

BORA ERCES Guidelines

Broward County Board of Rules and Appeals

Emergency Responder Communications Enhancement Systems (ERCES)



FBC Seventh Edition (2020)
Effective December 31, 2020

Revised 2021-10-14

Broward County Board of Rules and Appeals
Emergency Responder Communications Enhancement Systems (ERCES)
Guidelines

<u>Table of Contents</u>		<u>Pages</u>
Section 1.	Overview	2-7
Section 2.	Recommended Check Lists for AHJ's: NFPA 72 (2016), NFPA 1221 (2016)	8-24
Section 3.	FAQ's	25-32

Broward County Board of Rules and Appeals
Emergency Responder Communications Enhancement Systems (ERCES)
Guidelines

Section 1. Overview

Table of Contents

<u>Section</u>	<u>Page</u>
1 Title page, Table of Contents	2
1.1 Purpose	3
1.2 Background	4
1.3 Codes and Requirements for Broward County	5
1.4 Authorities Having Jurisdiction (AHJ)	6
1.5 Design	7
1.6 Installation	7
1.7 Permitting	7
1.8 Inspections	7
1.9 Final Acceptance	7

1.1 Purpose

An “Emergency Responder Communications Enhancement System” (ERCES) gives fire departments and law enforcement a reliable in-building communication system without detrimentally impacting the surrounding community’s Public Radio Communication Systems.

The purpose of these guidelines is to provide the designers, manufacturers, installers, inspectors, and FCC License Holders the tools to properly design, permit, install, and inspect a fully functional in-building communication enhancement system that meets the state and local codes for Broward County, Florida.

These are guidelines only and are not intended to be code items.

1.2 Background

Each municipality has an “Emergency Responder Communications System” for use by the fire department and law enforcement. These two-way radio systems generally work in open spaces without problems. However, these two-way radio systems do not always work inside buildings. Most buildings now require a signal repeater system located in the building to amplify the radio signal to allow the two-way radio system to work.

When these systems are not properly designed, installed, inspected, and maintained, then major communication problems can occur inside and outside of the building. One faulty system may take down the Public Safety Radio Communication System in a large part of a municipality. This faulty system would prohibit the fire department and law enforcement from communicating through their two-way radio system.

In 2015, BDA Systems installed in high rise buildings in the cities of Aventura and Hallandale Beach caused significant interference with the Broward County’s Public Safety Radio System. The Hallandale Beach System was improperly adjusted after the inspections were completed. Once the problems were identified, the building systems were immediately taken off-line, repaired, and re-inspected. The Broward County Administrator then asked Broward County Board of Rules and Appeals (BORA) to investigate the problems associated with the faulty installation and to review the existing codes and procedures to attempt to prevent this problem from occurring again.

BORA started up a temporary committee to address these problems. The committee found the following:

1. The state and local codes, Florida Building Codes (FBC), Florida Fire Prevention Code (FFPC), and NFPA 72, if followed, were sufficient and did not require any changes.
2. The problem was a procedural one. All three (3) codes required that the installation shall be permitted and the AHJ’s be notified. A new code section was added to the Florida Building Code (FBC), Broward County Edition, Chapter 1. This new section 118 set forth procedures requiring AHJ notification, among other requirements.

1.3 Codes and Requirements for Broward County

As of December 31, 2020, the following codes are in effect:

Florida Statute (FS)633.202(1)

Adopts the FFPC

Florida Statute (FS)633.202(18)

This statute pertains to high-rise buildings. (Subject to change)

**Florida Building Code (FBC), Seventh Edition (2020)
Broward County Edition, Chapter 1,**

Section 118 Two-Way Radio Communication Enhanced Public Safety Signal
Booster Systems

Florida Fire Prevention Code (FFPC) Seventh Edition (2020)

NFPA 1 Fire Code (2018)

Section 1.4 Equivalencies, alternatives, and modifications

Chapter 2 Referenced Publications

NFPA 70, NFPA 72 (2016), NFPA 780 (2017), NFPA 1221 (2016)

Section 11.10 Two-Way Radio Communication Enhancement System

NFPA 70 (NEC) (2017)

Section 90.7 Examination of equipment

Article 100 Definitions

Section 110.2 Approval (UL, etc.)

Section 100.2(B) Approval (UL, etc.)

Article 800 Communications circuits

Article 810 Radio and television equipment

Article 820 Community Antenna Television and Radio Distribution Systems

NFPA 72 (Fire Alarm) (2016)

**NFPA 1221 (2016) Standard for the Installation, Maintenance, and Use of Emergency
Services Communications Systems**

1.4 Authorities Having Jurisdiction (AHJ)

The AHJ is defined as: “An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure”.

