UL Code 864 9th Edition

An Overview of the Foremost Code Updates

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9th Edition of UL 864, ANSI/UL 864

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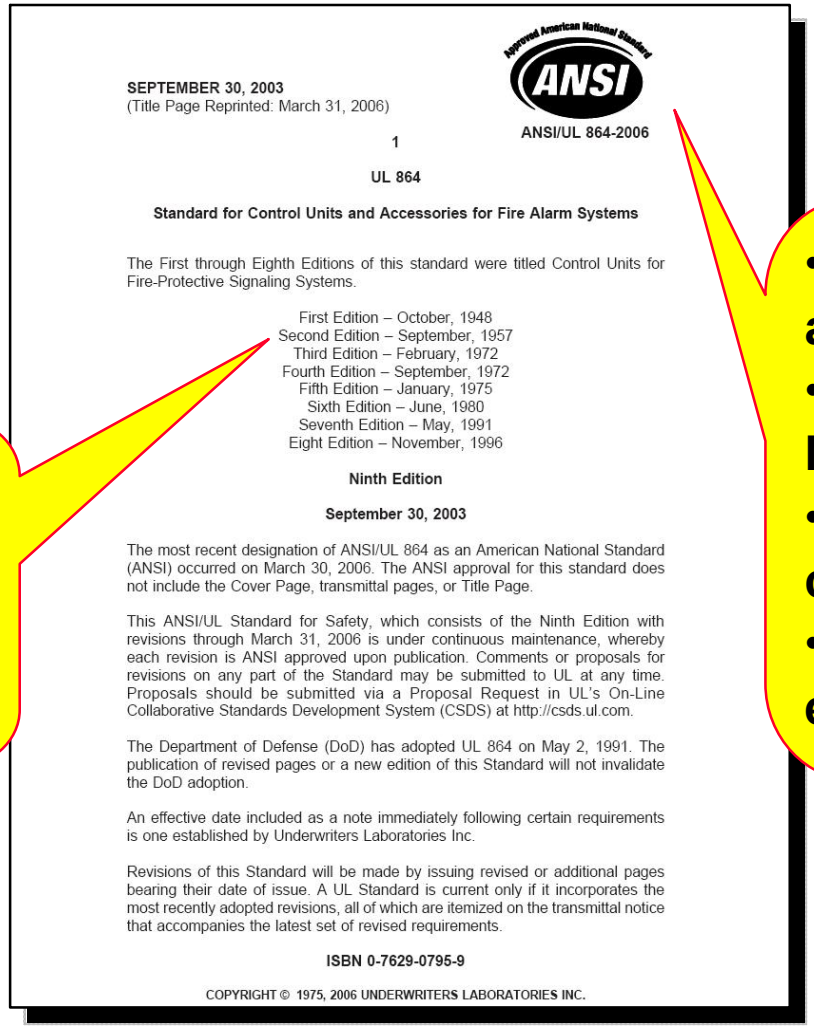

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ANSI/UL 864-2006

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UL 864

Standard for Control Units and Accessories for Fire Alarm Systems

The First through Eighth Editions of this standard were titled Control Units for Fire-Protective Signaling Systems.

First Edition – October, 1948
Second Edition – September, 1957
Third Edition – February, 1972
Fourth Edition – September, 1972
Fifth Edition – January, 1975
Sixth Edition – June, 1980
Seventh Edition – May, 1991
Eight Edition – November, 1996

Ninth Edition

September 30, 2003

The most recent designation of ANSI/UL 864 as an American National Standard (ANSI) occurred on March 30, 2006. The ANSI approval for this standard does not include the Cover Page, transmittal pages, or Title Page.

This ANSI/UL Standard for Safety, which consists of the Ninth Edition with revisions through March 31, 2006 is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

The Department of Defense (DoD) has adopted UL 864 on May 2, 1991. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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Latest incarnation of a standard first published in 1948

- **Note that UL 864 is an ANSI standard.**
- **ANSI is national Norm.**
- **<u>ANY</u> NRTL can certify.**
- **FM and UL are equivalent**

UL 864 9th Edition

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- When published in October 2003 the 9th edition had an effective date of October 31, 2005
- Three subsequent extensions by UL has moved the effective date to June 30, 2007
- UL no longer accepts products for certification to the 8th edition

Ground Fault Supervision

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3.46 GROUND FAULT – A circuit impedance to ground sufficient to result in the annunciation of a trouble condition.

