

INTERPRETIVE MEMORANDUM 2001 -

To: Licensed Architects
Licensed Engineers
Licensed Sprinkler Contractors
Licensed Fire Alarm Contractors
Licensed Fire Suppression Contractors
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Approved by: Mark Gates,
Deputy Assistant Secretary/Chief Architect

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Re: **Survivability - Notification appliance circuitry and fire command center**

Fire alarm circuitry design and installation having the ability to continue functioning during attack by fire is addressed and quantified under two "survivability" related sections in both the 1996 and 1999 editions of NFPA 72: *National Fire Alarm Code Notification Appliance Circuitry and Fire Command Center Survivability*.

Notification Appliance Circuitry

The 1996 edition of NFPA 72, Section 3-2.4 addressing Protected Premises Fire Alarm Systems, including fire alarm and supervisory signals states,

"The system shall be so designed and installed that attack by fire:

- (a) In an evacuation zone, causing loss of communications to this evacuation zone, shall not result in loss of communications to any other evacuation zone.

- (b) Causing failure of equipment or a fault on one or more installation wiring conductors of one communications path shall not result in total loss of communications to any evacuation zone.

Exception No. 1 to (a) and (b): Systems that, on alarm, automatically sound evacuation signals throughout the protected premises.

Exception No. 2 to (a) and (b): Where there is a separate means acceptable to the authority having jurisdiction for voice communications to each floor or evacuation zone.

Exception No. 3 to (b): The fire command center and the central control equipment.

Exception No. 4 to (b): Where the installation wiring is enclosed in a 2-hour rated cable assembly or enclosed in a 2-hour rated enclosure, other than a stairwell.

Exception No. 5 to (b): Where the installation wiring is enclosed within a 2-hour rated stairwell in a fully sprinklered building in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

Exception No. 6 to (b): When the evacuation zone is directly attacked by fire within the zone.”

This code section compares with the 1999 edition of NFPA 72:3-8.4.1.1.4 addressing notification appliance circuits which states,

“Notification appliance circuits and any other circuits necessary for the operation of the notification appliance circuits shall be protected from the point at which they exit the control unit until the point that they enter the notification zone that they serve using one or more of the following methods.

- (1) A 2-hour rated cable assembly

Article 760 of NFPA 70, *National Electrical Code*, contains wiring requirements for fire alarm systems. Only Mineral Insulated (MI) cable and Circuit Integrity (CI) cables have the necessary 2-hour rating. See exhibits 3.14(a) and 3.14(b) for examples of MI and CI cables.

- (2) A 2-hour rated shaft or enclosure

- (3) A 2-hour rated stairwell in a building fully sprinklered in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*”

Fire Command Center Survivability

In addressing fire command center survivability, the 1996 edition of NFPA 72 Section 1-3.12.4 states:

“ A fire command center shall be provided in accordance with 3-12.6.5

The Exception to this section states that: *Where emergency voice/alarm communications are used to automatically and simultaneously notify all occupants to evacuate the protected premises during a fire emergency, a fire command center shall not be required, but, where provided, shall meet the requirements of Section 3-12.*

3-12.4.2 The fire command center and the central control unit shall be located within a minimum 1-hour fire resistive area and shall have a minimum 3-ft (1-m) clearance about the face of the fire command center control equipment.

The Exception to this section states that: *Where approved by the authority having jurisdiction, the fire command center control equipment shall be permitted to be located in a lobby or other approved space.*

3-12.4.3 Where the fire command center control equipment is remote from the central control equipment: (Main Fire Alarm Control Panel)

- (a) The interconnecting wiring shall be provided with mechanical protection by installing the wiring in metal conduit or metal raceway.
- (b) The interconnecting wiring shall be provided with resistance to attack from a fire by routing the wiring through areas whose characteristics are at least equal to the limited combustible characteristics defined in NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*.
- (c) Where the interconnecting wiring exceeds 100 ft (30m), additional resistance to attack from a fire shall be provided by either:
 - 1. Installing the wiring in metal conduit or metal raceway in a 2-hour fire rated enclosure; or
 - 2. Enclosing the wiring in a 2-hour fire rated cable assembly and installing the cable in metal conduit or metal raceway.

This code section is similar to the 1999 edition of NFPA 72 Section 3-8.4.1.3.3 addressing fire command center survivability which states that:

3-8.4.1.3.3.1 A fire command center shall be provided in accordance with 3-

8.4.1.3.3.