In Broward County, Florida, the AHJ's are as follows for the installation of Two-Way Radio Communications Enhancing Systems:

1. Local Municipalities
 - A. Building AHJ (FBC)
 - B. Electrical AHJ (NFPA 70)
 - C. Fire Official AHJ (NFPA 72, NFPA 1221)
2. Broward County Elevator Inspection AHJ (if applicable)
FBC-30, FS 399, FAC 61C-5, ASME A17-1
3. FCC License Holder
 - A. Broward County Regional Emergency Services and Communication (RESC)
 - B. Fort Lauderdale
 - C. Coral Springs
 - D. Plantation

Note: Work shall not start on any project until a permit has been issued and signed by each of the AHJ's:

Building, Electrical, Fire, Elevator (if applicable), FCC License Holder(s)

The system shall not be energized (including testing) until written authorization is obtained by the:

FCC License Holder(s) (FBC, Broward County Edition, 118.4)

A building certificate of completion, or occupancy shall not be issued until the permit work is completed and signed off by each of the AHJ's:

(FBC, Broward County Edition, 118.1.4)

1.5 Design

The Emergency Responder Communications Enhancement System shall be designed by a Professional Engineer, licensed in the State of Florida. The Professional Engineer shall be available for Plan Review and Inspections if requested by the AHJ.

The FBC, Broward County Edition, Section 118 requires that the Professional Engineer have training and experience in Electrical Engineering.

Heat map drawings shall be prepared by the Professional Engineer or a Radio Frequency System Designer under the direct supervision of the Professional Engineer. Heat map drawings shall be prepared by a designer certified by the heat map software company. The drawings shall include the designer's name, certification level, the name of the heat map software company, software app name, and software app version.

1.6 Installation

The installation shall be completed by a qualified contractor. Contracting shall be in compliance with the State of Florida Electrical Contractor's Licensing Board (ECLB).

Only a licensed Electrical Contractor (EC), Fire Alarm Contractor (FAC), or BDA Contractor (BDAC) can contract to install a system. A systems integrator, which is not a licensed contractor, cannot contract for the installation. (FAC 61G6)

1.7 Permitting

Record drawings, signed and sealed by a qualified Professional Engineer, shall be submitted to each AHJ for plan review and approval. The FCC AHJ (License Holder) shall provide a written acceptance prior to the review by the other AHJ's. The drawings shall be approved by all AHJ's prior to the start of any work.

Refer to the applicable Code Compliance Plan Review Checklist for the requirements of each AHJ.

1.8 Inspections

The contractor shall coordinate all inspections as required by the AHJ's.

Note: Never energize the system for any reason without first passing the FCC AHJ initial inspection. Refer to the applicable Code Compliance Inspection Checklist for the requirements of each AHJ.

1.9 Final Acceptance

A Certificate of Occupancy or a Certificate of Completion for a building shall not be given until the Emergency Responder Communications Enhancement System is approved by the Authority Having Jurisdiction. (Building, Electric, Fire, Elevator (where applicable), and FCC License Holder) (FBC, Broward County Edition, 118.1.4)

Broward County Board of Rules and Appeals

Emergency Responder Communications Enhancement Systems (ERCES)

Guidelines

Section 2. Recommended Checklists

Table of Contents

<u>Section</u>	<u>Item</u>	<u>Page</u>
	Title page, Table of Contents	8
2.1.1	Plan Review Fire	9
2.1.2	Plan Review Electrical	11
2.1.3	Plan Review Elevator	12
2.1.4	Plan Review Building (Structural)	13
2.1.5	Plan Review FCC AHJ (License Holder)	14
2.2.1	Inspections Fire	17
2.2.2	Inspections Electrical	20
2.2.3	Inspections Elevator	21
2.2.4	Inspections Building (Structural)	22
2.2.5	Inspections FCC AHJ (License Holder)	23

2.1.1 Plan Review - Fire

Plans shall include the following information:

- 1. Building owner and address
- 2. Written sequence of operation
- 3. Signature and seal of the Engineer of Record with experience and training in electrical engineering.
The name, PE number, business name, CA number, address, and contact information shall be shown on the plans. The AHJ may require that the Engineer of Record provide evidence of experience and training in Electrical Engineering. (NFPA 72-10.5)
- 4. Applicable codes and edition dates (NFPA 72 (2016))(NFPA 1221 (2016))
- 5. Building description showing building construction, building occupancy, total square footage, number of floors, total height of building (NFPA 1-1.7.12) (NFPA 72-7.4)
- 6. Floor plans showing device locations, fire-rated enclosures, conduit runs, and propagation modeling, etc. (NFPA 1) (NFPA 1-1.7.12) (NFPA 72-7.4)
- 7. Riser plans for systems (NFPA 1-1.7.12) (NFPA 72-7.4)
- 8. Specifications with manufacturer's parts numbers (NFPA 1-1.7.12) (NFPA 72-7.4)
- 9. Firewall penetration details, etc. (NFPA 1-12.7.5.1, NFPA 1-1.7.12) (NFPA 72-7.4)
- 10. Identify the panel and circuit breaker; show panel location on plan. (NFPA 1-1.7.12) (NFPA 72-7.4)
- 11. Show circuit breaker lock. (NFPA 1-1.7.12) (NFPA 72-10.6.5.4)
- 12. The BDA enclosure shall be painted red and a sign shall show permit number, vendor name, and telephone number. (FBC BC 118.2.1.8) Provide an information binder stored next to the BDA. Information shall include: (NFPA 72-7.5)
 - (1) As-built drawings
 - (2) Manufacturer's data sheets and specs
 - (3) Heat maps with the final signal strength readings
 - (4) Final signal strength measurements (dB)
 - (5) Maintenance contract
 - (6) Broward County RESC, FCC AHJ (License Holder), all other approvals, and elevator variance letter, if applicable.
 - (7) Maintenance repair log, expiration date, maintenance provider
- 13. Pathway survivability level shall be 1, 2, or 3. (NFPA 1221-5.10)
All conductors shall be installed in raceways. (NFPA 1221-5)
- 14. The feeder and riser coaxial cables shall be rated as plenum cable (feeder cables shall be installed in an enclosure) that matches the building's fire rating and pathway survivability.
(NFPA 1221-9.6.2.1.1.1, NFPA-1.4) Riser cables shall be installed in a 2-hour-rated enclosure (NFPA 1221-9.6.2.1.3).
- 15. Feeder cables installed in raceways per Pathway Survivability Level 1 do not have to be in a rated enclosure. (NFPA 1221, TIA 16.2, NFPA-1.4)
- 16. Radio coverage shall be a minimum of 99% in critical areas, such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ and 90% in general building areas. (NFPA 1221-9.6.7)
- 17. Inbound signal level shall be sufficient to provide a minimum of DAQ 3.0 (3.4). (NFPA 1221-9.6.8.1*)
Outbound signal level shall be sufficient to provide a minimum of DAQ 3.0. (NFPA 1221-9.6.8.2)
- 18. Donor antenna isolation shall be a minimum of 20 dB above the inside antennas. (NFPA 1221-9.6.9)
- 19. System radio frequencies; system shall be capable of transmitting all public safety radio frequencies assigned to the FCC AHJ and be capable of using any modulation technology. (NFPA 1221-9.6.10.1)
- 20. Frequency changes. System shall be capable of upgrading. (NFPA 1221-9.6.10.2)