3.46 effective March 31, 2006

June 30, 2007

- **Ground faults are no longer just a short to ground**
- **Manufacturer specifies the amount of leakage to ground and UL tests to verify the trip point**
- **Wiring installation workmanship is very important!**

Products installed in Air-handling Spaces

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5.5 Products intended to be installed in air-handling spaces shall comply with the requirements in the Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces, UL 2043.

5.5 effective ~~March 31, 2006~~ **June 30, 2007**

- **This is an issue particularly for speakers and associated wiring**

Devices Installed in an Outlet Box

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12.2.4 The wiring terminals of a product intended for mounting in an outlet or junction type box shall be located or protected so that, upon installation:

a) The wiring in the outlet box is not forced against the product, product's terminals, or sharp edges so as to damage the conductor insulation or product's unprotected components, and/or

b) A product with exposed wiring terminals shall be held in its intended mounting location inside the box by mechanical means.

Revised 12.2.4 effective March 31, 2006

June 30, 2007

- **You can not just lay a device in an outlet box!**

Wiring the Fire Alarm

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14.4 All external circuits intended to be connected to nonpower-limited wire shall contain either current-limiting or overcurrent protection to prevent fault currents in excess of the current rating for the gauge wire size permitted by the National Electrical Code, ANSI/NFPA 70, or as specified in the installation wiring diagram/instructions. The overcurrent protection provided shall be as specified in Article 240 in ANSI/NFPA 70. See 58.3.3.

14.4 effective March 31, 2006

June 30, 2007

- **It is vital that the installer follow minimum wire gage size specified in the installation wiring diagram**

Alarm Signal Processing Time

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33.1.2 The time periods for processing and activation of signals in a worst case loaded system shall be as follows:

a) Automatic processing and activation of

1) Alarm notification appliances,

2) Local alarm and/or supervisory signal annunciation and/or actuation,

3) Pre-programmed emergency audio announcement,

4) Commencement of programmed delays, and/or

5) Other local fire safety functions associated with the protected premises

shall not be greater than 10 seconds from the initiation of an alarm or supervisory condition, or operation of a manually-activated switch.

- **This is a major change from 90 seconds that has been the requirement for fire for more than 30 years**

Trouble Signal Processing Time

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33.1.2 The time periods for processing and activation of signals in a worst case loaded system shall be as follows:

occurrence of the adverse condition, fault, or the restoration to normal.

Exception No. 1: Trouble signals identifying an inoperative transmitter in a low-power radio-frequency system that meet the Exception to 51.5.8.

Exception No. 2: The initial battery trouble signal annunciation from a battery-operated low-power radio-frequency transmitter that complies with 50.4.1.

- **Trouble signal process time remains essentially unchanged**
- **Provision is now made to delay transmission of a battery trouble to avoid overloading the central station when an area loses power**

Alarm and Trouble Signals Annunciation

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33.1.3 Alarm, supervisory, and trouble signals shall be indicated at the following locations:

a) Operator interface at the protected premises for local-type service and

b) Building fire command center for emergency voice/alarm communications systems.

- **Voice systems must have a command center and this location must indicate all alarm and trouble signals for the system.**

Visual Signal Annunciation at the Control

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33.2.2 The visual annunciation shall be capable of displaying all zones having a status change. Where all zones or status changes are not displayed simultaneously, all the following conditions apply:

a) The display shall indicate the initial status change for the highest priority type signal.

b) An indication for each type (such as fire alarm, fire trouble, sprinkler supervisory) of active non-displayed status changes shall be continuously visible during any off-normal condition.

c) A visual indication showing deactivated alarm notification appliances as required by 33.3.4.

d) The non-displayed status changes shall be capable of being displayed only by manual operation(s).

e) The display controls shall not interfere with the normal operation of the unit.

f) When concurrent signals are received, they shall be indicated as follows in descending order of priority:

1) Signals associated with life safety.

Can be a hold-up alarm!

2) Signals associated with property safety.

3) Supervisory signals and trouble signals associated with life and/or property safety.

4) All other signals.

Alarm Signaling

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33.3.2 Audible alarm notification circuits intended for evacuation shall have the capability of producing the American National Standards Institute's ANSI S3.41 audible emergency evacuation signal pattern, and shall be synchronized on a system basis.

