacobs, ISC Electronic Systems, Inc.
Recommendation: Make changes to the Inspection form in response to input and comments from various industry sources, and to keep it similar to the Record of Completion Form 10.18.2.1.1.
All changes are not complete, so this proposal will serve as a placeholder for changes to be completed before the January 2011 ROP meeting.
Substantiation: Existing form needs to be changed to accommodate various types of systems and circumstances.

72-231 Log #506 SIG-TMS **Final Action:**
(Figure 14.6.2.4 and A.14.6.2.4)

Submitter: Andrew G. Berezowski, Honeywell Inc.
Recommendation: Revise Figure 14.6.2.4 in both figure locations 7.3 and 7.5 and associated A.14.6.2.4 example in both test form locations 7.3 and 7.5

System intelligibility
~~___CSI ___STI~~
Test Method _____ Score ____
CIS Value _____

(attach report with locations, values, and weather conditions)
Substantiation: A record of the intelligibility test method and result should be maintained. Annex D provides information regarding both instrument based and subject based test methods. All of the test methods can be mapped to a CIS value. Also, see my separate proposal containing the proposed Table 18.4.10.4 (new) Mapping of Intelligibility Measurements to CIS Value.

72-262 Log #505a SIG-TMS **Final Action:**
(18.4.10.4, 18.4.10.5 (New) and D.2.4.1)

Submitter: Andrew G. Berezowski, Honeywell Inc.
Recommendation: Add new text as follows:

18.4.10.4* (new) In an ADS where intelligibility is required, and intelligibility measurement is required, the intelligibility of In-Building Fire Emergency Voice/Alarm Communications Systems and In-Building Mass Notification Systems shall be considered acceptable if at least 90 percent of the measurement locations within these ADSs have a measured minimum 0.65 CIS (0.45 STI/STI-PA) and an average of at least 0.70 CIS (0.50 STI/STI-PA) in accordance with Table 18.4.10.4.

A.18.4.10.4 See Annex D.

18.4.10.5* (new) Instrument-based intelligibility test methods shall employ STI or STI-PA test signals.

A.18.4.10.5 See Annex D.2.4.1.

Revise D.2.4.1 as follows

D.2.4.1 The intelligibility of an emergency communication system is considered acceptable if it complies with Section 18.4.10.4. ~~at least 90 percent of the measurement locations within each *ADS* have a measured STI CIS of not less than 0.45 (0.65 CIS) and an average STI of not less than 0.50 STI (0.70 CIS).~~ STI, STIPA, and subject based measurements should be mapped to a CIS score using Table 18.4.10.4. RASTI should not be employed in intelligibility measurements due to its limited range of acoustic test frequencies.

Insert 72_L505_tbl 18.4.10.4 here *

Substantiation: Where intelligibility measurement is required, there should be a corresponding performance requirement or else there is no real purpose in doing the measurement. This material was extracted from Annex D and revised to expand the use of subject-based measurement methods in addition to STI/STI-PA as articulated in Annex D.2.4.5.

The performance requirement should be expressed first in CIS in order to accommodate other than STI/STI-PA measurement systems. All of the standardized measurement systems referred to in Annex D correlate to CIS. Annex D.2.4.2 - D.2.4.5 describes subject-based test results and references IEC 20268-16 which describes methods of testing including STI, STI-PA, and RASTI.

RASTI is an older instrument based test method that used alone, has a limited range of test frequencies. Its use could result in a passing RASTI score, as compared to an STI/STIPA failing score, when tests are compared in the same ADS, in the presence of certain frequencies of background noise.

All of the test scores obtained using any of the methods can be mapped to a CIS (Common Intelligibility Scale) value. Table 18.4.10.4 (new) is an extraction of points within the range of acceptable intelligibility from the standard graphs.

The Common Intelligibility Scale (CIS) was originally described in "Barnett, P. W. and Knight, R.D. (1995). “The Common Intelligibility Scale”, Proc. I.O.A. Vol 17, part 7" Subject-based method data was obtained from "IEC 60849 - Sound Systems for Emergency Purposes", Figure B.1 "Conversion of existing intelligibility scales to the common intelligibility scale".

The relationship between STI and %ALcons is: STI = -0.1845 ln(%Alcons) + 0.9842, or %Alcons = $e^{(STI - 0.9842)/(-0.1845)}$, with an empirical relationship of %Alcons = 170.5405 $e^{(-5.419 * STI)}$. The relationship between STI and CIS is: CIS = 1 + log(STI), or STI = $10^{(CIS - 1)}$.

Subject based CIS scores in the table, occurring between data points, were linearly interpolated from adjacent data point values. The bold font indicates non-interpolated data.

In Figure 1 of "Development of an Accurate, Handheld, Simple-to-use Meter for the Prediction of Speech Intelligibility", Dr. Herman Steeneken/TNO Human Factors, Jan Verhave/TNO Human Factors, Steve McManus/Gold Line Corporation, Kenneth Jacob/Bose Professional Systems Division, Presented at Reproduced Sound 17 Stratford-on-Avon, November 16 ,2001, it is established that STI and STIPA scores, will vary by less than ± 0.02 with a 95% probability, and so essentially equal STI and STIPA scores are shown in the same column of the table.

This is not original material; its reference/source is as follows:

Table 18.4.10.4 (new) Mapping of Intelligibility Measurements to CIS Value

CIS	STI & STIPA	100 - (%Alcons)	PBWS -256	PBWS -1000	Short Sentences	Syllables -1000	Articulation Index
1.00	**1.00**	99.08					
0.99	**0.98**	98.96					
0.98	**0.95**	98.83					
0.97	**0.93**	98.68					
0.96	**0.91**	98.52					
0.95	**0.89**	98.35					
0.94	**0.87**	98.15					
0.93	**0.85**	97.94					
0.92	**0.83**	97.72					
0.91	**0.81**	97.47					
0.90	**0.79**	97.20					
0.89	**0.78**	96.91					
0.88	**0.76**	96.60					
0.87	**0.74**	96.27					
0.86	**0.72**	95.91					
0.85	**0.71**	**95.53**	**99.00**	**95.00**	**99.00**	**94.00**	**87.00**
0.84	**0.69**	95.12	98.70	93.90	98.80	92.60	84.30
0.83	**0.68**	94.69	98.40	92.80	98.60	91.20	81.60
0.82	**0.66**	94.23	98.10	91.70	98.40	89.80	78.90
0.81	**0.65**	93.74	97.80	90.60	98.20	88.40	76.20
0.80	**0.63**	93.22	97.50	89.50	98.00	87.00	73.50
0.79	**0.62**	92.67	97.20	88.40	97.80	85.60	70.80
0.78	**0.60**	92.09	96.90	87.30	97.60	84.20	68.10
0.77	**0.59**	91.48	96.60	86.20	97.40	82.80	65.40
0.76	**0.58**	90.83	96.30	85.10	97.20	81.40	62.70
0.75	**0.56**	**90.16**	**96.00**	**84.00**	**97.00**	**80.00**	**60.00**
0.74	**0.55**	89.45	95.60	82.40	96.70	78.10	58.50
0.73	**0.54**	88.71	95.20	80.80	96.40	76.20	57.00
0.72	**0.52**	87.94	94.80	79.20	96.10	74.30	55.50
0.71	**0.51**	87.13	94.40	77.60	95.80	72.40	54.00
0.70	**0.50**	86.29	94.00	76.00	95.50	70.50	52.50
0.69	**0.49**	85.42	93.60	74.40	95.20	68.60	51.00
0.68	**0.48**	84.51	93.20	72.80	94.90	66.70	49.50
0.67	**0.47**	83.57	92.80	71.20	94.60	64.80	48.00
0.66	**0.46**	82.59	92.40	69.60	94.30	62.90	46.50
0.65	**0.45**	**81.58**	**92.00**	**68.00**	**94.00**	**61.00**	**45.00**
0.64	**0.44**	80.54	91.50	66.30	93.30	59.10	44.00
0.63	**0.43**	79.46	91.00	64.60	92.60	57.20	43.00
0.62	**0.42**	78.35	90.50	62.90	91.90	55.30	42.00
0.61	**0.41**	77.21	90.00	61.20	91.20	53.40	41.00

Staff Note: This proposal has also been sent to SIG-NAS for their action and statement.

72-565 Log #539 SIG-TMS **Final Action:**
(A.10.4.3.1(2))

Submitter: Richard M. Simpson, Vector Security Inc.
Recommendation: Add text to read as follows:
A.10.4.3.1(2) Nationally recognized fire alarm certification programs might include those programs offered by the International Municipal Signal Association (IMSA), the National Institute for Certification in Engineering Technologies (NICET) and the Electronic Security Association (ESA)
Substantiation: The Electronic Security Association offers nationally recognized certification programs.

72-575 Log #531 SIG-TMS **Final Action:**
(A.14.4.2.2)

Submitter: Joshua Elvove, U.S. General Services Administration
Recommendation: Add an annex note to the table pertaining to interface equipment as follows:
A.14.4.2.2, Table 14.4.2.2 item 22. A monitor module installed on an interface device is not considered a supervisory device and therefore not subject to the quarterly testing frequency requirement. Test frequencies for interface devices should be in accordance with the applicable standard. For example, fire pump controller alarms such as phase reversal are required to be tested annually. If a monitor module is installed to identify phase reversal on the fire alarm control panel, it isn't necessary to test for phase reversal four times a year.
Substantiation: Monitor modules installed to provide specific device information are supervisory devices and because of this, any interface equipment attached to these monitor modules are falsely being required to be tested on the same frequency as the monitor device (e.g., quarterly per Table 14.4.5, item 15(l)) when the test frequency for that particular interface device may, as specified by the applicable standard, be less frequent. The annex note is intended to explain that it's unnecessary to test the interface equipment itself when testing the supervisory device. An example where this might be dangerous is for fire pump controller phase reversal as one might need to get inside a "hot" panel in order to actually demonstrate phase reversal and risk injury.

72-576 Log #18 SIG-TMS Final Action:
(A.14.4.12.1.3, A.14.4.12.1.4, and A.14.4.12.1.5)

Submitter: Jack Daniel, Jack Daniel Company
Recommendation: Revise text to read as follows:

A.14.4.12.1.3 Testing procedures typically are done on a grid system. A grid is overlaid onto a floor area to provide 20 grid cells. Grid cells are provided with definite minimum and maximum dimensions. For most buildings, using a minimum grid dimension of 20 ft (6.1 m) and a maximum grid dimension of 80 ft (24.4 m) will suffice to encompass the entire floor area. Where a floor exceeds 128,000 ft2 (11,890 m2), which is the floor area that can be covered by the maximum grid dimension of 80 ft (24.4 m), it is recommended that the floor be subdivided into sectors, each having an area of less than or equal to 128,000 ft2 (11,890 m2), and that each sector be tested individually with 20 grid cells in each sector. Signal strength measurements should be taken at the center of each grid and should be performed using standardized parameters as specified in A.14.4.12.1.4. Signal ~~strength~~ quality typically is recorded on the delivered audio quality (DAQ) scale. This scale is a universal standard often cited in system designs and specifications, using the following measures:

(1) DAQ 1: Unusable speech present but unreadable.
(2) DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion.
(3) DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
(4) DAQ ~~3.5~~ 3.4: Speech understandable with repetition only rarely required. Some noise/distortion.
(5) DAQ 4: Speech easily understood. Occasional noise/distortion.
(6) DAQ 4.5: Speech easily understood. Infrequent noise/distortion.
(7) DAQ 5: Speech easily understood.

The minimum allowable DAQ for each grid cell typically is DAQ 3. (17 db SINAD, +/1 5 dB)

The minimum downlink signal strength is specified in 24.5.2.3.1. The signal strengths are measured as per A.14.4.12.1.4 and will be recorded in each cell as well as the DAQ.