2.1.1 Plan Review - Fire (cont.)

- 21. System Components: Components shall be approved and compatible with the Public Safety Radio System. System shall be approved by the FCC License Holder. (NFPA 1221-9.6.11) (NFPA-1.1.4)
- 22. All repeaters, transmitter receptacles, signal booster components and battery system components shall be in a NEMA 4, 4X enclosure. (NFPA 1221-9.6.11.2) (NFPA 1-1.4) Exception: batteries may be installed in a NEMA 3R enclosure when the system is UL2524 listed.
- 23. Power supplies shall have at least two independent sources. (NFPA 1221-9.6.12)
- 24. The primary power source shall be supplied from a dedicated circuit and shall comply with NFPA 72. (NFPA 1221-9.6.12.1)
- 25. The secondary power source shall consist of one of the following (NFPA 1221-9.6.12.2):
 - (1) Battery with at least 12 hours of operation at 100%
 - (2) Battery with at least 24 hours of operation at 100%
 - Legally required generator with at least 12 hours of operation at 100%
- 26. System Monitoring: The fire alarm system shall monitor the following items as a minimum (NFPA 1221-9.6.13.1):
 - (1) Monitoring for integrity of the system shall comply with NFPA 72-10
 - (2a) Donor antenna malfunction
 - (2b) Active RF emitting device failure (70%)
 - (2c) Low battery capacity indicator
 - (2d) System component failure
 - (3a) Loss of normal AC power
 - (3b) Failure of battery charger
 - (4) Communication link between the Dedicated Monitoring Panel and the BDA shall be monitored for integrity.
- 27. Dedicated Panel (annunciator panel) shall show (NFPA 1221-9.6.13.2):
 - (1a) Normal AC power
 - (1b) Loss of normal power
 - (1c) Battery charger failure
 - (1d) Low battery capacity
 - (1e) Donor antenna malfunction
 - (1f) Active RF emitting device malfunction
 - (1g) System component malfunction
 - (2) Communication link between the Dedicated Monitoring Panel and the BDA shall be monitored for integrity.
- 28. Technical Criteria (NFPA 1221-9.6.14)
 - (1) Frequencies required
 - (2) Location and effective radiated power (ERP) of the FCC AHJ radio site
 - (3) Maximum propagation delay less than 30 micro-seconds
 - (4) List of specifically approved system components
 - (5) Other support technical information (Battery calculations)(NFPA 72-10.6.7.2.1)
- 29. Elevator hoistways and the elevator cabs shall be deemed critical areas.(FBC BC 118.2.1.9)
- 30. Systems shall have lightning protection. See FAQ 2021-05 for interpretation (NFPA 1221-9.6.3).

Note: This checklist is a minimum checklist. Coordinate with the local Fire AHJ for additional checklist items.

2.1.2 Plan Review - Electrical

Plans shall include the following information:

- 1. Building owner and address
- 2. N/A
- 3. Signature and seal of the Engineer of Record with experience and training in electrical engineering. The name, PE number, business name, CA number, address, and contact information shall be shown on the plans. (FBC BC 118.1.4) (61G15-30.003(2))
- 4. Applicable codes and edition dates (61G15-30.003(1b))
- 5. Building description showing building construction, building occupancy, total square footage, number of floors, total height of building (FAC 61G15)
- 6. Floor plans showing device locations, fire-rated enclosures, conduit runs, and propagation modeling, etc. (FBC BC 118.2.1.4)
- 7. Riser plans for systems (FAC 61G15)
- 8. Specifications with manufacturer's parts numbers and installation information (FAC 61G15-33)
- 9. Details, including firewall penetration, etc. (FAC 61G15) (NFPA 70 820-26)
- 10. Grounding and mounting details for antenna, mast, surge protection, BDA, power supply, battery enclosure, etc. (FAC 61G15) (NFPA 70-800,810, 820) See FAQ 2021-05 for interpretation.
- 11. Show how the system components are wired to power (120V). (NFPA 70-110.2(B))
Identify the Panel ID, Circuit ID, circuit breaker size, and wire size.
- 12. Circuit shall have an isolated ground, if required by the manufacturer. (NFPA 70)
- 13. Listing and labeling requirements (NFPA 70-110.2)
- 14. Identify minimum conduit sizes and minimum conduit 90-degree bend radiuses. (NFPA 70-110.3)
- 15. System equipment shall be installed in an air-conditioned and mechanically ventilated room where the manufacturer's installation document requires a temperature limitation and/or ventilation. (NFPA 70-110.3)