Exception: When a system is intended to provide signaling to more than one notification zone, synchronization of the audible emergency evacuation signal pattern on a notification circuit basis in lieu of a system basis is acceptable. Specifics covering the installation constraints shall be clearly detailed in the installation wiring diagram/instructions for the control unit.

- **This is the "Temporal Three"**
- **Synchronization introduces new complexities in the 9th edition**
  - **Compatibility is a critical issue**
  - **Current calculations and wire size are critical**
  - **Power supply loading**
- **Note the exception – The whole alarm system does not need to be synchronized!**

Supervisory Signals

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33.5.1 The signal indication resulting from the operation of a product for supervisory signals shall automatically include distinctive audible and visual signals for both the off-normal and the restoration-to-normal conditions of the supervisory initiating devices. Cancellation of the off-normal signal is acceptable annunciation for the restoration signal.

Exception: For products whose operation provide, in addition to the above, the capability of selecting nonautomatic distinctive restoration-to-normal supervisory signals (locking in the supervisory signals until manually reset), the installation wiring diagram/instructions for the product shall include instructions for selecting the respective operation.

- **Supervisory Signals must be distinctly different than trouble signals. This calls for a separate device to be used unless the sounder can make different sounds.**

- **Note supervisory signals generally do not latch**

Voice Alarm Command Center

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34.1.4 All required annunciation shall be at the fire command center portion of the system. Where there are multiple fire command centers, the center in control shall be identified by a visible indication at that center.

- **Controls Active LED on all ONYX panels**

Emergency Voice/Alarm Function Sequence

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34.2.1.1 In response to an initiating signal indicative of a fire alarm emergency, systems providing voice/alarm communication shall minimally be capable of providing the following functions:

a) Automatic activation of an evacuation signal to any or all zones in the system, consisting of a minimum of two cycles of the American National Standard Institute's ANSI S3.41 audible evacuation signal pattern, followed by a recorded evacuation message to any or all zones in the system.

b) Automatic alert tone (either separately produced or part of a pre-recorded message) of 3 – 10 seconds duration followed by a recorded message to any or all zones in the system. The alert tone/prerecorded message combination shall be repeated a minimum of three times. Preempting of the alert tone with a predetermined time delay is not prohibited.

c) Manual activation of an evacuation signal or recorded message on an all-call basis. Additionally, manual activation by zone is not prohibited.

- **This is consistent with NFPA 72**
- **Some major communities (i.e. Chicago) follow a different sequence**
- **It is vital to be familiar with the local "High Rise Code"**

Fire Warden Telephone Circuit

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34.3.7 Telephone/intercom circuits shall be monitored for integrity such that a single wire-to-wire fault, single open circuit, or single ground fault results in both an audible and visual trouble indication.

- **The Telephone circuit must be supervised for opens, shorts and grounds.**
- **In today's environment, communications for the fire service personnel is a vital function.**

Operation Time Requirements

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36.1.2 The time periods for automatic processing and activation of signals in a worst-case loaded product/system shall be as follows:

a) Not greater than 10 seconds from the operation of abort or manual release switches or initiation of an alarm condition until the required output functions are executed.

b) Not greater than 10 seconds from the initiation of a supervisory condition until the required output functions are executed.

c) Trouble signals and their restoration to normal shall be annunciated within 200 seconds of the occurrence of the adverse condition, fault, or the restoration to normal.

- **Operating time requirements are greatly changed from the 8th Edition of UL's 864 Code.**
- **Operating time for alarm and supervisory annunciation reduced to 10 seconds from 90.**
- **Trouble signals remain at 200 seconds.**

Releasing Device Service

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36.1.8 A product shall not activate releasing devices when the primary power is de-energized and all secondary power sources, other than those used solely to sustain time and date functions or volatile memory, are reduced from rated voltage to zero.

- **False tripping of a releasing device circuit, besides being an expensive mishap, can be very dangerous.**
- **This requirement specifically addresses a situation when the alarm panel is being serviced.**

Networked Releasing Device Panels

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36.1.9 Where networked control units are employed for a single releasing device service application, such that initiating devices, abort stations, or control switches on one unit controls releasing devices on another unit, a trouble condition or manual disconnect function occurring at any one unit involved in the releasing function(s) shall be visibly and audibly annunciated at each of the other interconnected control units involved in the releasing function.

