



# **HONEYWELL**

## **BDA / ERCES SYSTEMS**

### **LATEST CODES AND LISTINGS FOR ERCES/BI-DIRECTIONAL AMPLIFIER (BDA) SYSTEMS**

JP Plouffe  
Sr. Business Development Manager (BDA)

May 20, 2020

# **Honeywell**

# HOUSEKEEPING

All phones & computers are currently on mute

Use the chat bubble to ask any questions

Follow-up materials:

- Video recording of webinar
- PDF of the deck used
- Collateral

Poll questions

The Honeywell logo is displayed in a bold, red, sans-serif font.

# AGENDA

- 1. Latest Code Requirements & Changes**
- 2. How Do AHJs Specify and Ensure Compliance?**
- 3. Why UL 2524? UL 2524 = NFPA Compliant**
- 4. BDA SYSTEM Components & Design**
- 5. Signal Booster Class A vs. Class B**
- 6. AHJ Concerns About ERCES**
- 7. Fire Marshall Architect and Engineer Considerations**

**Honeywell**

May 20, 2020

**HONEYWELL**

**LATEST CODES AND LISTINGS FOR  
ERCES/BI-DIRECTIONAL AMPLIFIER  
(BDA) SYSTEMS**

**ENFORCEMENT & SPECIFYING FOR  
AHJS, ARCHITECTS & ENGINEERS**

**Honeywell**

# POLL QUESTION

(1 of 3)

WHAT'S YOUR COMFORT LEVEL  
WITH BDA CODES?

OPTION #1 IS 1-3

OPTION #2 IS 4-6

OPTION #3 IS 7-10



# WHAT IS A ERCES / BDA SYSTEM ?

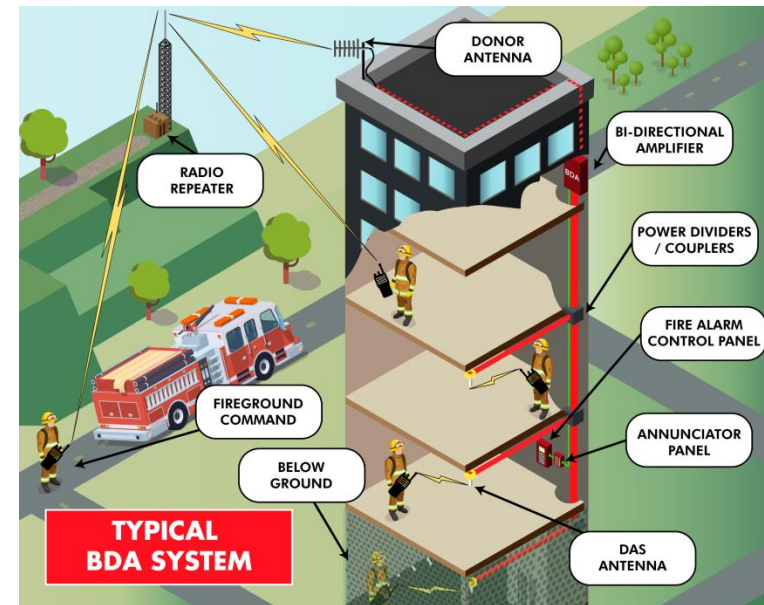
# WHAT IS A BDA SYSTEM?

**BDA – Bi-Directional Amplification system used to enhance in-building radio frequency signal coverage**

- Radio Frequency (RF) Amplifier that amplifies/boosts Signals in 2 directions
- Also known as a signal booster
- Can also be UDA: Uni-Directional Amplifier - Signals in 1 direction