Note: This checklist is a minimum checklist. Coordinate with the local Electrical AHJ for additional checklist items.

2.1.3 Plan Review - Elevator

Plans shall include the following information:

Elevator hoistways and elevator cabs shall be deemed critical areas, as per FBC BC 118.2.1.9.. A variance shall be obtained from the Broward County Elevator Inspection Services Section at Permitting prior to any work inside an elevator hoistway or elevator machine room. The variance shall be to install an antenna in the elevator hoistway(s) (ASME A17.1) (NFPA 1221-9.6.7.4) (FBC BC 118.2.1,9).

Note: The elevator code does not allow the elevator shaft to be used for coaxial cable risers. A variance is required. (ASME A17.1.2.8.1)

Note: This checklist is a minimum checklist. Coordinate with the local Elevator AHJ for additional checklist items.

2.1.4 Plan Review – Building (Structural)

- 1. Structural design calculations for antenna mast (if applicable, FBC BC 107.3.5)
- 2. Attachment and roof penetration details on plan for antenna mast (if applicable, FBC BC 107.3.5)
- 3. Floor plans showing fire-rated enclosures for cables and BDA room, including fire-rated UL designs (if applicable, FBC BC 107.3.5)
- 4. Riser plans showing fire-rated enclosure for cable, including fire-rated UL designs (if applicable, FBC BC 107.3.5)
- 5. Firewall penetrations, including UL designs (if applicable, FBC BC 107.3.5)

Note: This checklist is a minimum checklist. Coordinate with the local AHJ for additional checklist items.

2.1.5 Plan Review – FCC AHJ (License Holder)

For all installations in Broward County, the plans shall be approved by the Broward County FCC License Holder:

Broward County
Regional Emergency Services and Communications
Communications and Technology Division
1801 NW 64th St., Ste. 106A
Fort Lauderdale, FL 33309

Note: All systems shall be FCC registered through the Broward County RESC-CTD office as the FCC AHJ.

Contact Information:

Jose M. De Zayas
954-357-8012 (O)
954-790-8410 (C)
RESC-CTD-Radio@Broward.org (E)

For installations in the following cities, the plans shall also be approved by the local FCC License Holder:

1. Coral Springs

Communication Technical Coordinator
Coral Springs Police Department

Contact Information:

Thomas Ciampi
TCiampi@CoralSprings.org

2. Fort Lauderdale

Communication Shop
1301 SW 2nd Ct., Building 5
Fort Lauderdale FL

Contact Information:

Bobby Brown
Telecommunications Coordinator
Sustainability Department
954-828-5554 (O)
BOBrown@FortLauderdale.gov (E)

3. Plantation:

Barry Stearns
Fire Department
954-797-2150 (O)
BStearns@PSD.Plantation.org (E)

2.1.5 Plan Review – FCC AHJ (License Holder) (cont.)

Plans shall include the following information:

- 1. Building owner and address, all plans shall be signed and sealed by an engineer. (FBC BC 118.2)
- 2. Building description showing building construction, building occupancy, total square footage, number of floors, total height of building
- 3. Applicable codes and edition dates
- 4. Floor plans showing device locations, fire-rated enclosures, conduit runs, and propagation modeling, etc. Propagation (heat) map drawings shall include the following (FBC BC 118.2.1.4):
 - Indoor Prediction Legend
 - Pictogram Legend
 - Calculations Legend
 - Number of Channels
 - Predictive propagation shown on floor plans
 - Name of certified designer and company
 - Materials Legend
 - Cables Legend
 - Frequencies or frequency bands for the Public Radio System(s)
- 5. Riser plans for systems
- 6. Specifications with manufacturer's parts numbers
- 7. Manufacturer's specifications for equipment; include equipment temperature limits.
- 8. Grounding and mounting details for antenna, mast, surge protector, BDA, power supply, battery enclosure. (IEEE 1692, TIA 569, TIA 607)
- 9. Notes on plans shall state:

"The system shall never be energized for testing or operation until written, or on site, approval is obtained from all applicable FCC License Holders."
- 10. Inbound signal level shall be sufficient to provide a minimum of DAQ 3.0 (3.4). (NFPA 1221-9.6.8.1*)
Outbound signal level shall be sufficient to provide a minimum of DAQ 3.0. (NFPA 1221-9.6.8.2)
- 11. Isolation shall be a minimum of 20 dB above the (maximum) signal booster gain under all operating conditions.
- 12. System radio frequencies: system shall be capable of transmitting (transporting) all public safety radio frequencies used by the FCC AHJ (License Holder) and be capable of using any modulation technology.
- 13. Frequency changes. System shall be capable of upgrading.