- **Concern for false dumps carries over to networked systems.**
- **If multiple systems can trigger a dump in the same system, the status of any panel on the system must be annunciated at the other panels connected to the system.**

Pre-Discharge Notification

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36.2.6 Systems intended for the release of Halon 1301 as described in Halon 1301 Fire Extinguishing Systems, NFPA 12A, and/or clean agents as described in Clean Agent Fire Extinguishing Systems, NFPA 2001, shall have provision for a pre-discharge notification appliance circuit.

- **Releasing device control panels must provide a predischarge warning to alert the building occupants.**

Temporal Three

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36.2.7 All evacuation signals produced by the system shall have the capability of complying with the ANSI S3.41 Audible Emergency Evacuation Signal pattern.

- **Note the panel must have the capability of Temporal Three**
- **Some municipalities do not permit the Temporal Three; therefore, the requirement is one must have the capacity.**

Deactivating Alarm and Discharge

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36.2.8 A means for deactivating (silencing) activated alarm, predischarge, or discharge notification appliances shall comply with the following requirements:

a) Deactivating of activated notification appliance devices of a system shall be indicated by a constantly displayed and identified visual indicator.

b) An alarm signal deactivating means left in the off-normal condition when there is no alarm shall activate an audible trouble signal until the means is restored to normal.

c) When any deactivating means of a multiple-circuit system is activated, there shall be an indication of the related deactivated circuit(s) or zone(s) by an identified lamp(s) or other visual annunciation, and operation of the alarm notification appliances by any other circuit having its alarm deactivation means in the normal position shall not be prevented.

d) The switch shall be either:

1) A key-lock type with the key removable only in the normal position;

2) Located inside of a locked enclosure;

3) Access limited by a software security code providing a minimum of 1000 combinations and with a maximum 30-minute time-out feature after the last activity; or

4) Arranged to provide equivalent protection against unauthorized use.

e) The activation of the alarm, predischarge, or discharge signal deactivation means during an alarm or release condition shall not result in resetting a circuit intended for connection to releasing devices or HVAC equipment.

f) The alarm, predischarge, or discharge condition is indicated and maintained by a lamp or other visual indicator with the silencing means activated.

g) When signal deactivation can be accomplished in a selective or zone manner, the visual indicator(s) referenced in (a) shall distinguish notification appliance circuit(s) or zone(s) which have been deactivated from notification appliance circuit(s) or zone(s) which are still energized.

Abort Switches

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36.3.1 An abort switch, when provided, shall be a manually-operated, self-restoring device that suspends the intended sequence leading to release of the extinguishing agent. Such a switch shall be marked "abort".

Exception: Abort switches shall not be used on systems intended to perform pre-action or deluge water functions.

- **Abort Switches must be manually-operated.**
- **Abort Switches must be self-restoring.**
- **Abort Switches must *NOT* be used with pre-action or deluge water systems.**

Abort Switch Circuit Supervision

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36.3.5 A circuit to which an abort switch is connected shall comply with the requirements for initiating-device circuits as described in Common Performance and Monitoring for Integrity – Protected Premises Units/Systems, Section 51.

- **The abort switch circuit must meet the supervision and style requirements applicable to initiating circuits.**

Abort Switch Operation

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36.3.7 Operation of an abort switch while the system is in the alarm condition shall result in a distinct visual and audible annunciation of the abort condition at the operator interface for the system.

- **Operation of the abort switch during a fire alarm requires a distinctive visual and audible trouble signal.**
- **The visual indicator must be dedicated to the abort function.**
- **The audible may be the control panel common trouble sounder or a dedicated audible**

Manual Release Switch

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36.4.2 The manual release switch shall override any pre-discharge delays resulting in an immediate release or start of the manual release delay period. The delay period shall be 30 seconds or less from activation of the switch to actuation of the releasing device(s). The manual release switch is not required to override an abort function while the abort switch is activated. The operating instructions for the control unit shall describe whether the operation of the manual release will override an activated abort switch.