Not more than two nonadjacent grid cells should be allowed to fail the test. In the event that three of the areas fail the test, or if two adjacent areas fail the test, in order to be more statistically accurate, the testing grid resolution should be doubled. This would require decreasing the size to one-half the dimension used in the failed test to a minimum of 10 ft (3.0 m) and a maximum of 40 ft (12.2 m). Further, to cover the same floor area, the number of grids is quadrupled to 80. Not more than eight nonadjacent or five adjacent grid cells should then be allowed to fail the test. In the event that nine or more nonadjacent and/or six or more adjacent grid cells fail the test, consideration should be given to redesigning and reinstalling the public safety radio enhancement system to meet the minimum system design requirements. Failures should not be allowed in critical areas. Measurements should be made with the antenna held in a vertical position at (3 ft to 4 ft) [0.91 m to 1.22 m] above the floor. The DAQ and signal strength measurements should be recorded on small-scale drawings that are used for testing with the authority having jurisdiction. In addition, the gain values of all amplifiers should be measured, and the test measurement results should be kept on file with the building owner so that the measurements can be verified each year during annual tests.

A.14.4.12.1.4 Downlink measurements should be made with the following standardized parameters:

(1) A calibrated spectrum analyzer, or a calibrated automatic signal level measurement recording system to measure signal strength in dBm.
(2) Receiving antennas of equal gain to the agency's standard portable radio antenna, oriented vertically, with a centerline between 3 ft and 4 ft above floor
(3) A resolution bandwidth nearest the bandwidth of the channel under test
(4) Levels recorded while walking an "X" pattern, with the center of the pattern located approximately in the center of each grid area
(5) The linear distance of each side of the "X" equal to at least 10 percent of the length of the grid's side, and a minimum length of 10 ft (3.0 m)
(6) Measurement sampled in averaging mode to include a minimum of one sample per each 5 ft (1.52 m) traveled, recorded with not less than five samples per measurement recorded per side of the "X"

A.14.4.12.1.5 Typically, acceptance tests are required by the authority having jurisdiction prior to building occupancy. As built drawings should be provided along with other information required from the signal level and commissioning tests, including a full report with grid locations, DAQ and signal strength measurements, and amplifier gain values should be provided at the acceptance test. The acceptance test typically entails a random test by the authority having jurisdiction of radio communication in various portions of the building, especially including the critical areas.

The authority having jurisdiction can review any test documentation and ensure that the findings of the commissioning

test with respect to DAQ and signal strength levels and gain values are supported by the acceptance test.

Substantiation: DAQ measurements are subjective statements of perceived audio quality. While DAQ statements add value to the overall assessment of radio signal voice fidelity, particularly in radio environments with radio frequency noise interference. However subjective statements such as DAQ are subject to misinterpretation and are inadequate as repeatable benchmark measurements or as accurate validation of future performance verifications that are required by this code.

Further, DAQ statements do not apply to digital modulations and digital messages which is becoming standard applications of radio communications.

Section 24.5.2.3 states a measured value (in dBm values) for signal strength that is a much better technical specification than DAQ.

The proposed revisions below clarify the radio signal measurement requirements of this code and removes any misinterpretation that DAQ is an alternative to measured dBm values called out in 24.5.2.3.

The typo correction of DAQ 3.5 to DAQ 3.4 and the addition of "(17 dB SINAD, +/- 5 dB)" adds a quantifiable measurement of the minimum DAQ specification and harmonizes this code with the universally accepted authority on this specific metric, the Telecommunication Industry Association (TIA), TSB-88 standard.

These revisions do not change the intent or purpose of the original NFPA codes.

This is not original material; its reference/source is as follows:

Telecommunication Industry Association (TIA), T-88 standard; "(17 dB SINAD, +/-5 dB)".

72-577 Log #420 SIG-TMS **Final Action:**

(Figure A.14.6.2.4)

Submitter: Scott Jacobs, ISC Electronic Systems, Inc.

Recommendation: Make changes to the Inspection form in response to input and comments from various industry sources, and to keep it similar to the Record of Completion Form 10.18.2.1.1.

All changes are not complete, so this proposal will serve as a placeholder for changes to be completed before the January 2011 ROP meeting.

Substantiation: Existing form needs to be changed to accommodate various types of systems and circumstances.

72-604 Log #546 SIG-TMS **Final Action:**
(D.3.4 (New))

Submitter: Shane Clary, Bay Alarm Company
Recommendation: Revise text to read as follows:

D.3.4 (New) Calculating Percentage of the Articulation Loss of Consonants ($\%AL_{CONS}$)

There are occasions in which a space may not be available to take test measurements in prior to the design being completed. One method of calculation for the Speech Intelligibly Index is by the Calculating Percentage of Articulation Loss of Consonants ($\%AL_{CONS}$)

The formula is:

$\%AL_{CONS} = 656D_2^2RT_{60}^2(N)/VQM$

Where:

D_2 = Distance from the loudspeaker to the farthest listener

RT_{60} = Reverberation time in seconds

V = Volume of the room in cubic feet

Q = Directivity Index (Ratio)

N = Power ratio of L_W causing L_D to the L_W of all devices except those causing L_D

M = D_C modifier (usually 1)

As point of reference, D_C is the critical distance.

N is further defined as:

L_W = Sound power level in dB

L_D = Total direct energy

$L_W = 10\log (W_a/10^{-12}W)$

W_a = Acoustic watts

10^{-12} = Specified reference

$L_D = L_W + 10\log (Q/4ðr^2) + 10.5$

The conversion factor from $\%AL_{CONS}$ to STI is STI = $[-0.1845 \times \ln(\%AL_{CONS})] + 0.9482$.

Renumber remaining paragraphs as required.

Substantiation: NFPA 72® should contain within the Annex at least one method to perform a calculation, so that the designer may have somewhat of an idea if his/her design is moving towards meeting the intent of NFPA 72® for speech intelligibility. There are occasions, such as when a building has yet to be constructed, that field measurements are not possible.

There are now on the market a number of software packages that allow a designer to perform detailed analysis for each space within a building. These should certainly be considered and used for complex spaces. For simple spaces, or to obtain a quick snapshot of what may be required, this use of Calculating Percentage of the Articulation Loss of Consonants ($\%AL_{CONS}$) is a valuable tool.