2.1.5 Plan Review - FCC AHJ (License Holder) (cont.)

- 14. System Components: Components shall be approved and compatible with the Public Safety Radio System.
Show the propagation delay.
Signal Boosters shall have FCC Certification. Power supplies shall have at least two independent supplies. Battery shall provide twelve (12) hour minimum operational run time. (Provide a battery calculation at 100%)
- 15. Technical Criteria
 - (1) Frequencies or frequency bands required
 - (2) Location and effective radiated power (ERP) of the FCC AHJ radio site
 - (3) Maximum propagation delay (30 microseconds)
 - (4) List of specifically approved system components
 - (5) Other supporting technical information
- 16. Other industry standards include IEEE 1692, TIA 569, and TIA 607.

Note: This checklist is a minimum checklist. Coordinate with the local FCC AHJ (License Holder) for additional checklist items.

2.2.1 Inspection - Fire

Final Inspection

Property Information

Property Name: _____ Permit #: _____ Inspection Date: _____

Property Address: _____

Contact Information:

BDA Equipment Provider: _____

BDA Licensed Contractor: _____

Fire Alarm Licensed Contractor: _____

Fire Alarm Monitoring Company: _____

Engineer of Record: _____

- 1. The latest approved record drawings, operation manuals, and maintenance manuals are on the site.
- 2. The following representatives are on the site for the inspection:
 - Fire Inspector
 - Broward County RESC
 - Ft. Lauderdale TeleCom
 - Electrical Inspector
 - BDA equipment provider (systems integrator)
 - BDA Licensed Contractor
 - Fire Alarm Licensed Contractor
 - Engineer of Record, only for re-inspections, if required by the AHJ
 - Building Owner Representative
- 3. Fire Rated Enclosure openings and penetrations are properly sealed. (NFPA-1-12.7.5.1)
- 4. The installation complies with the pathway of survivability as shown on the approved record drawings.
Note: All conductors shall be installed in raceways. (NFPA 1221-5)
- 5. The system components match the approved record drawings for manufacturer and part numbers.
(NFPA 1221-9.6.11.1) (NFPA-1.1.4)
- 6. The BDA enclosure shall be painted red and a sign shall show permit number, vendor name and telephone number. (FBC BC 118.2.1.8)
- 7. Provide an information binder stored next to the BDA. Information shall include:
(NFPA 72-14.6.1.1) (FBC BC 118)
 - (1) As-built drawings
 - (2) Manufacturer's data sheets and specs
 - (3) Heat map
 - (4) Final signal strength measurement (dB)
 - (5) Maintenance contract
 - (6) Broward County RESC, FCC AHJ (License Holders), all other approvals and elevator variance letter, if applicable.
 - (7) Maintenance repair log, expiration date, maintenance provider
- 8. Pathway survivability level shall be 1, 2, or 3. (NFPA 1221-5.10)
All conductors shall be installed in raceways. (NFPA 1221-5)
- 9. The feeder and riser coaxial cables shall be rated as plenum cable (feeder cables shall be installed in an enclosure) that matches the building's fire rating and pathway survivability.
(NFPA 1221-9.6.2.1.1.1, NFPA-1.4) Riser cables shall be installed in a 2-hour-rated enclosure.
(NFPA 1221-9.6.2.1.3)
- 10. Feeder cables installed in raceways per Pathway Survivability Level 1 do not have to be in a rated enclosure. (NFPA 1221, TIA 16.2, NFPA-1.4)

2.2.1 Inspection - Fire (cont.)

- 11. Radio coverage shall be a minimum of 99% in critical areas, such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ and 95% in general building areas. (NFPA 1221-9.3.1.2.1) Elevator hoistways shall be deemed critical areas. (FBC BC 118-2.1.9)
- 12. Inbound signal level shall be sufficient to provide a minimum of DAQ 3.0. (NFPA 1221-9.6.8.1)
Outbound signal level shall be sufficient to provide a minimum of DAQ 3.0. (NFPA 1221-9.6.8.2)
- 13. Isolation shall be a minimum of 20 dB above the signal booster gain under all operating conditions. (NFPA 1221-9.6.9)
- 14. System radio frequencies: system shall be capable of transmitting all public safety radio frequencies assigned to the FCC AHJ (License Holder). (NFPA 1221-9.6.10.1) (FBC Broward Edition 2017-118)
- 15. Frequency changes: System shall be capable of upgrading. (NFPA 1221-9.6.10.2)
- 16. System Components: Components shall be approved and compatible with the Public Safety Radio System. (NFPA 1221-9.6.11)
- 17. All repeaters, transmitter receptacles, signal booster components and battery system components shall be in a NEMA 4, 4X enclosure. (NFPA 1221-9.6.11.2) (NFPA 1-1.4) Exception: batteries may be installed in a NEMA 3R enclosure when the system is UL2524 listed.
- 18. Power supplies shall have at least two independent sources. (NFPA 1221-9.6.12)
- 19. The primary power source shall be supplied from a dedicated circuit and shall comply with NFPA 72. (NFPA 1221-9.6.12.1)
- 20. The secondary power source shall consist of one of the following (NFPA 1221-9.6.12.2):
 - (1) Battery with at least 12 hours of operation at 100%
 - (2) Battery with at least 24 hours of operation at 100%
 - Legally required generator with at least 12 hours of operation at 100%
- 21. System Monitoring: The fire alarm system shall monitor the following items as a minimum (NFPA 1221-9.6.13.1):
 - (1) Monitoring for integrity of the system shall comply with NFPA 72-10
 - (2a) Donor antenna malfunction
 - (2b) Active RF emitting device failure
 - (2c) Low battery capacity indicator
 - (2d) System component failure
 - (3a) Loss of normal AC power
 - (3b) Failure of battery charger
 - (4) Communication link between the FACP and the BDA shall be monitored for integrity.
- 22. Dedicated Panel (annunciator panel) shall show (Auto-notification within 3 minutes, 20 seconds) (NFPA 1221-9.6.13.2):
 - (1a) Normal AC power
 - (1b) Loss of normal AC power
 - (1c) Battery charger failure
 - (1d) Low battery capacity
 - (1e) Donor antenna malfunction
 - (1f) Active RF emitting device malfunction
 - (1g) System component malfunction
 - (2) Communication link between the FACP and the BDA shall be monitored for3 integrity.

