Overview of New Bi-Directional Amplifier Requirements for Hospitals

Florida Hospital Association

Tuesday, July 24, 2018

Welcome!

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Vice President for Membership Relations
Florida Hospital Association

Objectives

- Provide an understanding of what a Public Safety Bi-Directional Amplifier system is and why it is important for hospitals.
- Discuss the compliance issues for hospitals as they relate to Florida Statute 633.202.
- Describe how a plan to attain compliance can be accomplished.

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What's the Issue?

FS 633.202

- Requires the State Fire Marshall to adopt National Fire Protection Association's (NFPA) Fire Prevention Code standards, including emergency communication systems.
- The statue becomes effective December 31, 2019 and will require certain hospitals to meet specific standards under NFPA for in-building, two-way radio coverage.

Today's Webinar Provides…

- Information on how the new statute relates to Public Safety in compliance with NPFA–72, NFPA-1221, and the International Fire Code testing requirements; AND,
- what the requirements are and examine best practices to achieve compliance.

Today's Speakers

Brian Lopez

- FCC Operator license
- FCC Technician license
- City of Miami Radio System Manager
- State of Florida Communications Chair
- BDA Guidelines for City of Miami

Craig Sells

- ERRC Sales Specialist
- ERRC Project Manager
- National Account Executive for ERRC systems
- Florida Fire College 4 Hour CEU trainer for ERRC

Richard Rodriguez

- Firefighter/ Lieutenant for City of Miami Fire
- Special Asst. to the Fire Marshall
- NFPA certified Fire Plans Reviewer
- Certified Fire Inspector
- Fire Code Consultant and Technical Advisor

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COMMUNICATION IN AN EMERGENCY???

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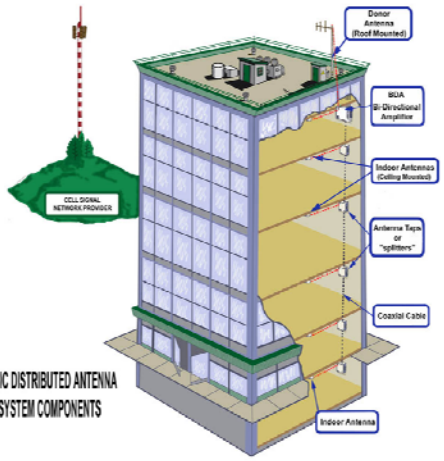
9/11 Over 300 Firefighters lost their lives in part due to Radio Communication Failure

Distributed Antenna System (DAS)

- A solution that distributes RF signal throughout a building, stadium or other defined area.
- Can be used to distribute any RF signal.
- RF sources can either be from the outdoor network (radio tower) or directly from base station radios.
- Typically public safety DAS are fed by a BDA using off-air signal
- NOTE: Coupling two DAS solutions together in a larger space is not recommended because they could interfere with each other



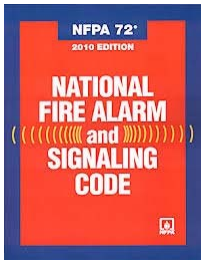
BASIC DISTRIBUTED ANTENNA SYSTEM COMPONENTS

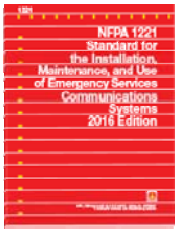
HEAD-END EQUIPMENT ROOM (BRAIN OF THE SYSTEM)

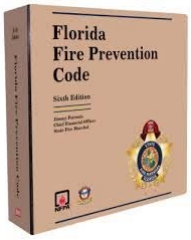
Important requirements that a BDA system has to conform with

- Supports local AHJ's bands
- NFPA 1, 72, 1221
- Florida Fire Prevention Code
- UL Listed
- Compliant FCC part 90
- Other requirements per AHJ.

CODES



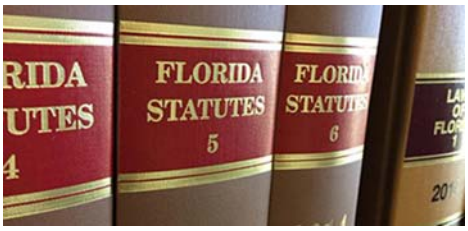




Note: July 1, 2018 Bill# CS/HB 1061 Community Association Fire and Life Safety Systems goes to Florida House of Representatives for Analysis

PERMIT ON FILE BY DECEMBER 31, 2019

Hospital systems are a complex environment that require extensive engineering to develop ERRC solutions



CHAPTER 633- Fire prevention and Control Section 202- Florida Fire Prevention Code

(18) The authority having jurisdiction shall determine the minimum radio signal strength for fire department communications in all new high-rise and existing high-rise buildings.