72-605 Log #508 SIG-TMS **Final Action:**
(D.3.6.1)

Submitter: Andrew G. Berezowski, Honeywell Inc.
Recommendation: Revise text to read as follows:

D.3.6.1. Measurements should be taken at an elevation of 5 ft (1.5m) or at any other elevation deemed appropriate ~~if the area is subject to normal occupant access~~ based on occupancy (e.g., elevated walkways, child-height, sitting height, work area height, etc.) or test instrument instructions.

Substantiation: Intelligibility measurement in a space should consider the ADS occupancy and function as well as any requirements associated with the test instrument.

72-606 Log #504 SIG-TMS Final Action:
(D.4.1.2)

Submitter: Andrew G. Berezowski, Honeywell Inc.
Recommendation: Revise text to read as follows:
D.4.1.2 . The Intelligibility Test System consists of a Talkbox and STIPA test meter (analyzer) all from one manufacturer. Units form other manufacturers should not beinterchanged unless said units have been tested by a recognized testing laboratory for compatibility (~~see D.2.3.6~~) D.2.3.5.2.
Substantiation: Should the reference be D.2.3.5.2?

72-609 Log #489 SIG-TMS Final Action:
(Annex G)

Submitter: Daniel J. Horon, CADgraphics, Incorporated
Recommendation: Revise Annex G to read as follows:

****Insert Include 72_L489_R Here****

Substantiation: This proposal had input from Vic Humm and members of the NFPA SIG-PRO Circuits and Pathways Task Group.
The current Annex G uses circuit designations from older editions of NFPA 72 that are not described in the current edition. The proposed changes are intended to make Annex G consistent with the new Chapter 12, Circuits and Pathways.
Designations Class R (redundant path) and Class S (single path) are proposed new designations, and are dependent upon other proposals from the Circuits and Pathways Task Group.

Annex G Wiring Diagrams and Guide for Testing Fire Alarm Circuits

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Annex G provides guidance for testing of the various ~~circuit styles and~~ classes of circuits identified in ~~Table 6.5, Table 6.6.1, and Table 6.7 of~~ Chapter ~~6. These tables have been substantially revised in~~ 12 of this Edition of ~~the Code but~~NFPA 72. Earlier Editions of NFPA 72 have used different designations for these ~~revisions have not been reflected~~circuits. Designations found in previous Editions (located in Annex ~~G. The changes made to the Chapter 6 tables are summarized below:~~ C of NFPA 72, Edition 2007 or earlier) can be compared with these corresponding diagrams.

~~*Table 6.5 Performance of Initiating Device Circuits:*~~

~~*(*~~**G.1**~~*)*~~ Circuit ~~***Styles A***~~Class Designations in this Edition of the Code are *Class* A, B, C, ~~***and E have been completely eliminated***~~D, E, R, S, & X. Definitions can be found in Chapter 12. Additionally, special circuits unique to Supervising Stations are designated as *Type* 4, 5, 6 & 7 and definitions can be found in Chapter 26.

~~*(2) Performance information for circuit Styles B and D remains but these circuits are now designated simply Class B and Class A, respectively, without any style designation.*~~

~~*Table 6.6.1 Performance of Signaling Line Circuit*~~

~~*(1) Circuit Styles 0.5, 1, 2, 3, 3.5, 4.5, and 5 have been completely eliminated.*~~

~~*(2) Circuit Styles 4, 6, and 7 remain.*~~

~~*Table 6.7 Notification Appliance Circuit.*~~

~~*(1) Circuit Styles W and X have been completely eliminated.*~~

~~*(2) Performance information for circuit Styles Y and Z remains but these circuits are now designated simply Class B and Class A, respectively, without any style designation.*~~

~~*Since Annex G has not changed, it still provides useful guidance for applications that use the older style designations. However for these older styles, users of this annex will need to consult with earlier editions of the Code to obtain related circuit performance information.*~~

~~**G.1**~~

The wiring diagrams depicted in Figure G.2.1 through Figure G.2.17 are representative of typical circuits encountered in the field and are not intended to be all-inclusive.

~~The noted styles are as indicated in Table 6.5, Table 6.6.1, Table 6.7, and Table 8.6.3.2.2.2.~~

The noted systems are as indicated in NFPA 170, *Standard for Fire Safety Symbols*.

~~Because~~An individual point-identifying (addressable) fire alarm initiating device operates on a signaling line circuit and is designated as a Class A, Class B, or Class X initiating device circuit. All fire alarm circuits must test free of grounds because metallic

conductors will cause failure of the circuit when a second ground condition occurs on the same power source.

Non-metallic circuit paths, such as wireless and fiber-optic may still be designated as Class A, B, or X if they meet the other performance requirements of those pathways.

Ground-fault detection is not required for all circuits that might be interconnected with the fire alarm system. Therefore, tests for ground-fault detection should be limited to those circuits equipped with ground-fault detection. The Class R designation is for a redundant circuit that may use metallic conductors, but is not concerned with ground fault detection. Class S is a single path supervised circuit that may use metallic conductors, but is not concerned with ground fault detection.

~~An individual point-identifying (addressable) initiating device operates on a signaling line circuit and not on a Style A, B, C, D, or E (Class B and Class A) initiating device circuit.~~

~~All of~~ The following initiating device circuits are illustrative of either alarm or supervisory signaling. Alarm-initiating devices and supervisory initiating devices are not permitted ~~on the same initiating device circuit~~to have identical annunciation at the fire alarm control unit.

~~In addition to losing its ability to receive an alarm from an initiating device located beyond an open fault, a Style A (Class B) initiating device circuit also loses its ability to receive an alarm when a single ground fault is present.~~

~~Style C and Style E (Class B and Class A) initiating device circuits can discriminate between an alarm condition and a wire-to-wire short. In these circuits, a wire-to-wire short provides a trouble indication. However, a wire-to-wire short prevents alarm operation. Shorting-type initiating devices cannot be used without an additional current or voltage limiting element.~~

Directly connected system smoke detectors, commonly referred to as two-wire detectors, should be listed as being electrically and functionally compatible with the fire alarm control unit and the specific subunit or module to which they are connected. If the detectors and the units or modules are not compatible, it is possible that, during an alarm condition, the detector's visible indicator will illuminate, but no change of state to the alarm condition will occur at the fire alarm control unit. Incompatibility can also prevent proper system operation at extremes of operating voltage, temperature, and other environmental conditions.