2.2.1 Inspection - Fire (cont.)

- 23. Signage is provided to locate the BDA.
Fire Department signal booster permit number, service provider, expiration date, and contact telephone numbers are shown. (FBC 118.2.1.8) (NFPA 72-10.18.3.2)
- 24. Completed NFPA documentation specific to this system is provided. [NFPA 72-7.8.2; figure 7.8.2(a) and (b)]
- 25. Documentation is provided showing that a maintenance and service agreement has been entered into between the property owner and the provider of the BDA System.
(NFPA 72-14.4.10.1) (NFPA 72-14.4.10.6) (NFPA 72-14.6.1.1)
- 26. DAQ, Delivered Audio Quality, for the system is a minimum of DAQ 3.0. Include all floors, critical areas, elevator cabs, and general building areas. (NFPA 1221-9.6.7.3)
- 27. Where required by the manufacturer, the power receptacle shall be an isolated ground type receptacle and shall be connected to an isolated ground. (NFPA 1221-5.8.2)
- 28. Systems shall have lightning protection (NFPA 1221-9.6.3). See FAQ 2021-05 for interpretation.

Note: This checklist is a minimum checklist. Coordinate with the local Fire AHJ for additional checklist items.

2.2.2 Inspection - Electrical

- 1. **Rough Electrical Inspection** (FBC BC (2020)-1.110.3(B))
 - Installation of conduits
 - Installation of coaxial cables according to manufacturer's instructions
 - Antenna, mast, cables, etc. shall be grounded and protected (NFPA 70-800, 810, 820)
 - Panels, BDA, and BBU shall be grounded and protected (NFPA 70-800, 810, 820).
 - See FAQ 2021-05 for interpretation.
 - Power connection to the BDA
 - Installation of conduits and equipment in fire-rated enclosures or rooms

- 2. **Final Inspection**
 - All electrical components are in place.
 - Label "BDA" circuit breakers.

Note: This checklist is a minimum checklist. Coordinate with the local Electrical AHJ for additional checklist items.

2.2.3 Inspection - Elevator

- 1. Rough System Inspection**
 - Elevator variance approved.
 - Conduit and cable installed in elevator shafts.

- 2. Final Inspection**
 - Antenna(s) installed in the elevator shaft.

Note: This checklist is a minimum checklist. Coordinate with the local Elevator AHJ for additional checklist items.

2.2.4 Inspection-Building (Structural)

Rough Inspections:

- 1. Inspection for all fire-rated enclosures/penetrations for cables and BDA room (FBC BC 110.3)
 - a. Framing inspection, if applicable
 - b. Drywall inspection, if applicable
- 2. In progress roof penetrations (if applicable, FBC BC 110.3)

Final Inspections:

- 1. Antenna mast installation (FBC BC 110.3)
- 2. Inspection for all fire-rated enclosures/penetrations for cables and BDA room (FBC BC 110.3)
- 3. Roof final (if applicable, FBC BC 110.3)

Note: This checklist is a minimum checklist. Coordinate with the local AHJ for additional checklist items.

2.2.5 Inspection - FCC AHJ (License Holder)

1. Initial Inspection

- 1. The system shall never be energized for testing or operation until written, or onsite approval is obtained from the FCC AHJ (License Holders).
(FBC BC 1.118.4.2.2)
- 2. Prior to the initial inspection, a letter from the Engineer of Record stating that the installation is complete and ready to be energized for testing shall be received by the FCC AHJ (License Holders). The system settings and pictures of the installed major components shall also be provided to the FCC AHJ (License Holders). (FBC BC – 1.118.4.2.1)

The following components shall be included in the letter and pictures:

- (1) BDA with information
Permit Number; Serviced by _____; Telephone _____
- (2) Enclosures with battery charger and batteries installed, wired with a label showing the battery installation date.
- (3) All equipment shall be properly grounded per TIA 607 and Motorola R56 Standards.
- (4) Antenna mast shall be grounded and protected by to the NFPA 780 Lightning Protection System.
- (5) Antenna shall have surge protection installed and wired.
- 3. The contractor shall coordinate the inspection with all responsible parties.
The following shall be present at a minimum:
 - Owners representative
 - Electrical Contractor
 - Fire Alarm Contractor
 - BDA Vendor representative with analyzer and computer to gain access to the BDA program to check levels and settings.
 - System Engineer of Record, if requested by the AHJ.
 - Electrical AHJ
 - Fire Official AHJ
 - FCC AHJ(s) (License Holders) (There may be more than one.)
- 4. The Initial Inspection shall include the following:
 - (1) The System shall be energized for the first time.
 - (2) Items (1) through (10) in Section 2 above shall be inspected for compliance.
 - (3) Check the noise floor of the BDA transmitter. The noise floor shall not rise more than 1.5 dB at the donor antenna.
 - (4) System Engineer of Record shall attend all inspections, if requested by the AHJ.