COMPLIANCE

New Construction and Remodeling where Certificate of Occupancy increases by 20%- Compliance required

Existing Buildings- Permit on file by December 31, 2019 and required to comply by January 1, 2022

Existing Apartment Buildings- Permit on file by December 31, 2022 and required to comply by January 1, 2025

WHAT CHANGED TO REQUIRE PUBLIC SAFETY RADIO ENHANCEMENT

National Fire Prevention Code 1

2012 NFPA 1

11.10* Two-Way Radio Communication Enhancement Systems.

A.11.10 Two-way radio communication enhancement systems provide for greater flexibility and safety for emergency responders during in-building operations.
11.10.1 In all new and existing buildings, minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ.
11.10.2 Where required by the AHJ, two-way radio communication enhancement systems shall comply with *NFPA 72*. IN THE 2015 EDITION NFPA 1221 REPLACED NFPA 72.
11.10.3 Where a two-way radio communication enhancement system is required and such system, components, or equipment has a negative impact on the normal operations of the facility at which it is installed, the AHJ shall have the authority to accept an automatically activated responder system.

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Code provisions changing with ever cycle.

NFPA CODE REFERENCE	NFPA 72 - 2013	NFPA 1221 - 2016
In-Building Solution Required	NFPA 1 Section 11.10	NFPA 1 Section 11.10
Pathway Survivability for Coaxial Cable Required	2 Hour for Riser Coaxial Cable – Sec. 24.3.13.8.4	2-Hour for Riser Coaxial Cable – Sec. 9.6.2.1.3
Plenum Rated Coaxial Cable Required	Yes, Riser & Feeder Coaxial Cable Sec. 24.3.13.8.3	Yes, Riser & Feeder Coaxial Cable – Sec. 9.6.2.1.1.1
Lightning Protection Required	Not addressed in Section 24.5.2	Yes, In accordance with NFPA 780 – Sec. 9.6.3
Isolation of Donor Antenna Required	Yes, 15 db – Sec. 24.5.2.3.3	Yes, 20 db – Sec. 9.6.9
Battery Backup Required	12 Hours – Sec. 24.5.2.5.5.2	12 Hours – Sec. 9.6.12.2
Signal Strength & Area Coverage Required	-95 dBm – Sec. 24.5.2.3 90% General – Sec. 24.5.2.2.1 99% Critical – Sec. 24.5.2.2.2	DAQ 3.0 - Sec. 9.6.8 90% General - Sec. 9.6.7.5 99% Critical - Sec. 9.6.7.4
Monitoring By Fire Alarm Required	Yes – Sec. 24.5.2.6	Yes – Sec. 9.6.13
Cabinets for Equipment & Battery Backup Required	Yes, NEMA 4/NEMA 4X – Sec. 24.5.2.5.2	Yes, NEMA 4/NEMA 4X – Sec. 9.6.11.2
Monitor Antenna Malfunction Required	Yes, Donor Antenna – Sec. 24.5.2.6(2)(a)	Yes, Donor Antenna – Sec. 9.6.13.1(2)(a)
System Acceptance/Testing	Section 24.5.2.1.2	Section 9.6.4, 11.3.9 & 11.3.9.1

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System Monitoring 2013 NFPA 72

24.5.2.6 System Monitoring.

24.5.2.6.1 Fire Alarm System. The public safety radio communications enhancement system shall include automatic supervisory and trouble signals for malfunctions of the signal booster(s) and power supply(ies) that are annunciated by the fire alarm system and comply with the following:

(1) The integrity of the circuit monitoring signal booster(s) and power supply(ies) shall comply with 10.6.9 and Section 12.6.
(2) System and signal booster supervisory signals shall include the following:
   (a) Antenna malfunction
   (b) Signal booster failure
   (c) Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted.
(3) Power supply signals shall include the following for each signal booster:
   (a) Loss of normal ac power
   (b) Failure of battery charger

24.5.2.6.2[a] Dedicated Panel. A dedicated monitoring panel shall be provided within the fire command center to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

(1) Normal ac power
(2) Signal booster trouble
(3) Loss of normal ac power
(4) Failure of battery charger
(5) Low-battery capacity

A.24.5.2.6.2 Due to the longer backup-battery requirement for the public safety radio communications enhancement system, it is recognized that the fire alarm system might not be available to provide monitoring of radio system signals, including low-battery signals. Therefore, redundant status annunciation is required to provide local signals to the incident commander or his/her designee at the fire command center.