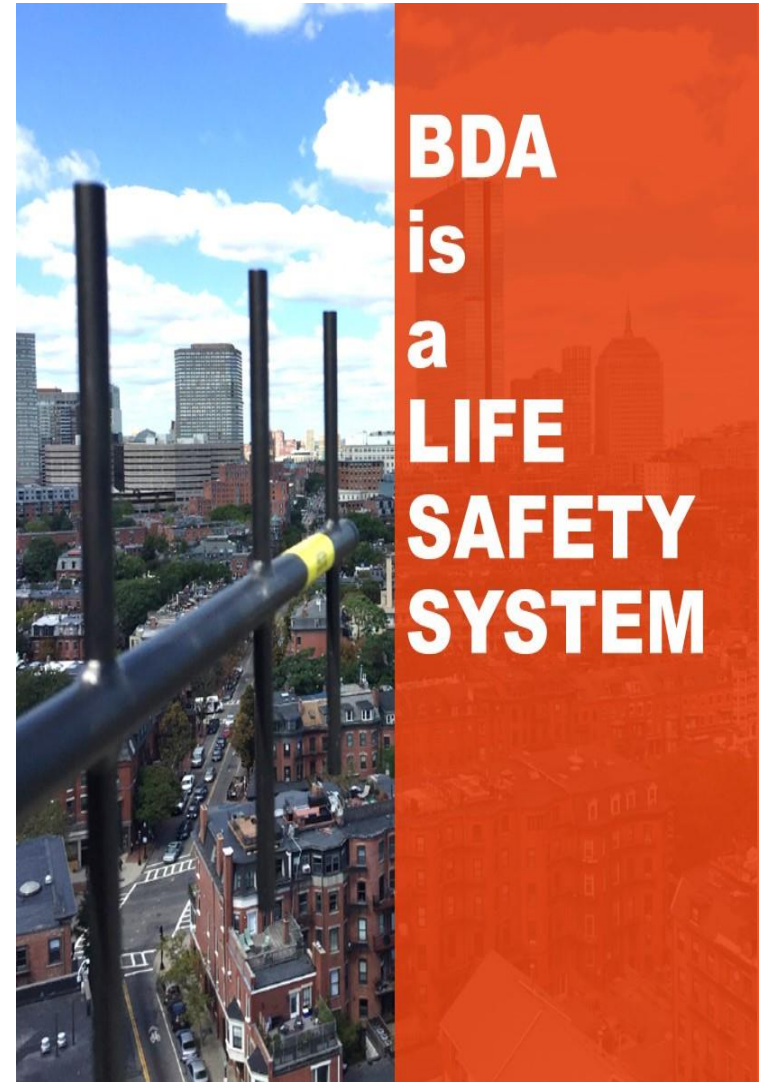
## **Distributed Antenna System (DAS)**

- An active device (BDA/Signal Booster) and an antenna distribution provides coverage where it needs to be within a structure



# BDA IS A LIFE SAFETY SYSTEM

- **Supervised by building's fire alarm system**
- **Typically purchased with Fire Alarm**
  - Installed and tested by qualified, factory certified technicians
  - Inspected by AHJ
- **Code Driven Requirement**
- **AHJ Specifications**
  - AHJ/Jurisdictions have different frequency requirements





**DURING AN  
EMERGENCY,  
RELIABLE  
COMMUNICATION IS  
CRITICAL.**

***STAYING INFORMED WITH  
CLEAR RADIO TRANSMISSIONS  
BETWEEN FIRST RESPONDERS  
WILL HELP PREVENT FURTHER  
INJURIES AND SAVE MORE  
LIVES***



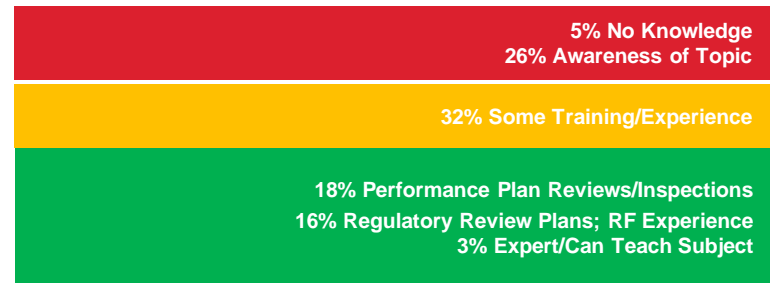
# HOW IMPORTANT ARE BDAS TO PUBLIC SAFETY?

% of Buildings with Poor Radio Frequency Coverage

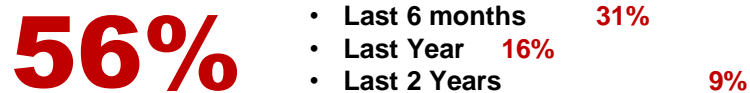


Do you have a method to track these buildings?  
**Yes 38%, No 62%**

Level of Expertise with BDA/ERRCS Systems



Have You Experienced a Communications Failure within a building during an emergency incident?



How Important is Reliable In-Building Communication Coverage of PS LRM during emergencies?

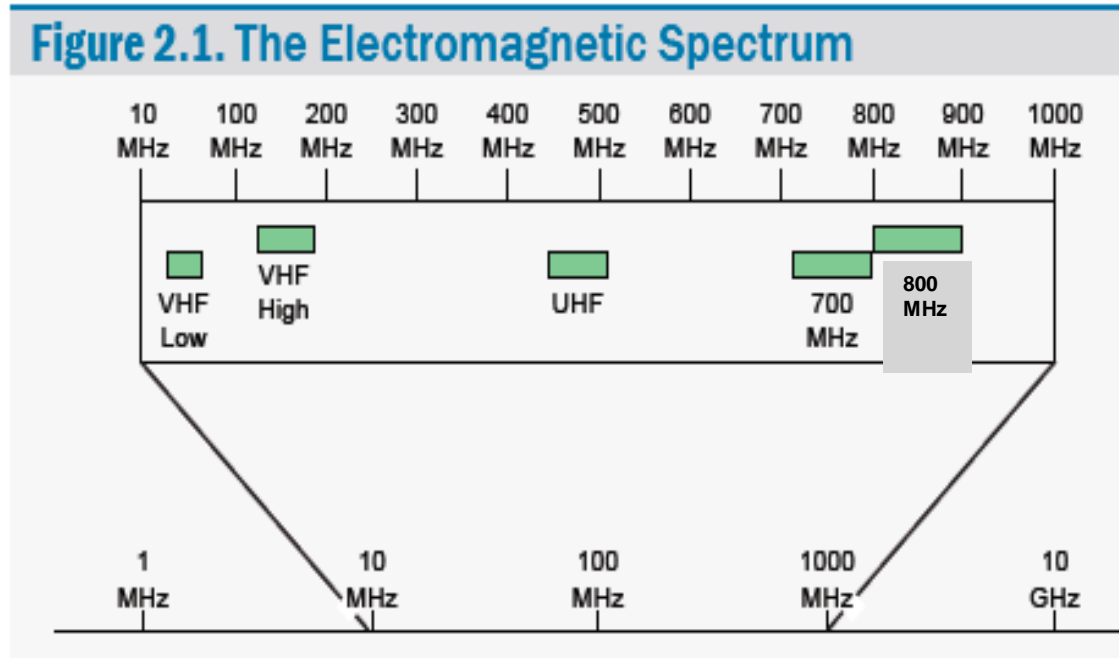


Source: IAFC Survey 2017 by Safer Buildings Coalition

Author: Safer Buildings Coalition: [www.saferbuildings.org](http://www.saferbuildings.org), Source: Creative Commons SBC In Building ERRCS Survey of IAFC Members