Where two or more two-wire detectors with integral relays are connected to a single initiating device circuit, and their relay contacts are used to control essential building functions (e.g., fan shutdown, elevator recall), it should be clearly noted that the circuit might be capable of supplying only enough energy to support one detector/relay combination in an alarm mode. If control of more than one building function is required, each detector/relay combination used to control separate functions should be connected to separate initiating device circuits, or they should be connected to an initiating device circuit that provides adequate power to allow all the detectors connected to the circuit to be in the alarm mode simultaneously. During acceptance and reacceptance testing, this feature should always be tested and verified.

A speaker is an alarm notification appliance, and, if used as shown in the diagrams in

G.2, the principle of operation and supervision is the same as for other audible alarm notification appliances (e.g., bells and horns).

The testing of supervised remote relays is to be conducted in the same manner as for notification appliances.

G.2 Wiring Diagrams and Testing.

When testing circuits, the correct wiring size, insulation type, and conductor fill should be verified in accordance with the requirements of NFPA 70, *National Electrical Code*.

G.2.1 Testing Nonpowered ~~Alarm-Initiating or Supervisory-Initiating Devices (e.g., Manual Station or Valve Supervisory Switch) Connected to Style~~, Hard-Wired Class A, or B, ~~or C~~ Initiating Device Circuits. Disconnect conductor at device or control unit, then reconnect. Temporarily connect a ground to either leg of conductors, then remove ground. Both operations should indicate audible and visual trouble with subsequent restoration at control unit. ~~Conductor-to-conductor short should initiate alarm. Style A and Style B (Class B) indicate trouble Style C (Class B). Style A (Class B) does not initiate alarm while in trouble condition. See Figure G.2.1.~~

G.2.1.1 Hard-Wired Alarm-Initiating or Supervisory-Initiating Devices. Hard-Wired alarm initiating devices (e.g., Manual Station or Valve Supervisory Switch) by their intended function, initiate alarm upon a conductor-to-conductor short. See Figure G.2.1.

******Insert Existing Figure G.2.1 Here******

FIGURE G.2.1 Nonpowered Alarm-Initiating or Supervisory-Initiating Devices Connected to ~~Style A,~~Hard-Wired and B~~, or C~~ Initiating Device Circuits.

G.2.2 Nonpowered ~~Alarm-Initiating or Supervisory-Initiating Devices Connected to Style D or E Initiating Device~~Class A Circuits. Disconnect a conductor at a device at midpoint in the circuit. Operate a device on either side of the device with the disconnected conductor. Reset fire alarm control unit and reconnect conductor. Repeat test with a ground applied to either conductor in place of the disconnected conductor. Both operations should indicate audible and visual trouble, then alarm or supervisory indication with subsequent restoration. See Figure G.2.2.

~~**FIGURE G.2.2 Nonpowered Alarm-Initiating or Supervisory-Initiating Devices Connected to Style D or E Initiating Device Circuits.**~~

G.2.3 Circuit-Powered (Two-Wire) Smoke Detectors for ~~Style~~ Class A, or B~~, or C~~ Initiating Device Circuits. Remove smoke detector where installed with plug-in base or disconnect conductor from fire alarm control unit beyond first device. Activate smoke detector per manufacturer's published instructions between fire alarm control unit and circuit break. Restore detector or circuit, or both. Fire alarm control unit should indicate trouble whe~~re~~n fault occurs and alarm whe~~re~~n detectors are activated between the break

and the fire alarm control unit. See Figure G.2.3.

****Insert Existing Figure G.2.3 Here****

FIGURE G.2.3 Circuit-Powered (Two-Wire) Smoke Detectors for ~~Style~~Class A, or B, or ~~C~~ Initiating Device Circuits.

G.2.4 Circuit-Powered (Two-Wire) Smoke Detectors for ~~Style D or E~~ Class A Initiating Device Circuits. Disconnect conductor at a smoke detector or remove where installed with a plug-in base at midpoint in the circuit. Operate a device on either side of the device with the fault. Reset control unit and reconnect conductor or detector. Repeat test with a ground applied to either conductor in place of the disconnected conductor or removed device. Both operations should indicate audible and visual trouble, then alarm indication with subsequent restoration. See Figure G.2.4.

****Insert Existing Figure G.2.4 Here****

FIGURE G.2.4 Circuit-Powered (Two-Wire) Smoke Detectors for ~~Style D or E~~ Class A Initiating Device Circuits.

G.2.5 Combination Alarm-Initiating Device and Notification Appliance Circuits. Disconnect a conductor either at indicating or initiating device. Activate initiating device between the fault and the fire alarm control unit. Activate additional smoke detectors between the device first activated and the fire alarm control unit. Restore circuit, initiating devices, and fire alarm control unit. Confirm that all notification appliances on the circuit operate from the fire alarm control unit up to the fault and that all smoke detectors tested and their associated ancillary functions, if any, operate. See Figure G.2.5.

****Insert Existing Figure G.2.5 Here****

FIGURE G.2.5 Combination Alarm-Initiating Device and Notification Appliance Circuits.

G.2.6 Combination Alarm-Initiating Device and Notification Appliance Circuits Arranged for Operation with a Single Open or Ground Fault. Testing of the circuit

is similar to that described in G.2.5. Confirm that all notification appliances operate on either side of fault. See Figure G.2.6.

****Insert Existing Figure G.2.6 Here****

FIGURE G.2.6 Combination Alarm-Initiating Device and Notification Appliance Circuits Arranged for Operation with a Single Open or Ground Fault.

G.2.7 ~~Style~~ Class A, ~~B,~~ or ~~C~~ B, Circuits with Four-Wire Smoke Detectors and an End-of-Line Power Supervision Relay. Testing of the circuit is similar to that described in G.2.3 and G.2.4. Disconnect a leg of the power supply circuit beyond the first device on the circuit. Activate initiating device between the fault and the fire alarm control unit. Restore circuits, initiating devices, and fire alarm control unit. Audible and visual trouble should indicate at the fire alarm control unit where either the initiating or power circuit is faulted. All initiating devices between the circuit fault and the fire alarm control unit should activate. In addition, removal of a smoke detector from a plug-in-type base can also break the power supply circuit. Where circuits contain various powered and nonpowered devices on the same initiating circuit, verify that the nonpowered devices beyond the power circuit fault can still initiate an alarm. A return loop should be brought back to the last powered device and the power supervisory relay to incorporate into the end-of-line device. See Figure G.2.7.