System Monitoring 2016 NFPA 1221

9.6.13 System Monitoring.

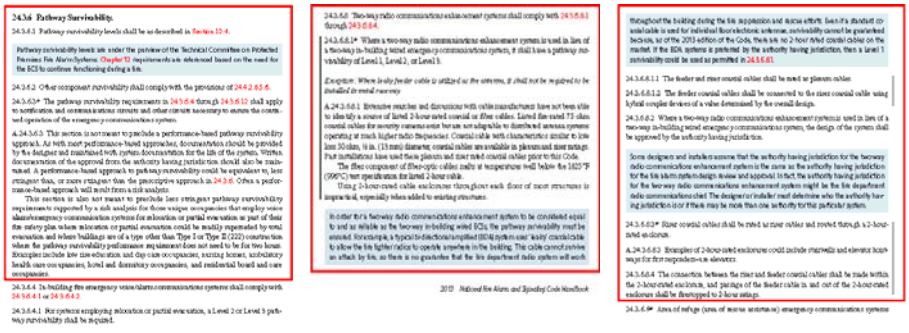
9.6.13.1 Fire Alarm System. The system shall include automatic supervisory signals for malfunctions of the two-way radio communications enhancement systems that are annunciated by the fire alarm system in accordance with *NFPA 72*, and shall comply with the following:

(1) Monitoring for integrity of the system shall comply with *NFPA 72*, Chapter 10.
(2) System supervisory signals shall include the following:
   (a) Donor antenna malfunction
   (b) Active RF emitting device failure
   (c) Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted
   (d) System component failure
(3) Power supply supervisory signals shall include the following for each RF emitting device and system component:
   (a) Loss of normal ac power
   (b) Failure of battery charger
(4) The communications link between the fire alarm system and the two-way radio communications enhancement system must be monitored for integrity.

9.6.13.2 Dedicated Panel.

(1) A dedicated monitoring panel shall be provided within the fire command center to annunciate the status of all RF emitting devices and system component locations. The monitoring panel shall provide visual and labeled indications of the following for each system component and RF emitting device:
   (a) Normal ac power
   (b) Loss of normal ac power
   (c) Battery charger failure
   (d) Low battery capacity (to 70 percent depletion)
   (e) Donor antenna malfunction
   (f) Active RF emitting device malfunction
   (g) System component malfunction
(2) The communications link between the dedicated monitoring panel and the two-way radio communications enhancement system must be monitored for integrity.

Pathway Survivability



24.3.6 Pathway Survivability.

24.3.6.1 Pathway survivability levels shall be as described in Section 12.4.

Pathway survivability levels are under the purview of the Technical Committee on Protected Premises Fire Alarm Systems. Chapter 12 requirements are referenced based on the need for the ECS to continue functioning during a fire.

24.3.6.2 Other component survivability shall comply with the provisions of 24.4.2.6.5.6.

24.3.6.3* The pathway survivability requirements in 24.3.6.4 through 24.3.6.12 shall apply to notification and communications circuits and other circuits necessary to ensure the continued operation of the emergency communications system.

A.24.3.6.3 This section is not meant to preclude a performance-based pathway survivability approach. As with most performance-based approaches, documentation should be provided by the designer and maintained with system documentation for the life of the system. Written documentation of the approval from the authority having jurisdiction should also be maintained. A performance-based approach to pathway survivability could be equivalent to, less stringent than, or more stringent than the prescriptive approach in 24.3.6. Often a performance-based approach will result from a risk analysis.