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# PUBLIC SAFETY RADIO FREQUENCY



**VHF Band = 150-174MHz**

**UHF Band = 450-520MHz, Comprised of 10MHz-wide Sub-Bands**

**700MHz**

**800 MHz**

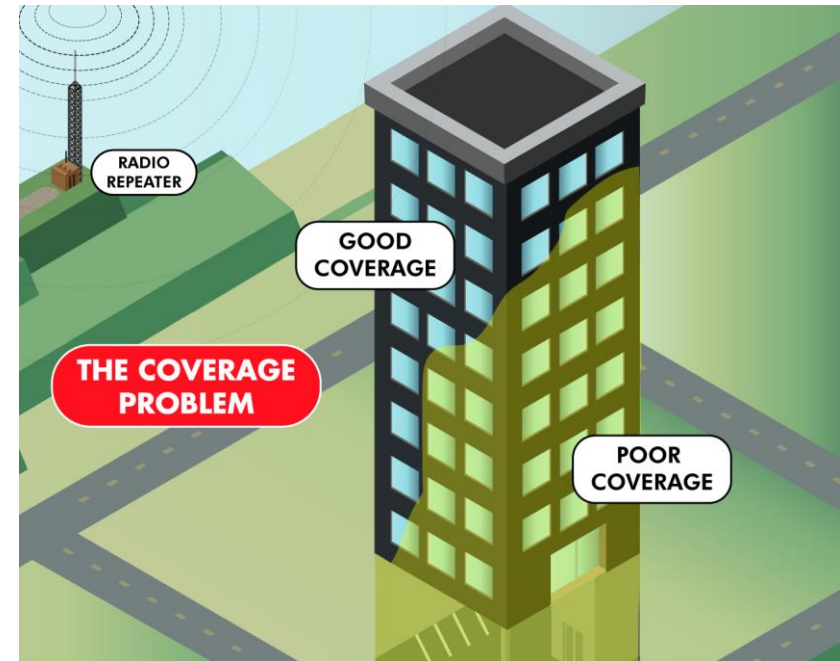
**Operates on a specific radio frequency/channel –  
Within a specific band**

# THE COVERAGE PROBLEM

## In-building radio signal degradation

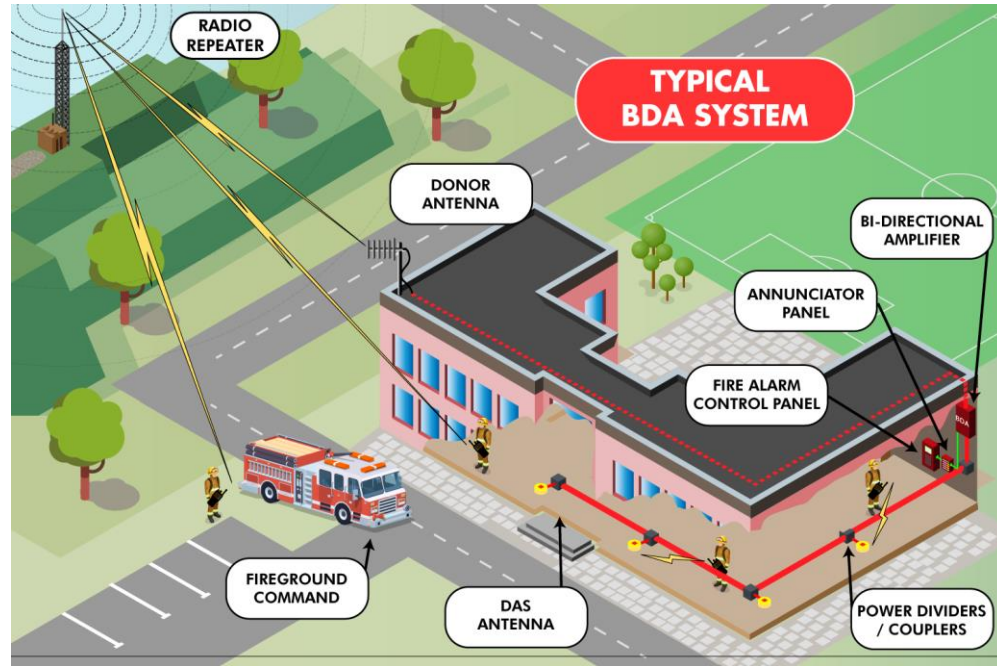
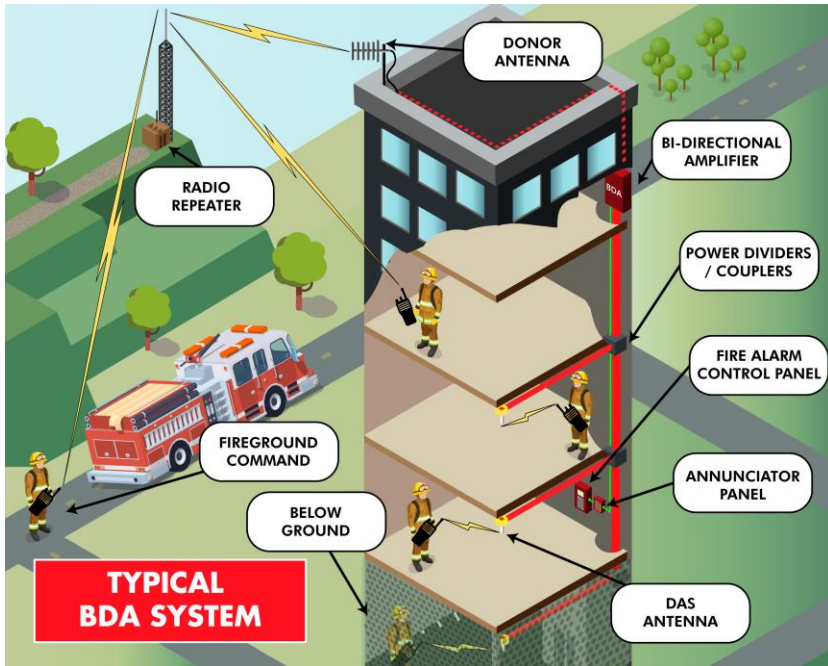
### Radio signals are attenuated by:

- Concrete, Metal and other building materials
- Low-E Glass
- Below-Ground Structures
- Other obstructions
- RF Interference



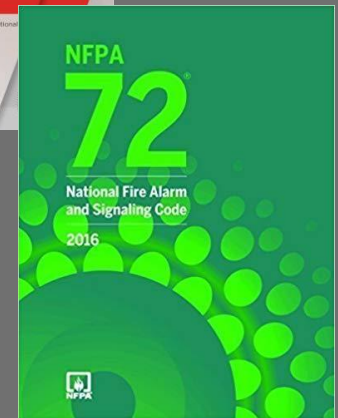
**The consequence: Poor in-building radio signal coverage and “dead spots”.  
Emergency responders lose communications**

# THE COVERAGE SOLUTION ERCES / BDA





# CODE REQUIREMENTS



# CODE DEVELOPMENT

**It  
Is now...**

**FIRE  
CODE**

- **In-Building Life Safety Concerns:**
  - Protect Public
  - Protect First Responders/Emergency Personnel
- **Standardization and Consistency for In-Building Public Safety Systems**
- **Enforce “Public Safety” grade qualifiers for the**
  - Installation
  - Installer

# CODE-DRIVEN REQUIREMENT

## IBC 2015 - Section 916, NFPA 1 Section 11-10

- Refers to IFC section 510 or the state recognized fire code

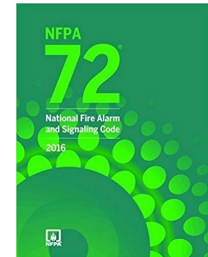


## IFC Section 510 Emergency Responder Radio Coverage

- First appeared in the appendix of the 2009 IFC; the provision was moved to the body of the code in 2012.
- Section 1103.2 specifies the requirements for emergency responder radio coverage in existing buildings.

## NFPA 72 National Fire Alarm and Signaling Code

- 2010 / 2013 Edition, section 24.5.2
- The 2016 edition of NFPA 72 relocated the requirements to NFPA 1221
- 2016 & 2019 Editions of NFPA 1221, Emergency Service Communications Systems, Section 9.6



## Code Adoption

- At present 28 states (including D.C.) are requiring BDA Systems.
- There are 34 States that have adopted IFC; 4 more IBC; 9 more NFPA 1/101.



# FIRE CODE TERMINOLOGY

## ERCES

Emergency Radio Communication Enhancement Systems

## IBERRES

In-Building Emergency Responder Radio Enhancement System

## ERRCS

Emergency Responder Radio Coverage Systems

### Other

- **IBERRS** (In-Building Emergency Responder Radio Systems)
- **IBPSRSB** (In-building Public Safety Radio Signal Booster)
- **IBRS** (In-Building Radio System)
- **IBECRES** (In-Building Emergency Communication Radio Enhancement Systems)
- **IBPSCS** (In-Building Public Safety Communication Systems)
- **ARC** (Auxiliary Radio Communication – New York City & Long Island)
- **PSSB** (Public Safety Signal Booster)
- **PSIBCS** (Public Safety In-Building Communications Systems)
- **PSBDA** (Public Safety Bi-Directional Amplifier)
- **PSRES** (Public safety Radio Enhancement System)
- **ERCS** (Emergency Radio Coverage System)
- **ECRS** (Emergency Communications Radio System)
- **SBS** (Signal Booster System)
- **DAS** (Distributed Antenna System)
- **RCES** (Radio Communication Enhancement Systems – 2-Way)

# FUTURE CODE REQUIRES UL 2524

2021 IFC, IBC, and NFPA 1 will **all require BDA Systems to comply with UL 2524** & listed by an OSHA-accredited Nationally Recognized Testing Laboratory (NRTL)



2018 GROUP A PROPOSED CHANGES TO THE I-CODES

**F48-18**  
IFC: 510.4, 80  
Proponent: Michael O'Brian, Chair, representing FCAC (FCAC@iccsafe.org)

**2018 International Fire Code**

Revise as follows:

**510.4 Technical requirements.** Equipment required to provide emergency responder radio coverage shall be listed in accordance with UL 2524. Systems, components and equipment required to provide the emergency responder radio coverage system shall comply with Sections 510.4.1 through 510.4.2.8.