- **Manual release switch must override all delays except manual release delay period**
- **Release must occur within 30 seconds**
- **The manual abort switch is not required to override the manual release switch. This can be a programming function.**
- **Operator's manual must specify if manual override is provided.**

Protected Premise Controls Timing # 1

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38.1.2 The time periods for processing and activation of signals in a worst-case loaded system shall be as follows:

a) Automatic processing of alarm or supervisory signals and start of transmission to a supervisory station receiver shall not be greater than 10 seconds from the initiation of an alarm or supervisory condition.

b) Transmission of trouble signals and their restoration to normal shall be started within 200 seconds of the occurrence of the adverse condition, fault, or the restoration to normal. Annunciation of trouble signals at the protected premises shall also occur within 200 seconds of the occurrence of the faults indicated in 38.2.1.

Exception No. 1: Trouble signals identifying an inoperative transmitter in a low-power radio-frequency system that comply with the Exception to 51.5.8.

Exception No. 2: The initial battery trouble signal from a battery-operated low-power radio-frequency transmitter complying with the requirements of 50.4.1.

Exception No. 3: Off-premises primary power failure trouble signal transmission for products employing digital alarm communication (DACT) transmission as described in 50.2.1.

Exception No. 4: Failure of DACT communication path as indicated in 40.3.2.12.

Protected Premise Controls Timing # 2

Honeywell

Exception No. 1: Trouble signals identifying an inoperative transmitter in a low-power radio-frequency system that comply with the Exception to 51.5.8.

- **Report time can be 1 minute to 4 hours based on FCC regulations.**

Exception No. 2: The initial battery trouble signal from a battery-operated low-power radio-frequency transmitter complying with the requirements of 50.4.1.

- **Battery trouble signal shall be transmitted within 4 hours.**
- **Battery trouble signal shall be transmitted for 7 days.**

Exception No. 3: Off-premises primary power failure trouble signal transmission for products employing digital alarm communication (DACT) transmission as described in 50.2.1.

- **Immediate local annunciation.**
- **Transmission of signal within 60 to 180 minute delay.**

Exception No. 4: Failure of DACT communication path as indicated in 40.3.2.12.

- **Immediate local annunciation.**
- **Transmission over working path within 4 minutes.**

Protected Premise Signal Annunciation

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38.1.3 Alarm, supervisory, and trouble signals shall be indicated at the protected premises for systems serving two or more zones when the off-premises signal does not include zone of origin status change information. Where all zones or status changes are not displayed simultaneously, the display information shall comply with 33.2.2.

- **If the signals sent to a remote supervisory station do not include zone information for a multi-zone panel, zone information must be indicated at the panel.**

- **If indication is not lamp per zone, it must include:**
  - **Signal prioritization**
  - **Indication by type**
  - **Indication by zone**

Digital Radio Alarm Transmitters

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38.5.4 Digital alarm radio transmitters (DART) utilizing private signal transmission facilities and radio alarm transmitters (RAT) shall be arranged to check for the fault conditions specified in 51.1.1 and those indicated in (a) and (b) such that within 200 seconds of the occurrence of a fault condition either an audible trouble shall be annunciated at the protected premises or a trouble signal transmission shall have commenced.

a) Any external antennas and related connecting cable and

b) Interconnections between elements of the transmitting equipment located in separate enclosures.

38.5.5 Where the elements of the equipment described in 38.5.4 are physically separate, provision shall be made such that the interconnecting wiring or cabling is capable of being mechanically protected.

- **"Mechanically protected" means conduit**
- **If the transmitting antenna of transmitter/antenna combination are remote, conduit is required**

DACT Dual Line Requirement

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40.3.2.8 A DACT shall have provision for two separate transmission paths. The DACT shall be capable of selecting the operable transmission path in the event of failure of the other.

Exception: Where a DACT is connected to a telephone line that is monitored for integrity so that the fault conditions indicated in 40.2.2 – 40.2.7 are annunciated within 200 seconds at the supervising station, a second transmission path is not required.

- **Requirement includes:**
  - **Indication of fault subscriber location**
  - **Can not inhibit other subscriber**
  - **Faults include single open, ground, wire-to-wire short & noise**
  - **Signal restoration of service**
  - **Fault condition and restorations must be annunciated at the supervising station within 200 seconds**

New Transmission Technologies

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40.7 Other transmission technologies

40.7.1 Other transmission technologies that operate on principles different from the transmission technologies covered in 40.1.1 – 40.6.1 shall meet the requirements in the Other Technologies Transmission section in National Fire Alarm Code, NFPA 72, and any other requirement considered appropriate for the application.