The Exception to this section states that: *If emergency voice/alarm communications are used to automatically and simultaneously notify all occupants to evacuate the protected premises during a fire emergency, a fire command center shall not be required, but, if provided, shall meet the requirements of 3-8.4.1.3.*

3-8.4.1.3.3.2 The fire command center and the central control unit shall be located within a minimum 1-hour rated fire-resistive area and shall have a minimum 3-ft (1-m) clearance from the front of the fire command center control equipment.

3-8.4.1.3.3.3 If the fire command center control equipment is remote from the central control equipment (main fire alarm control panel), the following requirements shall apply.

- (1) The interconnecting wiring shall be provided with mechanical protection by installing the wiring in metal conduit or metal raceway.
- (1) The interconnecting wiring shall be provided with resistance to attack from a fire by routing the wiring through areas whose characteristics are at least equal to the limited combustible characteristics defined in NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*.
- (3) If the interconnecting wiring exceeds 100' (30 m), additional resistance to attack from a fire shall be provided by doing either of the following:
 - a. Installing the wiring in metal conduit or metal raceway in a 2-hour fire-rated enclosure
 - b. Enclosing the wiring in a 2-hour fire-rated cable assembly and installing the cable in metal conduit or metal raceway.

The following four questions have been asked concerning the previously described sections of NFPA 72 related to survivability of both notification appliance circuits and fire communication centers.

- (1) Will it be acceptable to install notification risers that meet a 2-hour rating without the use of conduit? (Recognizing that the cable must be protected to 7 feet above finished floor)
- (2) Will the remote control equipment need to be within a 2-hour area provided the connected cable assembly meets the 2-hour rating?
- (3) Must the 2-hour space be dedicated to the fire alarm system or can it be co-located with other electrical, telephone or data cabling?

(4) Is it acceptable to install remote system nodes and or power supplies in an approved stairwell provided that the equipment is dedicated to fire alarm service?

1. Will it be acceptable to install notification risers that meet a 2-hour rating without the use of conduit? (Recognizing that the cable must be protected to 7 feet above finished floor)

This office determines that 2-hour rated cable assemblies used for notification appliance circuits are not required to be enclosed in conduit. This determination is based on the ability of each successive code edition to clarify each previous code edition.

The NFPA 72 Section 3.8.4.1.1.4 (99 edition) specifically states that 2-hour rated cable assembly is acceptable for this purpose. Note: This determination does not apply to wiring described for fire command center survivability. The 1999 edition of NFPA 72, Section 3-8.4.1.3.3.3 specifically does not permit the use of unenclosed rated cable between the fire command center and central control equipment.

2. Will the remote control equipment need to be within a 2-hour area provided the connected cable assembly meets the 2-hour rating?

Only remotely located central control equipment (main control panel) are to be protected by fire command center survivability requirements of 72:3-8.4.1.3.3.3.

Remote control panels acting as initiating devices shall be protected in accordance with initiating circuitry survivability requirements of 72:3-8.4.1.1.4. Typically, the panels and associated wiring shall be located in a 2-hour fire rated shaft or enclosure as being equivalent to notification circuitry equipment.

This determination is based on NFPA 72:3-11.2 (96 edition) and 72:3-8.1.2 (99 edition) which states that where approved by the authority having jurisdiction, interconnected control units providing localized detection, evacuation signaling, and auxiliary functions shall be permitted to be monitored by a fire alarm system as initiating devices.

This office also observes that NFPA 101:32-8.5 (97 edition) and SBC 412.4.3 states that a high rise fire command station shall contain certain essential equipment which includes:

1. Voice fire alarm system panels and controls.
2. Fire department two-way telephone communication service panels and controls where required by another section of this Code.
3. Fire detection and fire alarm system annunciation panels.
4. Elevator floor location and operation annunciators.
5. Sprinkler valve and water flow annunciators.

6. Emergency generator status indicators.
7. Controls for any automatic stairway door unlocking system.
8. Fire pump status indicators.
9. A telephone for fire department use with controlled access to the public telephone system.
10. Status indicators and controls for air handling systems.
11. Emergency power, light, and emergency systems, controls and status indicators.

When located remotely from the fire command station (as authorized by the authority having jurisdiction), the main fire alarm control panel and essential equipment described by NFPA 101:32-8.5 and SBC 412.4.3 is required to be protected “for survivability” in the manner stipulated by NFPA 72:3-8.4.1.3.3.3. This determination is based on the code intent expressed by SBC 412.4.3 which states that the fire command station is the principal location where the status of the detection, alarm, communications and control systems is displayed and from which the system has the capability for manual control.