Add new standard(s) follows:

**UL** Underwriters Laboratories LLC  
333 Pfingsten Road  
Northbrook IL 60062

**UL 2524 -2018:**  
Outline of Investigation for In-building 2-Way Emergency Radio Communication Enhancement Systems

**Reason:**  
This is one of 10 proposals being submitted as a package relating to technical changes proposed for Section 510. While the Fire Code Committee will consider each proposal independently, the intent is for approval of all proposals in this package which have been submitted as a correlated set of companion code change proposals.  
This proposal adds a requirement to test and list equipment installed to enhance emergency responder radio coverage in buildings to ensure fire and shock safety and compliance with the performance requirements specified in IFC Section 510 and NFPA 1221.  
This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire safety and hazardous materials in new and existing buildings and facilities and the protection of life and property in wildland urban interface areas. In 2017 the Fire-CAC has held 3 open meetings. In addition, there were numerous conference calls, Regional Work Group and Task Group meetings for the current code development cycle, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: <https://www.iccsafe.org/codes-tech-support/cs/fire-code-action-committee-fcac/>

**Cost Impact**  
The code change proposal will increase the cost of construction .  
The requirement to test and list equipment will add to the cost for required equipment installed in new or existing buildings. The cost to test and certify safe equipment should not add more than 1/2% to the total cost of this equipment.  
Internal ID: 377

**F48-18**

**Committee Action:** **Approved as Submitted**

**Committee Reason:** This proposal was approved as it will eliminate or reduce the need to have a professional engineer to review all designs and provides an appropriate listing for such equipment. (Vote 13-1)

**Assembly Motion:** **NONE**

NFPA 1225 – next version of NFPA requirements for BDA Systems currently in development also **requires UL 2524** (in current draft, final approvals pending)

# IFC 2018 BUILDING REQUIREMENTS

## IFC Rule 510.1 Emergency responder radio coverage in new buildings.

New buildings shall have *approved* radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems of the jurisdiction, measured at the exterior of the building.

### Current NFPA and IFC Codes

Conditions	NFPA 1221 Section 9.6 – 2016 edition	IFC 510 – 2018 edition
Antenna Malfunction	Applicable – System & BDA	Not specifically – AHJ may require
Signal Booster Failure	Yes	Yes
Low Battery 70%	Yes	Not specifically – AHJ may require
Loss of Normal A.C.	Yes	Yes
Failure of Battery Charger	Yes	Not specifically – AHJ may require
Backup Duration	12 Hours	24 Hours* (12 hours 2018 IFC)
Signal Coverage	$\geq 95$ dBm (DAQ3.0 2016 edition) / 90% / 99%	$\geq 95$ dBm (DAQ3.0) / 95%
Monitoring / Maintenance	Yes	Yes
Battery Backup Cabinets	NEMA4	NEMA4 (NEMA3R 2018 IFC)

# IFC 2018 BUILDING REQUIREMENTS

## 510.2 Emergency responder radio coverage in EXISTING BUILDINGS.

Existing buildings shall be provided with *approved* radio coverage for emergency responders as required in Chapter 11.

### Chapter 11: 1103.2 Emergency responder radio coverage in existing buildings.

Existing buildings other than Group R-3, that do not have approved radio coverage for emergency responders in the building based on existing coverage levels of the public safety communication systems, shall be equipped with such coverage according to one of the following:

- Whenever an existing wired communication system cannot be repaired or is being replaced, or where not approved in accordance with Section 510.1, Exception 1.
- Within a time frame established by the adopting authority.

**Exception:** Where it is determined by the fire code official that the radio coverage system is not needed.

# **IFC CHPT.-510 COVERAGE REQUIREMENTS**

## **510.4.1 Radio signal strength.**

The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 and 510.4.1.2.

### **510.4.1.1 Minimum signal strength into the building.**

A minimum signal strength of -95 dBm shall be receivable within the building.

### **510.4.1.2 Minimum signal strength out of the building.**

A minimum signal strength of -95 dBm shall be received by the agency's radio system when transmitted from within the building.

# **NFPA COVERAGE REQUIREMENTS**

**Critical Area Coverage – 99% (NFPA 1221 9.6.7.4) coverage required in Critical areas:**

- Emergency Command Center(s)
- Fire Pump Room(s)
- Exit Stairs
- Exit Passageways
- Elevator Lobbies
- Standpipe Cabinets
- Sprinkler Sectional
- Valve Locations

**General Area Coverage – General building areas should have (90% NFPA 1221 9.6.7.5) and (95% “all floors of the building,” IFC 510.5.3, DRAFT 2018 edition) coverage**