2.2.5 Inspection - FCC AHJ (License Holder) (cont.)

2. Final Inspection

This Inspection is a joint effort between the Fire Official and the FCC AHJ (License Holders). Prior to the final inspection, the contractor shall provide to the Fire Official and to the FCC AHJ (License Holders) the following documentation showing that the building is ready for the final inspection.

After passing the initial inspection, the contractor shall submit to the FCC AHJ (License Holder) a Post Heat Map Study to show that all areas are covered per the code. A letter from the Engineer of Record shall state that the System is completed, fully operational, and ready for the final inspection.

The contractor shall coordinate the inspection with all responsible parties. The following shall be present at a minimum:

- Owners' representative
- Electrical Contractor
- Fire Alarm Contractor
- BDA Vendor representative with analyzer and computer to gain access to the BDA program to check levels and settings.
- System Engineer of Record, if requested by the AHJ
- Electrical AHJ
- Fire Official AHJ
- FCC AHJ(s) (License Holders) (There may be more than one.)

Final Inspection:

- (1) Owner shall provide proof of a signed service agreement with the BDA vendor.
- (2) The noise floor of the BDA transmitter shall be rechecked.

Note: This checklist is a minimum checklist. Coordinate with the local FCC License Holder AHJ for additional checklist items.

Broward County Board of Rules and Appeals

Emergency Responder Communications Enhancement Systems (ERCES) Guidelines

Section 3. Frequently Asked Questions (FAQ)

Table of Contents

<u>Section</u>	<u>Item</u>	<u>Page</u>
	Title page, Table of Contents	25
3.1	FAQ 2021-3.1 Cables Inside Buildings	26
3.2	FAQ 2021-3.2 Cables and Flexible Conduit	27
3.3	FAQ 2021-3.3 Cables, Rated	28
3.4	FAQ 2021-3.4 Lightning Protection	29
3.5	FAQ 2021-3.5 Product Compatibility	30
3.6	FAQ 2021-3.6 Testing	32

FAQ 2021-3.1
Cables Inside Buildings

Question: Do the feeder and riser coaxial cables found in NFPA 1221-9.6 (2016), Two Way Radio Communications Enhancement Systems, have to comply with NFPA 1221-5.5 (2016), Wiring Inside Buildings?

Applicable Codes:

NFPA 1221-5.5 Wiring Inside Buildings

NFPA 1221-5.5.2 Where installed in buildings, conductors and fiber-optic cables shall be installed in accordance with NFPA 70 in any one of the following wiring methods:

- (1) Electrical metallic tubing
- (2) Intermediate metal conduit
- (3) Rigid metal conduit
- (4) Surface metal raceways
- (5) Reinforced thermosetting resin conduit (RTRC)

NFPA 1221-5.5.2.1 Rigid polyvinyl chloride conduit shall be permitted where approved by the AHJ.

NFPA 1221-9.6

Discussion:

NFPA 1221-5.5.2 is for all wiring inside buildings.

Answer: The installation of all feeder and riser coaxial cables shall comply with NFPA 1221-5.5 (2016), Wiring Inside Buildings.

FAQ 2021-3.2
Cables and Flexible Conduit

Question: Is flexible conduit allowed for use for riser and feeder cables?
Is an assembly of armored cable with coaxial allowed for use as riser or feeder cables?

Applicable Codes: NFPA 1-1.4
NFPA 1221-1.5
NFPA 1221-5.5

Discussion: NFPA 1221-5.5 does not mention armored cable (AC) or flexible metal conduit (FMC) as approved wiring methods.
NFPA 1.4 and NFPA 1221-1.5 May be used to allow armored cable or flexible metal conduit (FMC).

Answer: The engineer may design a system with armored cable (AC) or flexible metal conduit (FMC). The design is subject to obtaining the approval of the AHJ.

FAQ 2021-3.3

Cables, Rated

Question: NFPA 1221 (2016), Sections 9.6.2.1.1.1, 9.6.2.1.3, and 9.6.2.1.4 appear to be in conflict. TIA 16.2 for NFPA 1221 (2016) tried to resolve this problem. How does one comply?

Applicable Codes:

NFPA 1-1.4

NFPA 1221-1.5

NFPA 1221-9.6.2.1.1,1 The feeder and riser coaxial cables shall be rated as plenum cables that match the building's fire rating and pathway survivability.