This section is also not meant to preclude less stringent pathway survivability requirements supported by a risk analysis for those unique occupancies that employ voice alarm emergency communication systems for relocation or partial evacuation as part of their fire safety plan where relocation or partial evacuation could be readily superseded by total evacuation and where buildings are of a type other than Type I or Type II (222) construction where the pathway survivability performance requirement does not need to be for two hours. Examples include low risk education and day-care occupancies, nursing homes, ambulatory health care occupancies, hotel and dormitory occupancies, and residential board and care occupancies.

24.3.6.4 In building fire emergency voice/alarm communications systems shall comply with 24.3.6.4.1 or 24.3.6.4.2.

24.3.6.4.1 For systems employing relocation or partial evacuation, a Level 2 or Level 3 pathway survivability shall be required.

24.3.6.5 Two-way radio communications enhancement systems shall comply with 24.3.6.6.1 through 24.3.6.6.4.

24.3.6.6.1* Where a two-way radio communications enhancement system is used in lieu of a two-way in-building wired emergency communications system, it shall have a pathway survivability of Level 1, Level 2, or Level 3.

Exception: Where leaky feeder cable is utilized as the antenna, it shall not be required to be installed in metal raceway.

A.24.3.6.6.1 Extensive searches and discussions with cable manufacturers have not been able to identify a source of listed 2-hour-rated coaxial or fiber cables. Listed fire-rated 75-ohm coaxial cables for security camera use are not adaptable to distributed antenna systems operating at much higher radio frequencies. Coaxial cable with characteristics similar to low loss 50-ohm, ½ in. (13 mm) diameter, coaxial cables are available in plenum and riser ratings. Past installations have used these plenum and riser rated coaxial cables prior to this Code.

The fiber component of fiber-optic cables melts at temperatures well below the 1825°F (996°C) test specification for listed 2-hour cable.

Using 2-hour-rated cable enclosures throughout each floor of most structures is impractical, especially when added to existing structures.

In order for a two-way radio communications enhancement system to be considered equal to and as reliable as the two-way in-building wired ECS, the pathway survivability must be ensured. For example, a typical bi-directional amplified (BDA) system uses leaky coaxial cable to allow the fire fighter/radio to operate anywhere in the building. The cable cannot survive an attack by fire, so there is no guarantee that the fire department radio system will work throughout the building during the fire suppression and rescue efforts. Even if a standard coaxial cable is used for individual floor/electronic antennas, survivability cannot be guaranteed because, as of the 2015 edition of the Code, there are no 2-hour-rated coaxial cables on the market. If the BDA system is protected by the authority having jurisdiction, then a Level 1 survivability could be used as permitted in 24.3.6.6.1.

24.3.6.6.1.1 The feeder and riser coaxial cables shall be rated as plenum cables.

24.3.6.6.1.2 The feeder coaxial cables shall be connected to the riser coaxial cable using hybrid coupler devices of a value determined by the overall design.

24.3.6.6.2 Where a two-way radio communications enhancement system is used in lieu of a two-way in-building wired emergency communications system, the design of the system shall be approved by the authority having jurisdiction.

Some designers and installers assume that the authority having jurisdiction for the two-way radio communications enhancement system is the same as the authority having jurisdiction for the fire alarm system design review and approval. In fact, the authority having jurisdiction for the two-way radio communications enhancement system might be the fire department radio communications chief. The designer/installer must determine who the authority having jurisdiction is or if there may be more than one authority for the particular system.

24.3.6.6.3* Riser coaxial cables shall be rated as riser cables and routed through a 2-hour-rated enclosure.

A.24.3.6.6.3 Examples of 2-hour-rated enclosures could include stairwells and elevator hoistways for fire-responders use elevators.

24.3.6.6.4 The connection between the riser and feeder coaxial cables shall be made within the 2-hour-rated enclosure, and passage of the feeder cable in and out of the 2-hour-rated enclosure shall be firestopped to 2-hour ratings.

24.3.6.6* Areas of refuge (area of rescue assistance) emergency communications systems

2013 National Fire Alarm and Signaling Code Handbook

2013 NFPA 72

2013 NFPA 72 – RES Testing

14.4.10.6* Annual Tests. Where a public safety radio enhancement system is required, it shall be the building owner's responsibility to have all live components of the system, such as signal boosters, newer supplies, and backup batteries tested at a minimum of once every 12 months. The authority having jurisdiction shall be notified in advance and shall direct annual test procedures and requirements.