# ERCES / BDA System Codes & Standards

Code Requirements	NFPA*		IFC	
	NFPA 72 - 2013	NFPA 1221 - 2016	IFC 510 - 2015	IFC 510 - 2018
<b>In-Building Solution Required</b>	<b>Section 24.5.2</b>	<b>Section 9.6</b>	<b>Section 510.1</b>	<b>Section 510.1</b>
<b>Level 1, Level 2 or Level 3 Pathway Survivability</b>	2 Hour for Riser Coaxial Cable Section 24.3.6.8.1	2-Hour for Riser Coaxial Cable Section 9.6.2.1.1	Not Addressed in Section 510. Referenced in 24.3.6.8.1 of NFPA 72-2013	Yes, Section 510.4.2. Reference to NFPA 1221
<b>Plenum Rated Coaxial Cable Required</b>	Yes, Riser & Feeder Coaxial Cable Section 24.3.6.8.1.1	Yes, Riser & Feeder Coaxial Cable Section 9.6.2.1.1.1	Not Addressed in Section 510. Referenced in 24.3.6.8.1.1 of NFPA 72-2013	Yes, Section 510.4.2. Reference to NFPA 1221
<b>Lightning Protection Required</b>	Not addressed in Section 24.5.2	Yes, In accordance with NFPA 780 Section 9.6.3	Not Specifically Addressed in Section 510	Yes, Section 510.4.2 Per NFPA 780 as Referenced in NFPA 1221
<b>Isolation of Donor Antenna Required</b>	Yes, 15 dB Section 24.5.2.3.3	Yes, 20 dB Section 9.6.9	Not Specifically Addressed in Section 510	Yes, 20 dB - Section 510.4.2.4 (4)
<b>Secondary Power Source</b>	12 Hours Section 24.5.2.5.5.2	12 Hours Section 9.6.12.2	24 Hours - Section 510.4.2.3	12 Hours - Section 510.4.2.3 or 2-Hours Battery w/ Emergency Generator
<b>Signal Strength &amp; Area Coverage Required</b>	-95 dBm - Section 24.5.2.3 90% General - Section 24.5.2.2.2 99% Critical - Section 24.5.2.2.1	DAQ 3.0 - Section 9.6.8 90% General - Section 9.6.7.5 99% Critical - Section 9.6.7.4	-95 dBm - Section 510.4.1 95% General - Section 510.4.1 99% Critical - Not Specifically Addressed in Section 510	DAQ 3.0 - Section 510.4.1.1 95% General - Section 510.4.1 99% Critical - Section 510.4.2 Reference to NFPA 1221
<b>Monitoring By Fire Alarm Required</b>	Yes - Section 24.5.2.6	Yes - Section 9.6.13	Yes - Section 24.5.2.6 NFPA 72 -2013	Yes - Section 9.6.13 NFPA 1221-2016
<b>Cabinets for Equipment &amp; Battery Backup Required</b>	Yes, NEMA 4/NEMA 4X -Section 24.5.2.5.2	Yes, NEMA 4/NEMA 4X - Section 9.6.11.2	Yes, NEMA 4 - Section 510.4.2.4 (1) & (2)	Yes, NEMA 4/NEMA 3R - Section 510.4.2.4 (1) & (2)
<b>Monitor Antenna Malfunction Required</b>	Yes, Donor Antenna - Section 24.5.2.6(2)(a)	Yes, Donor Antenna - Section 9.6.13.1(2)(a)	Yes, Section 24.5.2.6(2)(a) NFPA 72-2013	Yes, Donor Antenna - Section 510.4.2.5
<b>System Acceptance/Testing</b>	Section 24.5.2.1.2	Section 9.6.4, 11.3.9 & 11.3.9.1	Section 510.5.3	Section 510.5.3

\*NFPA 1 Section 11.10: In all new and existing buildings, minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ. Where required by the AHJ, two-way radio communication enhancement systems shall comply with NFPA 1221.

**Always Verify EXACT AHJ BDA System Requirements for Each Jurisdiction!**



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# POLL QUESTION

(3 of 3)

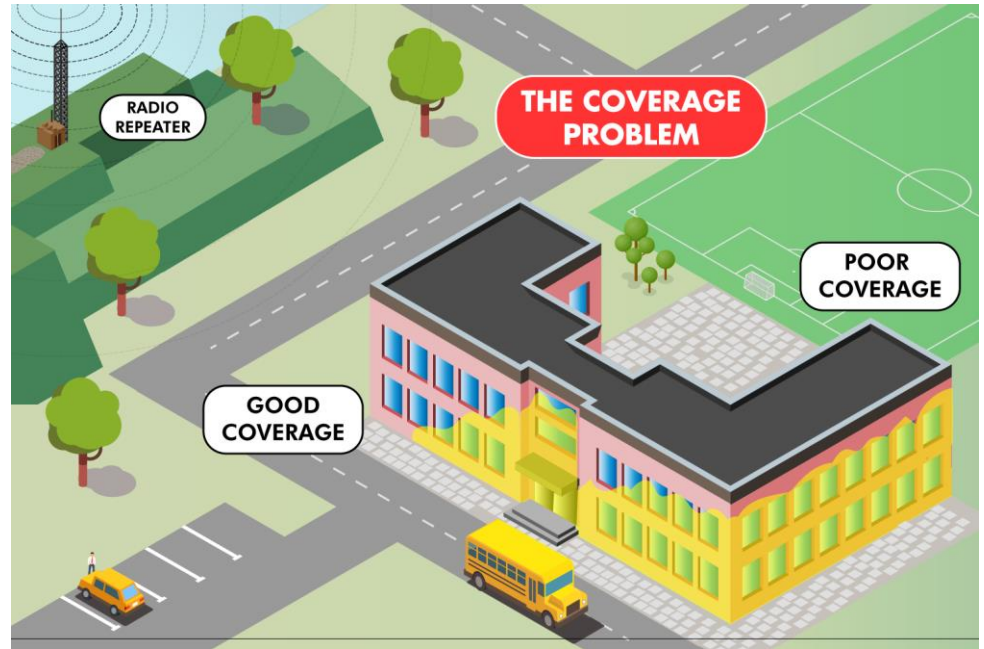
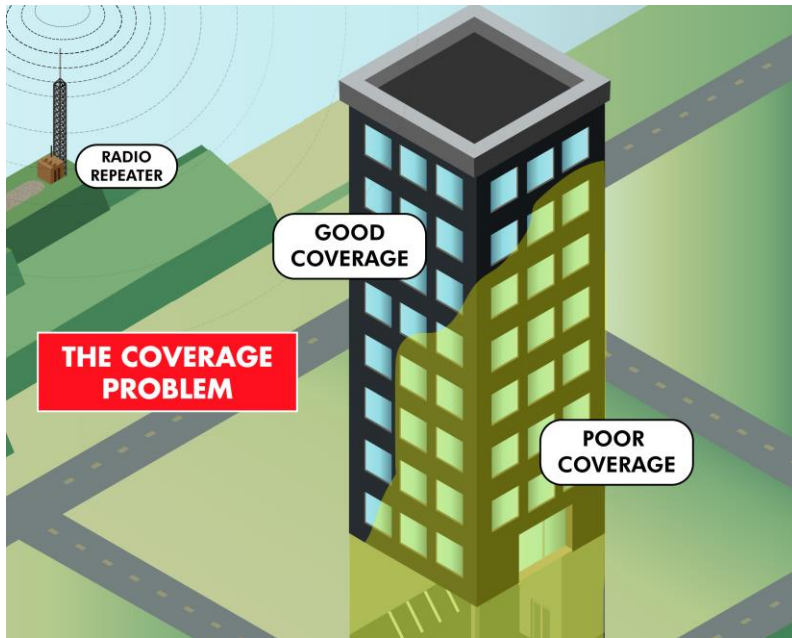
DO YOU FEEL YOU HAVE A BETTER  
UNDERSTANDING OF THE CODE?  
YES OR NO