NFPA 1221-9.6.2.1.3 Riser coaxial cables shall be rated as riser cables and routed through a 2-hour rated enclosure. [72:24.3.13.8.3]

NFPA 1221-9.6.2.1.4 The connection between the riser and feeder coaxial cables shall be made with an enclosure matching the building's fire rating and pathway survivability, and passage of the feeder cable in and out of the enclosure shall be fire-stopped to the building's fire rating and pathway survivability.

NFPA 1221-9.6.2.1 (2019) The backbone, antenna distribution, radiating, or any fiber-optic cables shall be rated as plenum cables.

NFPA 1221-9.6.2.3 (2019) Backbone cables shall be routed through an enclosure that matches the building's fire rating.

Discussion:

NFPA 1221-9.6.2.1.1.1 and 9.6.2.1.4 were amended by TIA 16.2 to change from a 2-hour-rated enclosure to an enclosure matching the building's fire rating. However, NFPA 9.6.2.1.3 was not changed and still requires a 2-hour-rated enclosure. Where code sections conflict, the more stringent code section applies.

Answer: Riser coaxial cables shall be rated a riser cables and routed through a 2-hour-rated enclosure.

FAQ 2021-3.4
Lightning Protection

Question: What is required to comply with NFPA 1221-9.6.3 (2016), Lightning Protection?

Applicable Codes:

NFPA 1-1.4 Equivalency

NFPA 70-Chapter 8 Communications Systems

NFPA 1221-1.5 Equivalency

NFPA 1221-9.6.3* Systems shall have lightning protection that complies with NFPA 780.

NFPA 780 Standard for the installation of Lightning Protection Systems.

Discussion:

NFPA 780, is for a **complete** system to protect the **entire** structure or building.

Protecting a portion of a structure or building is not addressed and is not allowed by this code. Lightning Protection Systems are designed to protect the building structure, not to protect sensitive electronic equipment.

In Broward County, less than 30% of the buildings have lightning protection. Most of the buildings that have Lightning Protection Systems do not comply with NFPA 780. These Lightning Protection Systems do comply with the accepted standards in the industry: LPI-175/2020, by Lightning Protection Institute (LPI) and/or United Laboratories, Inc. (UL)

When a building is not protected by a Lightning Protection System that complies with NFPA 780, it may not be feasible or possible to add an NFPA 780 Lightning Protection System.

NFPA 1221 (2016) is 5 years old and was adopted by FBC 2020. NFPA 1225 (2022) will come out next year. While the FBC has not adopted the NFPA 1225 (2022), we can use the new codes to help us interpret the current codes when the current codes are vague and confusing. The committee for NFPA 1225 is re-addressing the Lightning Protection System requirements. The answer below is consistent with the committee's statement.

Answer:

1. The ECRES installed in any building shall be in compliance with the following Codes:

NFPA 70-800 Communication Systems

NFPA 70-810 Radio and Television Equipment

NFPA 70-820 CATV and Radio Distribution Systems

2. The ECRES installed in buildings where an existing Lightning Protection System is in place, shall be protected by the existing Lightning Protection System.

The donor antenna shall be placed within the Lightning Protection System's "Zone of Protection". An assessment shall be completed by a qualified and certified Lightning Protection System installer to define the specific requirements.

FAQ 2021-3.5
Product Compatibility

Question: Can we use the product compatibility form (3.4) to comply with NFPA 1-1.4 and NFPA 1221?

Applicable Codes: NFPA 1-1.4
NFPA 1221

Discussion:

There are many components of an ERCES that do not fall into a category having a UL Standard. In these cases, the AHJ should use NFPA 1-1.4 Equivalencies, Alternatives, and Modifications to enable the usage of these components in an ERCES.

Answer: The engineer may design a system with the product compatibility list (see the attachment) shown on the drawings. The design is subject to obtaining the approval of the AHJ.

Two-Way Radio Communications Enhancement Systems Product Compatibility					
Item	Manufacturer	Product Name	Part Number	UL Standard	NRTL Listing
BDA/Repeater				60950 2524	
Power Supply					
Charger					
Battery/Enclosure					
Remote Annunciator					
Surge Protection					
Donor Antenna				N/A	-
In-Building Antenna				N/A	-
Couplers				N/A	-
Connectors				N/A	-
Splitters				N/A	-
Ground Kit				NA	-
Mast				NA	-
Outside Cable					
Plenum Cable					
The above items are compatible for use with the BDA. This form shall be filled out by the BDA manufacturer.					
BDA Mfgr. _____ Address _____ City/State _____ Rep Name _____ Title _____ Date _____			Florida Engineer of Record: _____ Name _____ PE # _____ Company _____ CA # _____ Date		

**FAQ 2021-3.6
TESTING**

Question: What are the minimum requirements for radio coverage and signal strengths for fire department communication systems in buildings?

Applicable Codes: NFPA 1-11.10
NFPA 1221-9.6 Two-Way Radio Communications Enhancement Systems
NFPA 1221 A.11.3.9 Test Procedures
FS 633.202(18) Florida Statutes

Answer: The Fire Official (Fire AHJ) shall determine the minimum requirements for radio coverage and signal strengths for the Fire Department Communication System inside buildings.

The Fire Official shall test a building to determine if an ERCES is required.

The Fire Official shall test a new ERCES installed in a building for final acceptance of the system.

Test procedures shall comply with NFPA 1221 A.11.3.9.

Contact the local municipality's Fire Official for coordination and scheduling the testing.