****Insert Existing Figure G.2.7 Here****

FIGURE G.2.7 ~~Style A,~~Class B~~, or C~~ Circuits with Four-Wire Smoke Detectors and an End-of-Line Power Supervision Relay.

G.2.8 ~~Style A,~~Class B~~, or C~~ Initiating Device Circuits with Four-Wire Smoke Detectors That Include Integral Individual Supervision Relays. Testing of the circuit is similar to that described in G.2.3 with the addition of a power circuit. See Figure G.2.8.

****Insert Existing Figure G.2.8 Here****

FIGURE G.2.8 ~~Style A,~~Class B~~, or C~~ Initiating Device Circuits with Four-Wire

Smoke Detectors That Include Integral Individual Supervision Relays.

G.2.9 Alarm Notification Appliances Connected to ~~Style W and Y~~Class B (Two-Wire) Circuits. Testing of the notification appliances connected ~~to Style W and Style Y (~~as Class B~~)~~ is similar to that described in G.2.3. See Figure G.2.9.

******Insert Existing Figure G.2.9 Here******

FIGURE G.2.9 Alarm Notification Appliances Connected to ~~Styles W and Y~~ Class B (Two-Wire) Circuits.

G.2.10 Alarm Notification Appliances Connected to ~~Style X and Z~~ Class A (Four-Wire) Circuits. Testing of the notification appliances connected ~~to Style X and Style Z (Class B and~~as Class A~~)~~ is similar to that described in G.2.4. See Figure G.2.10.

******Insert Existing Figure G.2.10 Here******

FIGURE G.2.10 Alarm Notification Appliances Connected to ~~Style X and Z~~Class A (Four-Wire) Circuits.

G.2.11 System with a Supervised Audible Notification Appliance Circuit and an Unsupervised Visible Notification Appliance Circuit. Testing of the notification appliances connected to ~~Style X and Style Z (~~Class B~~ and Class A)~~ is similar to that described in G.2.4. See Figure G.2.11.

******Insert Existing Figure G.2.11 Here******

FIGURE G.2.11 Supervised Audible Notification Appliance Circuit and an Unsupervised Visible Notification Appliance Circuit.

G.2.12 System with Supervised Audible and Visible Notification Appliance Circuits. Testing of the notification appliances connected to ~~Style X and Style Z (~~Class B~~ and Class A)~~ is similar to that described in G.2.4. See Figure G.2.12.

****Insert Existing Figure G.2.12 Here****

FIGURE G.2.12 Supervised Audible and Visible Notification Appliance Circuits.

G.2.13 Series Notification Appliance Circuit, Which No Longer Meets the Requirements of *NFPA 72*. An open fault in the circuit wiring should cause a trouble condition. See Figure G.2.13.

****Insert Existing Figure G.2.13 Here****

FIGURE G.2.13 Series Notification Appliance Circuit.

G.2.14 Supervised Series Supervisory-Initiating Circuit with Sprinkler Supervisory Valve Switches Connected, Which No Longer Meets the Requirements of *NFPA 72*. An open fault in the circuit wiring of operation of the valve switch (or any supervisory signal device) should cause a trouble condition. The classification of this circuit is now designated as Class D because the intended operation is performed. When the circuit fails, the indication at the fire control unit is the same as if the supervisory switch were to open. Fire alarm initiating devices, including supervisory inputs, are no longer allowed to annunciate as trouble conditions. See Figure G.2.14.

****Insert Existing Figure G.2.14 Here****

FIGURE G.2.14 Supervised Series Supervisory-Initiating Circuit with Sprinkler Supervisory Valve Switches Connected.

G.2.15 Initiating Device Circuit with Parallel Waterflow Alarm Switches and a Series Supervisory Valve Switch, Which No Longer Meets the Requirements of *NFPA 72*. An open fault in the circuit wiring or operation of the valve switch should cause a trouble signal. See Figure G.2.15.

****Insert Existing Figure G.2.15 Here****

FIGURE G.2.15 Initiating Device Circuit with Parallel Waterflow Alarm Switches

and a Series Supervisory Valve Switch.

G.2.16 System Connected to a Municipal Fire Alarm Master Box Circuit. Disconnect a leg of municipal circuit at master box. Verify alarm sent to public communications center. Disconnect leg of auxiliary circuit. Verify trouble condition on control unit. Restore circuits. Activate control unit and send alarm signal to communications center. Verify control unit in trouble condition until master box reset. See Figure G.2.16.

******Insert Existing Figure G.2.16 Here******

FIGURE G.2.16 System Connected to a Municipal Fire Alarm Master Box Circuit.

G.2.17 Auxiliary Circuit Connected to a Municipal Fire Alarm Master Box. For operation with a master box, an open or ground fault (where ground detection is provided) on the circuit should result in a trouble condition at the fire alarm control unit. A trouble signal at the fire alarm control unit should persist until the master box is reset. For operation with a shunt trip master box, an open fault in the auxiliary circuit should cause an alarm on the municipal system. See Figure G.2.17.

******Insert Existing Figure G.2.17 Here******

FIGURE G.2.17 Auxiliary Circuit Connected to a Municipal Fire Alarm Master Box.

G.3 Circuit ~~Styles~~Classes.

Some testing laboratories and authorities having jurisdiction permitted systems to be classified as ~~a Style 7 (~~Class ~~A)~~X by the application of two circuits ~~of the same style~~ operating in ~~parallel~~ tandem. An example of this is to take two series circuits, ~~either Style 0.5 or Style 1.0 (~~Class B~~),~~ and operate them in ~~parallel~~ tandem. The logic ~~is~~ was that if a condition occurs on one of the circuits, the other ~~parallel~~ series circuit remain~~s~~ ed operative. To understand the principles of the circuit, alarm receipt capability should be performed on a single circuit, and the ~~style~~ *Class* type, based on the performance, should be indicated on the record of completion.