- **NFPA 72, including the 2007 edition, is basically a prescriptive standard**
- **Each technology is treated differently**
  - **There is no correlation between technologies**
  - **Technologies are not rated as to their strength**
- **NFPA technical committee recognized this limitation and created the *Other Technologies Transmission* section**
- **This is where Internet based requirements originated**

Time to transmit an alarm signal

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42.1.3 The time periods for processing and activation of signals in a worst-case loaded system shall be as follows:

a) Automatic processing and activation of the master box or shunt circuit shall not be greater than 10 seconds from the initiation of an alarm condition.

b) Trouble signals and their restoration to normal shall be annunciated at the protected premises within 200 seconds of the occurrence of the adverse condition, fault, or the restoration to normal.

Exception No. 1: Trouble signals identifying an inoperative transmitter in a low-power radio-frequency system that meet the Exception to 51.5.8.

Exception No. 2: The initial battery trouble signal from a battery-operated low-power radio-frequency transmitter that complies with the requirements of 50.4.1.

- **The "10 seconds" applies to all signal processing at the protected premise.**
- **Trouble annunciation or signal retransmission remains at 200.**

Multi Zone Systems

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45.2.2 The visual annunciation shall be capable of displaying all zones having a status change. Where all zones or status changes are not displayed simultaneously, all the following conditions apply:

a) The display shall indicate the initial status change for the highest priority type signal.

b) An indication for each type (alarm, trouble, supervisory) of active non-displayed status changes shall be continuously visible during any off-normal condition.

c) A visual indication showing deactivated notification appliance circuits as required by 45.3.2.

d) The non-displayed status changes shall be capable of being displayed only by manual operation(s).

e) The display controls shall not interfere with the normal operation of the unit.

f) When concurrent signals are received, they shall be indicated as follows in descending order of priority:

1) Signals associated with life safety;

2) Signals associated with property safety;

3) Supervisory signals and trouble signals associated with life and/or property safety;

4) All other signals.

Note:
A holdup alarm can have same priority as fire

Burglar Alarm

Component Reliability

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53.2 Opening or shorting of capacitors shall either have no adverse effect on normal operation or be indicated by a trouble or an audible alarm signal.

Exception: Where it is not practical to have a component failure indicated, a reliable component shall be used. The reliability of the component may be based on de-rating or on reliability data recorded for the particular component. Suitable sources are:

a) The capacitor derating parameters specified in Table 53.1;

b) The Military Handbook Electronic Reliability Design Handbook, MIL-HDBK-338; and

c) Component reliability data based on actual performance in a similar application, such that the failure rate is equal to or less than 0.5 failures per million hours of operation.

- **In 8th edition, 50% derating was required.**
- **In 9th edition, 864 adopts a process first introduced in UL217.**
- **This change permits more design flexibility.**

Software

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54 Software

54.1 General

54.1.1 Any product that is dependent upon software program(s) to achieve proper operation shall meet all the requirements in this section.

- **Software has become a major concern.**
- **It is critical that the A&E and installer be familiar with the programming function.**
- **It is particularly critical that each of the programming options be understood with regard to standard compliance.**

Software compliance with the standard

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54.1.2 Where compliance with this standard is dependent upon the proper selection of software features and parameters which are field programmable, one of the following shall be met:

a) The software shall not permit any product operation or contain any programming options that are prohibited by this standard;

b) The software shall be partitioned and identified in the field programming software as complying or not complying with (a); or

c) A summary as described in 90.23 shall be provided in the front of the programming manual describing all programming options and parameters that have the potential for conflicting with the requirements in this standard and stating the proper program selections that would be in accordance with this standard. Additionally, information shall also appear throughout the manual where the specific feature or option appears describing the requirements of this standard.

- **Software has made possible the concept of a universal panel.**
- **All features and options may not be compliant with UL 864 or NFPA 72.**
- **It is vital that the A&E review the options selected to assure compliance.**

Executive Software tracking

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54.1.3 A release level shall identify the executive software of a product. A new release level shall be assigned due to any changes in the executive software.

54.1.4 With the executive software resident in the product, the release level of the software shall be visibly marked on the product or shall be capable of being displayed on a visual annunciator provided as part of the unit.

54.2.1 The executive program shall not be accessible for change, modification, or addition by the user, nor shall program execution depend upon site specific programming by the user.