A.14.4.10.6 Typically, annual tests require several items to be checked. Annual tests should include all procedures encompassed in 14.4.10.1 through 14.4.10.4. Signal boosters should be tested to ensure that the gain is the same as it was upon initial installation and acceptance. Backup batteries and power supplies should be tested under load for a period of 1 hour to verify that they will properly operate during an actual power outage. Other active components are typically checked to determine that they are operating within the manufacturer's specifications for the intended purpose.

What is involved

- Understand the requirements
  - Meet with AHJ's: Code and Guidelines
  - Initial Signal Strength Testing
  - Control Channel – Number of Channels
  - Tower – Donor Sites – Distance
- Understand the building construction
  - Types of wall, floor and roof
  - Understanding critical and non critical coverage areas

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Grid Sheet

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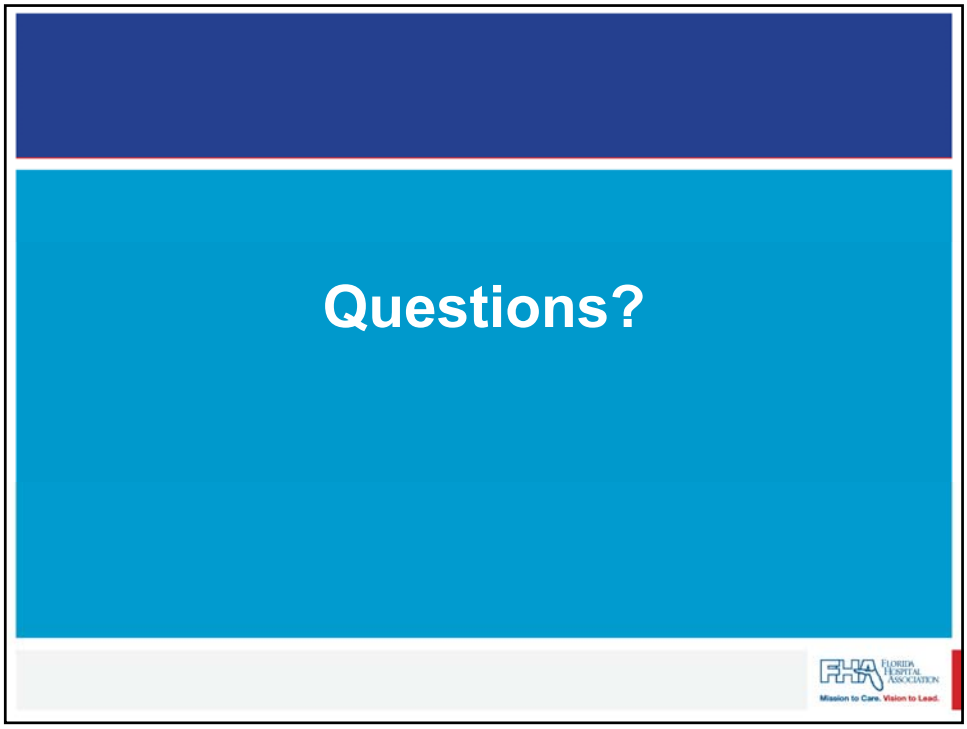
The BDA Process

- Find a qualified contractor to start the process.
- Preliminary survey is required to determine signal strength requirements.
  - If survey is a pass, no further action required.
  - If survey is a fail, the process for installation officially begins.
- Plans are to be submitted to the AHJ for approval.
  - Plan approved permit is issued.
- With approved permit work can commence.
- Call in for appropriate inspections.
- When all inspections pass and all appropriate documents given to the AHJ, permit is closed.

Thank you Florida Hospital Association for the opportunity to inform you of this critical life safety requirement.



EM Education

- **July 31 – August 1** - **Certified Healthcare Emergency Professional (CHEP) Preparation Course and Certification Exam**
  - Details and Registration at: http://www.fha.org/education-and-events/event-details.aspx?itemId=744
- **September 12 – Hospital Incident Command System (HICS, Ver. V)**
  - Details and registration at: http://www.fha.org/education-and-events/event-details.aspx?itemId=844

Webinar Evaluation

- We would appreciate your feedback!!
- Web participants can stay logged in as the webinar closes to be redirected to the online survey (the link will also be provided in a follow up email).

Thank you!

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