# **ERCES RF SITE SURVEYS**

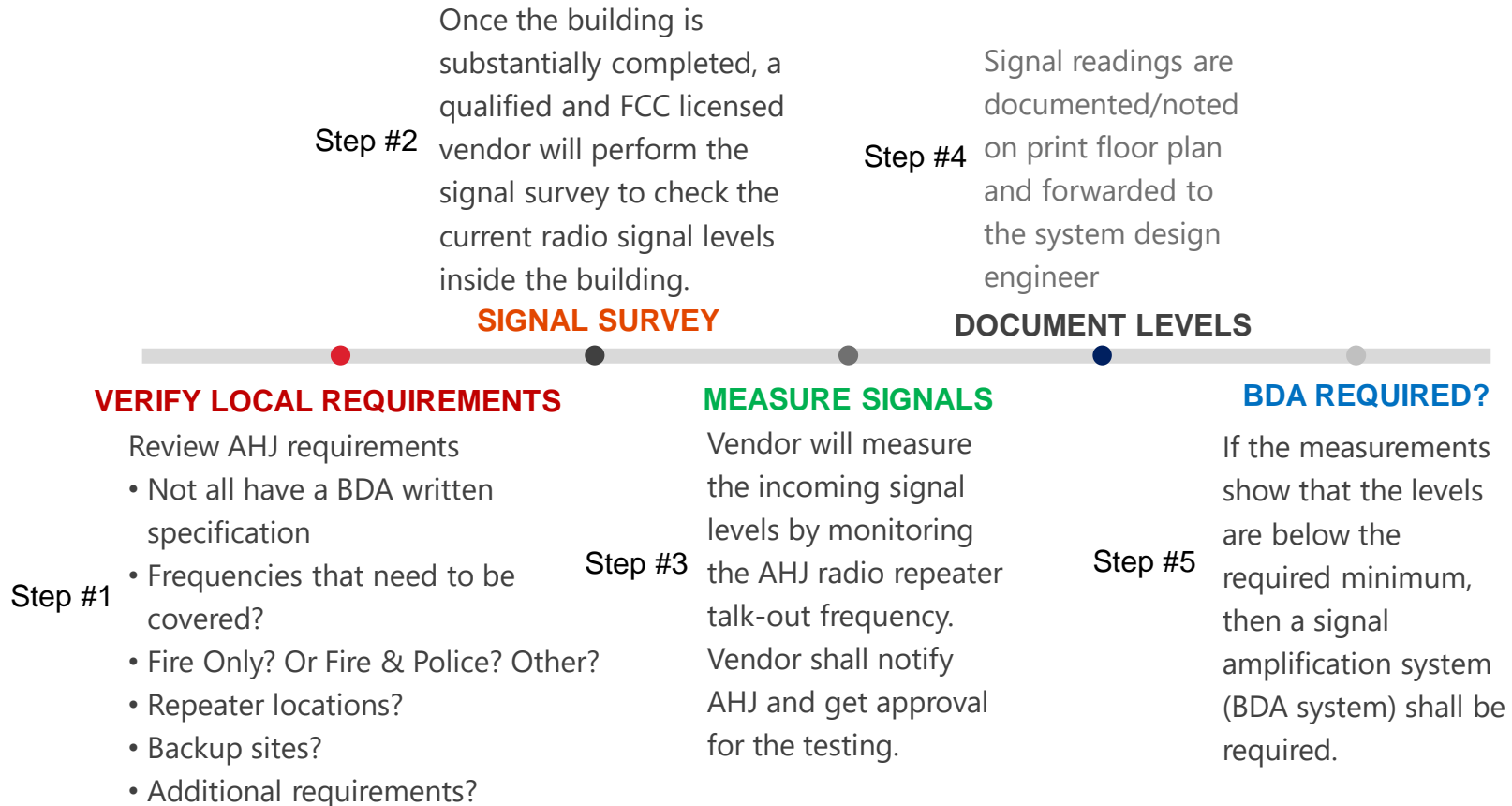
# THE COVERAGE PROBLEM



# **RADIO SIGNAL SITE SURVEY**

- **Determines if a building has sufficient radio signal coverage or if it needs a signal enhancement (ERCES) system.**
- **It is a responsibility of the building owner or construction company to perform survey and to certify signal coverage on a 100% completed building. Survey report needs to be submitted to the AHJ.**
- **AHJ Should have signal surveys for all buildings in the jurisdiction.**
- **Signal enhancement system (ERCES) is required for building with insufficient coverage.**
- **Final survey / signal coverage certification is done upon building completion.**
- **Surveys are done by FCC GROL certified technicians. Minimum 20 readings per floor. Test all critical areas. Report submitted to AHJ.**