- **Knowing the Rev. level of the software is very important particularly when a problem occurs.**

User Access and Programming

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54.2.2 Site-specific programming is not prohibited from being performed at the factory or in the field. When the product permits programming in the field, the extent of the programming shall be limited to the following:

a) Assignment and mapping of protected premises output circuits where there is a procedure or product feature that allows the programmer or AHJ to readily verify and review all programming. Mapping of input circuits to a supervising station transmitter output circuit is not permitted and shall be automatically accomplished by the executive program. Actuation of the supervising-station receiver output circuits (audible visual, recording) shall be automatically accomplished by the executive program without user input.

b) Setting of parameters and variables that relate only to topics influenced by use and installation of the product.

- **Mapping of output circuits is permitted.**
- **Mapping input circuits to supervising station is not permitted.**
- **The executive program does automatic mapping of critical functions.**

Combination Systems

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56.1 When a fire alarm system shares components, equipment, circuitry, and installation wiring with non-fire systems, short circuits, open circuits, or grounds in the non-fire system equipment or the connections between the non-fire system equipment and the fire alarm products shall not impair the required operation of the fire alarm system or prevent appropriate alarm, supervisory, or trouble annunciation and signaling, or unfaulted fire-safety control activation.

56.1 effective March 31, 2006

56.2 To determine compliance with 56.1, the operation, removal, replacement, failure, or maintenance procedure on any hardware, software, or circuit not performing any of the fire alarm system functions shall not cause loss of any of the fire alarm functions, including supervision, or prevent required alarm, supervisory, trouble, or fire-safety annunciation, signaling, or actuation.

- **Anything non-fire connected to a fire alarm system can not cause any degradation of supervision or alarm functions.**
- **Testing is conducted by placing opens, shorts, grounds on these circuits to verify ***NOTHING*** has been compromised.**

Interconnected Fire Alarm Control Units

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57.4 Unless interconnected control units located at a protected premises are intended to be installed such that the display annunciation at each unit can be simultaneously observed, alarm, supervisory, and trouble conditions, as well as reset, alarm silence, or trouble silence actuation originating at any unit shall be annunciated at each control unit and non-supplementary operator interface.

- **This is a concern for A&E and Installer - how and where you install is very important.**
- **Unless you can see the displays on all of the alarm panels at the same time, ALL panels must concurrently display:**
  - **Alarm**
  - **Supervisory**
  - **Trouble**
  - **Reset**
  - **Alarm Silence**
  - **Trouble Silence**

Power Supply Capacity

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59.7 A product intended to be used with a standby battery shall have sufficient capacity to maintain a charged battery under all conditions of intended operation, including sufficient capacity to operate the product with the battery disconnected or fully discharged. In any operating mode, the battery charger shall be capable of maintaining the battery in the charged condition when the product input is at a maximum of 85 percent of rated voltage or at some lower level of transfer voltage as determined according to 50.2.1 – 50.2.5.

- **The power supply shall be capable of operating the system under full load with supply voltage at 85% of rated with battery disconnected.**
- **The system must be capable of fully charging the battery when the supply voltage is reduced to 85% (or transfer voltage) of rated voltage.**

Notification Appliance Circuits

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- Compatibility of Notification Appliances with specific panels is now critical
- Voltage calculations are very important-one can't add just one more device
- Synchronization is a critical factor as the steady-state load can be very much less then the peak load
- Great care must be taken in selecting notification appliances for use with a particular panel.
- The panel installation instructions and wiring diagrams are your primary guide.

Rating Designations

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61.2.1.1 All notification appliance circuits of a product shall be identified by one of the rating designations shown in Table 61.1.