G.3.1 Style 0.5. This signaling circuit operates as a series circuit in performance. This is identical to the historical series audible signaling circuits. Any type of break or ground in one of the conductors, or the internal of the multiple interface device, and the total circuit is rendered inoperative.

To test and verify this type of circuit, either a conductor should be lifted or an earth

ground should be placed on a conductor or a terminal point where the signaling circuit attaches to the multiplex interface device.

G.3.2 Style 0.5(a) (Class B) Series~~.~~ Which No Longer Meets the Requirements of *NFPA 72*. Style 0.5(a) functions so that, when a box is operated, the supervisory contacts open, making the succeeding devices inonoperative while the operating box sends a coded signal. Any alarms occurring in any successive devices will not be received at the receiving station during this period. See Figure G.3.2.

******Insert Existing Figure G.3.2 Here******

FIGURE G.3.2 Style 0.5(a) ~~(Class B)~~ Series.

G.3.3 Style 0.5(b) ~~(Class B)~~ Shunt~~.~~ Which No Longer Meets the Requirements of *NFPA 72*. The contact closures when the device is operated (and remains closed) to shunt out the remainder of the system until the code is complete. See Figure G.3.3.

******Insert Existing Figure G.3.3 Here******

FIGURE G.3.3 Style 0.5(b) ~~(Class B)~~ Shunt.

G.3.4 Style 0.5(c) ~~(Class B)~~ Positive Supervised Successive Which No Longer Meets the Requirements of *NFPA 72*. An open or ground fault on the circuit should cause a trouble condition at the control unit. See Figure G.3.4.

******Insert Existing Figure G.3.4 Here******

FIGURE G.3.4 Style 0.5(c) ~~(Class B)~~ Positive Supervised Successive~~.~~

G.3.5 Style 1.0 ~~(Class B).~~Which No Longer Meets the Requirements of *NFPA 72*. This is a series circuit identical to the diagram for Style 0.5, except that the fire alarm system hardware has enhanced performance. *[See Figure G.3.5(a) and Figure G.3.5(b).]* A single earth ground can be placed on a conductor or multiplex interface device, and the circuit and hardware will still have alarm operability.

If a conductor break or an internal fault occurs in the pathway of the circuit conductors, the entire circuit becomes inoperative.

To verify alarm receipt capability and the resulting trouble signal, place an earth ground on one of the conductors or at the point where the signaling circuit attaches to the multiplex interface device. One of the transmitters or an initiating device should then be placed into alarm.

******Insert Existing Figure G.3.5 (a) Here******

FIGURE G.3.5(a) Style 1.0 (Class B).

******Insert Existing Figure G.3.5(b) Here******

FIGURE G.3.5(b) Typical Transmitter Layout.

G.3.6 Typical McCulloh Loop. This is the central station McCulloh redundant-type circuit and has alarm receipt capability on either side of a single break. See Figure G.3.6.

******Insert Existing Figure G.3.6 Here******

FIGURE G.3.6 Typical McCulloh Loop.

G.3.6.1 To test, lift one of the conductors and operate a transmitter or initiating device on each side of the break. This activity should be repeated for each conductor.

G.3.6.2 Place an earth ground on a conductor and operate a single transmitter or initiating device to verify alarm receipt capability and trouble condition for each conductor.

G.3.6.3 Repeat the instructions of G.3.6.1 and G.3.6.2 at the same time, verify alarm receipt capability, and verify that a trouble condition results.

G.3.7 Class B (Formerly Style 3.0 ~~(Class B~~). This is a parallel circuit in which multiplex interface devices transmit signal and operating power over the same conductors. *(See Figure G.3.7.)* The multiplex interface devices might be operable up to the point of a single break. Verify by lifting a conductor and causing an alarm condition on one of the units between the central alarm unit and the break. Either lift a conductor to verify the trouble condition or place an earth ground on the conductors. Test for all the valuations shown on the signaling table.

On ground-fault testing, verify alarm receipt capability by actuating a multiplex interface initiating device or a transmitter.

****Insert Existing Figure G.3.7 Here****

FIGURE G.3.7 Class B (Formerly Style 3.0 ~~(Class B~~).

G.3.8 Style 3.5 ~~(Class B). Repeat~~ Which No Longer Meets the Requirements of *NFPA 72*. Follow the instructions for Class B (formerly Style 3.0 ~~(Class B~~) and verify the trouble conditions by either lifting a conductor or placing a ground on the conductor. See Figure G.3.8.

****Insert Existing Figure G.3.8 Here****

FIGURE G.3.8 Style 3.5 ~~(Class B).~~.

G.3.9 Class B (Formerly Style 4.0 ~~(Class B). Repeat~~). Follow the instructions for Class B (Formerly Style 3.0 ~~(Class B~~) and include a loss of carrier where the signal is being used. See Figure G.3.9.

****Insert Existing Figure G.3.9 Here****

FIGURE G.3.9 Class B (Formerly Style 4.0 ~~(Class B~~).

G.3.10 Style 4.5 ~~(Class B). Repeat~~ Which No Longer Meets the Requirements of *NFPA 72*. Follow the instructions for Style 3.5 ~~(Class B).~~ Verify alarm receipt capability while lifting a conductor by actuating a multiple interface device or transmitter on each side of the break. See Figure G.3.10.

****Insert Existing Figure G.3.10 Here****

FIGURE G.3.10 Style 4.5 (Class B).

G.3.11 Class A (Formerly Style 5.0 ~~(Class A~~). Verify the alarm receipt capability and

trouble annunciation by lifting a conductor and actuating a multiplex interfacing device or a transmitter on each side of the break.

G.3.11.1 Ground Test on Class A (Formerly Style 5.0) Circuit. For the earth ground verification, place an earth ground and certify alarm receipt capability and trouble annunciation by actuating a single multiplex interfacing device or a transmitter. See Figure G.3.11.

****Insert Existing Figure G.3.11 Here****

FIGURE G.3.11 Class A (Formerly Style 5.0 ~~(Class A~~).