The survivability of remotely located fire command station equipment is a primary concern of fire fighters responding to an emergency at the protected premises. The apparent code intent is to protect this wiring more stringently than notification circuitry.

3. Must the 2-hour space be dedicated to the fire alarm system or can it be co-located with other electrical, telephone or data cabling?

This issue is addressed by NFPA 70, (96 edition) Article 760-26 for conductors of different circuits in the same cable, enclosure, or raceway which states that Class 1 and nonpower-limited fire alarm circuits shall be permitted to occupy the same cable, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the enclosure or raceway. Power-supply and fire alarm circuit conductors shall be permitted in the same cable, enclosure, or raceway only where connected to the same equipment.

Fire alarm devices such as remote panels are not addressed by this section. Fire alarm devices located in a 2-hour space in common with other electrical equipment shall be independently protected for survivability unless listed for such a location.

A practical application of Answers #2 and #3 would allow the use of a 2-hour rated, vertically aligned, electrical room for use as a notification circuitry riser.

4. Is it acceptable to install remote system nodes and or power supplies in an approved stairwell provided that the equipment is dedicated to fire alarm service?

NFPA 101:5-1.3.2.1 ('97 edition) does not allow the placement of fire alarm equipment (such as nodes and power supplies) in an exit stairwell. Visual notification devices (strobes) are allowed in exit stair enclosures, as required by ADA-AG Section 4.28.3. Loudspeakers used for voice evacuation purposes are permitted in stairwells by NFPA 72:3-12.6.6.4 (96 edition), 72:3-8.4.1.3.5.6.3 (99 edition).

Exception No. 2 to (e) states that:

Penetrations for fire alarm circuits shall be permitted within enclosures where fire alarm circuits are installed in metallic conduit and penetrations are protected in accordance with 6-2.3.2.4.

This section does not address fire alarm devices. Fire alarm circuits only may occur in an exit enclosure.

These additional questions and answers are offered for clarification purposes:

A. Is a central control station (fire command station) always required in a high rise building?

Yes, no exception to a fire command station at a high rise facility is provided by NFPA 101:32-8.5 or by SBC 412.4.3. If provided, the control center and associated wiring circuits shall be subject to the survivability requirements of NFPA 72. Remotely located essential control center equipment is allowed only on a case-by-case basis by this office and with the approval of the local emergency response office(s).

B. 72:3-8.4.1.1.4 (99 edition) states that survivability requirements are applicable to notification appliance circuits and any other circuits necessary for the operation of the notification appliance circuitry. How will this requirement be enforced?

Buildings and systems reviewed by the 1999 edition of NFPA 72 having signaling line circuits which initiate notification circuitry shall be subject to the applicable survivability requirements of 72:3-8.4.1.1.4 (1999 edition).

Existing buildings having deficient survivability protectives shall be evaluated on a case by case basis.

Devices providing general or zoned notification upon fire breaching unprotected fire alarm circuitry enclosures will be considered as potential code equivalencies.

Example 1: Unprotected vertically aligned electric equipment rooms containing fire alarm circuitry having smoke detectors that initiate general

building alarm.

Example 2: Interspersed “local mode” control panels that can provide the automatic zoned notification upon impaired contact with the main panel (fault condition).

This office observes that fire alarm circuitry and emergency / standby power wiring are closely related such that survivability is governed by either system’s least restrictive protective. NFPA 70:700-9 (d, 1, a and b) states that emergency power fire protection can be provided by the building’s automatic sprinkler system.

Example 3: This office will acknowledge the presence of an automatic sprinkler system as offering some degree of protection that may be considered as a partial equivalency to the protective survivability measures required by NFPA 72 for fire alarm notification circuitry and fire command center wiring.

NOTE: Notification circuitry survivability is required in high rise and low rise buildings having zoned evacuation.

Summary

The Life Safety Code has no apparent preference concerning planned evacuation sequencing and observes that several code references citing survivability requirements offer survivability exceptions for systems automatically sounding evacuation signals throughout the protected premises. Such exceptions include the following references:

(Exception No. 1 to 72:3-2.4, ‘96 edition
Exception to 72:3-12.3.1, ‘96 edition
Exception to 72:3-8.4.1.3.3, ‘99 edition
Also note 72-3-8.4.1.1.1., ‘99 edition)