Voltage types and ratings

Table 61.1 effective March 31, 2006

Rating designation	Voltage type	Maximum RMS voltage range limits
Regulated 12 DC	DC	8 – 17.5
Regulated 24 DC	DC	16 – 33
Regulated 12 FWR	FWR	8 – 17.5
Regulated 24 FWR	FWR	16 – 33
Regulated 120 AC	AC	96 – 132
Regulated 240 AC	AC	192 – 264
Special application	Any	Rated

- **All NAC circuits must be identified by one of these designations**
- **All NAC circuits must operate within the specified voltage range**
- **Note the special application category**

Regulated NAC Circuits

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Table 61.2
Regulated NAC circuits

Tabl

Condition	Magnitude	Duration	Frequency	Required circuit voltage
1 (non-pulsing load)	Minimum circuit rating	Continuous	Continuous	Rated RMS value
2 (non-pulsing load)	Maximum circuit rating	Continuous	Continuous	Rated RMS value
3 (synchronized repetitive pulsing load)	Impedance load equal to 5 times the maximum circuit rating	16.7 milliseconds	2 hertz	Rated RMS value during individual application of surge impedance

Condition	Magnitude	Duration	Frequency	Required circuit voltage
4 (non-synchronized repetitive pulsing load)	Impedance load equal to the maximum circuit rating plus the greater of the following currents: a) A value equal to 1.5 times the maximum single notification appliance operating RMS current rating specified to be connected to the circuit. b) A value equal to 4 times the maximum single notification appliance operating RMS current rating specified for connection to the circuit where the maximum number of appliances exceed 30.	Continuous	Continuous	Rated RMS value

Special Application NAC Circuits

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Table 61.3
Special application NAC circuits

Table 61.3 effective March 31, 2006

Condition	Magnitude	Duration	Frequency	Required circuit voltage
1 (non-pulsing load)	Minimum circuit rating	Continuous	Continuous	Rated RMS value
2 (non-pulsing load)	Maximum circuit rating	Continuous	Continuous	Rated RMS value
3A (synchronized repetitive pulsing load)	Impedance load equal to the maximum peak of the repetitive surge current of the notification appliance multiplied by the specified maximum number of corresponding notification appliance to be used on the circuit.	See note (1)	2 hertz	Rated RMS value during individual application of surge impedance
3B (non-synchronized repetitive pulsing load)	Impedance load equal to the maximum circuit rating plus the greater of the following currents: a) A value equal to 1.5 times the maximum single notification appliance operating RMS current rating specified to be connected to the circuit. b) A value equal to 4 times the maximum single notification appliance operating RMS current rating specified for connection to the circuit where the maximum number of appliances exceed 30.	Continuous	Continuous	Rated RMS value
4	Connected to the maximum specified number of the notification appliance to be used on the circuit.	See note (2)	See note (2)	See note (2)

NOTES

1) Surge current time frame window specified by the manufacturer of the special application notification appliance.

2) The combination of product and notification appliance shall comply with the Signal Strength and Format Test in the Standard for Signaling Devices for the Hearing-Impaired, UL 1971, or the Standard for Visual Signaling Appliances – Private-Mode Emergency and General Utility Signaling, UL 1638, and/or the Audibility Test in the Standard for Audible Signal Appliances, UL 464, as applicable.

Regulated NAC Surge Current Loading

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Table 61.4
Regulated NAC circuits – surge current immunity loading
Table 61.4 effective March 31, 2006

Condition	Magnitude	Duration	Frequency
A (initial surge current load)	Impedance load equal to 10 times the current rating for the NAC circuit.	16.7 milliseconds	Once per minute
B (repetitive surge current load)	Impedance load equal to 5 times the current rating for the NAC circuit.	16.7 milliseconds	2 hertz

- **Loading for first surge is 10X steady state rating of circuit**
- **Loading for repetitive surges is 5X steady state rating**

Special Application Surge Current Loading

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Table 61.5
Special application NAC circuits – surge current immunity loading

Condition	Magnitude	Duration	Frequency	Cycles
A1 (initial surge current load)	Impedance load equal to the maximum peak of the initial surge current multiplied by the specified maximum number of corresponding notification appliance to be used on the circuit.	See note (a)	Once per minute	50
A2 (repetitive surge current load)	Impedance load equal to the maximum peak of the repetitive surge current multiplied by the specified maximum number of corresponding notification appliance to be used on circuit.	See note (a)	2 hertz	50
B1 (initial surge current load)	Connected to the maximum specified number of the notification appliance to be used on the circuit.	Circuit cycled into the alarm condition for 5 seconds	Once per minute	50
B2 (repetitive surge current load)	Connected to the maximum specified number of the notification appliance to be used on the circuit.	Circuit activated in alarm condition for 15 minutes	n/a	n/a
[a] Surge current time frame window specified by the manufacturer of the special application notification appliance.				

- **Only devices specified in the panel installation documentation are permitted!**