G.3.12 Class A (Formerly Style 6.0 ~~(Class A). Repeat~~). Follow the instructions ~~for Style 2.0 [Class A (a) through (c)].~~ from G.3.11. Verify the ~~remaining steps for~~ trouble annunciation for the various combinations. See Figure G.3.12.

****Insert Existing Figure G.3.12 Here****

FIGURE G.3.12 Style 6.0 (Class A).

G.3.13 ~~Style 6.0 (~~Class A with Circuit Isolators~~) (Class A).~~ For the portions of the circuits electrically located between the monitoring points of circuit isolators, follow the instructions for a ~~Style 7.0 (~~Class ~~A)~~X circuit. It should be clearly noted that the alarm receipt capability for remaining portions of the circuit protection isolators is not the capability of the entire circuit but is permitted with enhanced system capabilities. See Figure G.3.13.

****Insert Existing Figure G.3.13 Here****

FIGURE G.3.13 ~~Style 6.0 (~~Class A with Circuit Isolators~~) (Class A).~~

G.3.14 Class X (Formerly Style 7~~.0 (Class A). Repeat~~). Follow the instructions for testing of Class A (Formerly style 6~~.0 (Class A~~) for alarm receipt capability and trouble annunciation. See Figure G.3.14(a) through Figure G.3.14(k).

~~NOTE: A portion of the circuit between the alarm processor or central supervising station~~

~~and the first circuit isolator does not have alarm receipt capability in the presence of a wire-to-wire short. The same is true for the portion of the circuit from the last isolator to the alarm processor or the central supervising station.~~

NOTE: Some manufacturers of this type of equipment have isolators as part of the base assembly. Therefore, in the field, this component might not be readily observable without the assistance of the manufacturer's representative.

******Insert Existing Figure G.3.14(a) Here******

FIGURE G.3.14(a) Class X. (Formerly Style 7~~.0 (Class A).~~)

******Insert Existing Figure G.3.14(b) Here******

FIGURE G.3.14(b) Low-Power Radio (Wireless) Fire Alarm System.

******Insert Existing Figure G.3.14(c) Here******

FIGURE G.3.14(c) Two-Way RF Multiplex Systems.

******Insert Existing Figure G.3.14(d) Here******

FIGURE G.3.14(d) One-Way Radio Alarm System.

******Insert Existing Figure G.3.14(e) Here******

FIGURE G.3.14(e) One-Way Radio Alarm System (Type 6 and Type 7).

***Insert Existing Figure G.3.14(f) Here

FIGURE G.3.14(f) Style 4 Fiber Network.

****Insert Existing Figure G.3.14(g) Here****

FIGURE G.3.14(g) Style 4 Fiber Network (Single Break).

****Insert Existing Figure G.3.14(h) Here****

FIGURE G.3.14(h) Style 4 Fiber Network (Double Break).

****Insert Existing Figure G.3.14(i) Here****

FIGURE G.3.14(i) Style 7 Fiber Network (Two LANs).

****Insert Existing Figure G.3.14(j) Here****

FIGURE G.3.14(j) Style 7 Fiber Network (One LAN).

****Insert Existing Figure G.3.14(k) Here****

requirements.

FIGURE G.3.14(k) Style 7 Fiber Network.

G.4 Batteries.

To maximize battery life, nickel-cadmium batteries should be charged as in Table G.4(a).

Table G.4(a) Voltage for Nickel-Cadmium Batteries

Float voltage	1.42 volts/cell + 0.01 volt
High-rate voltage	1.58 volts/cell + 0.07 volt - 0.00 volt

Note: High- and low-gravity voltages are (+) 0.07 volt and (-) 0.03 volt, respectively.

To maximize battery life, the battery voltage for lead-acid cells should be maintained within the limits shown in Table G.4(b).

Table G.4(b) Voltage for Lead-Acid Batteries

Float Voltage	High-Gravity Battery (Lead Calcium)	Low-Gravity Battery (Lead Antimony)
Maximum	2.25 volts/cell	2.17 volts/cell
Minimum	2.20 volts/cell	2.13 volts/cell
High-rate voltage	—	2.33 volts/cell

72-614 Log #24c SIG-TMS **Final Action:**
(H.1.2.1)

Submitter: John F. Bender, Underwriters Laboratories Inc.
Recommendation: Revise text as follows:

H.1.2.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th floor, New York, NY 10036.

ANSI/ASME A17.1a/CSA B44a, *Safety Code for Elevators and Escalators*, 2008.

ANSI/ATA 878.1, *ARCNET Local Area Network*, 1999.

ANSI/EIA 709.1, *LonWorks Control Networking Standard*, 1999.

ANSI/FM 3260, *American National Standard for Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling,* 2004.

ANSI S3.2, *Method for Measuring the Intelligibility of Speech Over Communications Systems*, 1989, revised 1999.

ANSI S3.41, *American National Standard Audible Emergency Evacuation Signal*, 1990, reaffirmed 2008.

ANSI/UL 268, *Standard for Smoke Detectors for Fire Alarm Systems*, ~~2006~~ 2009. (SIG-IDS)

ANSI/UL 464, *Standard for Audible Signaling Appliances,* ~~2003, revised 2008~~ 2009. (SIG-NAS)

ANSI/UL 521, *Standard for Heat Detectors for Fire Protective Signaling Systems*, 1999, revised ~~2004~~ 2010. (SIG-NAS)

ANSI/UL 864, *Standard for Control Units and Accessories for Fire Alarm Systems*, 2003, revised ~~2006~~ 2010. (SIG-ECS, SIG-TMS)

ANSI/UL 1638, *Standard for Visual Signaling Appliances — Private Mode Emergency and General Utility Signaling,* 2001, revised 2008.

ANSI/UL 1971, *Standard for Signaling Devices for the Hearing Impaired*, 2002, revised 2008.

Substantiation: Update referenced standards to most recent revisions. UL 268 is the first publication of the common UL and ULC standard for Smoke Detectors for Fire Alarm Systems. National differences are identified in the new standard. UL 464 includes a new section for protective covers and accessories and a new jarring test, revises marking requirements, outdoor use salt spray test, various test voltages, temperature tests, endurance test, and deletes the dust test. ANSI/UL 521 updated the temperature test. UL 864 has been revised to include fail-safe fire release devices.