# TYPICAL ERCES SURVEY PROCESS

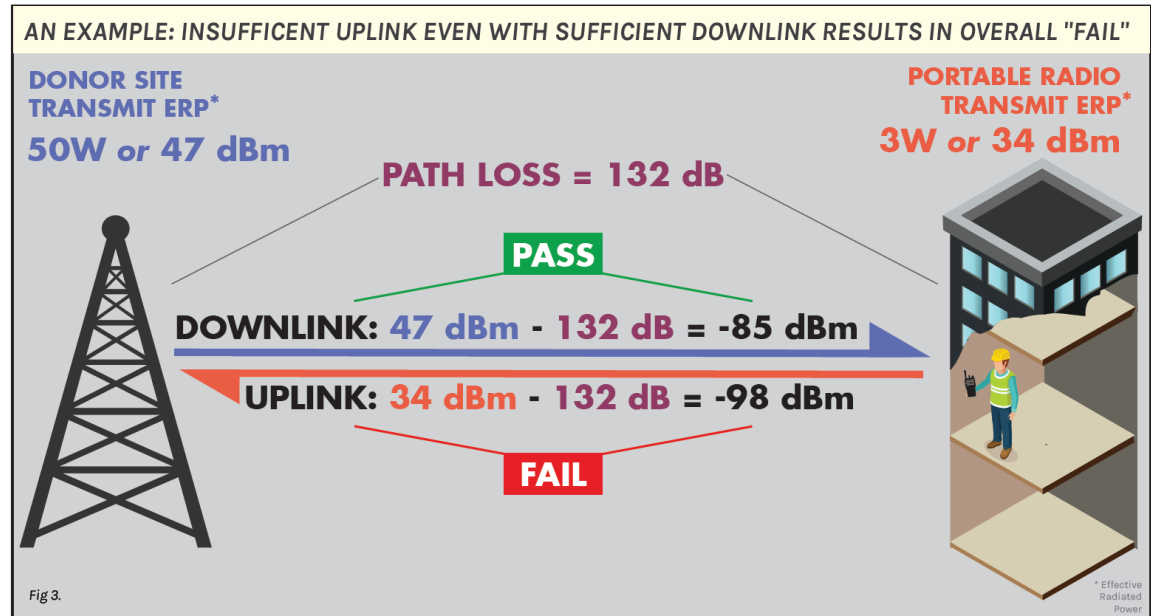


# CODE-REQUIRED INBOUND AND OUTBOUND SIGNAL STRENGTH

**Q:** If signal strength readings are not performed at the donor site, *how can you ensure a minimum outbound signal strength of -95 dBm?*

**A:** Calculate outbound signal strength based on the inbound signal strength.

1. Determine the *signal strength difference* between the *donor site ERP* (effective radiated power) and the *portable radio's ERP*, typically 34 dBm
2. Then subtract the *signal strength difference* from our *in-building signal strength* reading to determine the *outbound signal strength*



**-85 dBm is the inbound signal strength and 13 dB is the signal strength difference (47 dBm – 34 dBm = 13 dB).**

We can calculate the **outbound signal strength as -98 dBm (-85 dBm - 13 dB = -98 dBm).**

Although the minimum inbound signal strength is met, **the site survey will fail** since the outbound signal strength is below the required -95 dBm minimum.

# DAQ-3 VS -95 DOWNLINK & -95 UPLINK

DAQ is a subjective measure, the challenge is the translation of DAQ to dBms which is not a part of NFPA or IFC codes.

DAQ LEVEL	dBm LEVEL	DEFINITION
1	-115 to -122dBm	Unusable. Speech present but not understandable.
2	-110 to -115dBm	Speech understandable w/slight effort. Requires occasional repetition due to noise or distortion.
3	-110dBm	Speech understandable w/slight effort. Requires occasional repetition due to noise or distortion
3.4	-100 to -105dBm	Speech understandable without repetition. Some noise or distortion present.
4	-95 to -100dBm	Speech easily understandable. Little noise or distortion.
4.5	-90 to -95dBm	Speech easily understandable. Rare noise or distortion.
5	Higher than -90dBm	Perfect. No Distortion or noise discernible.

Site Survey Results	ESD-DOWNLINK dBms	ESD-UPLINK dBms	Radio Shop DOWNLNK dBms	Radio Shop UPLNK DAQ 3
FL 1 Area 1	-95	-108	-95	-110
FL 1 Area 2	-85	-98	-85	-100
FL 1 Area 3	-83	-96	-83	-98
FL 1 Area 4	-82	-95	-82	-97
FL 1 Area 5	-91	-104	-91	-106
FL 1 Area 6	-75	-88	-75	-90
FL 1 Area 7	-81	-94	-81	-96
FL 1 Area 8	-79	-92	-79	-94
FL 1 Area 9	-80	-93	-80	-95
FL 1 Area 10	-86	-99	-86	-101

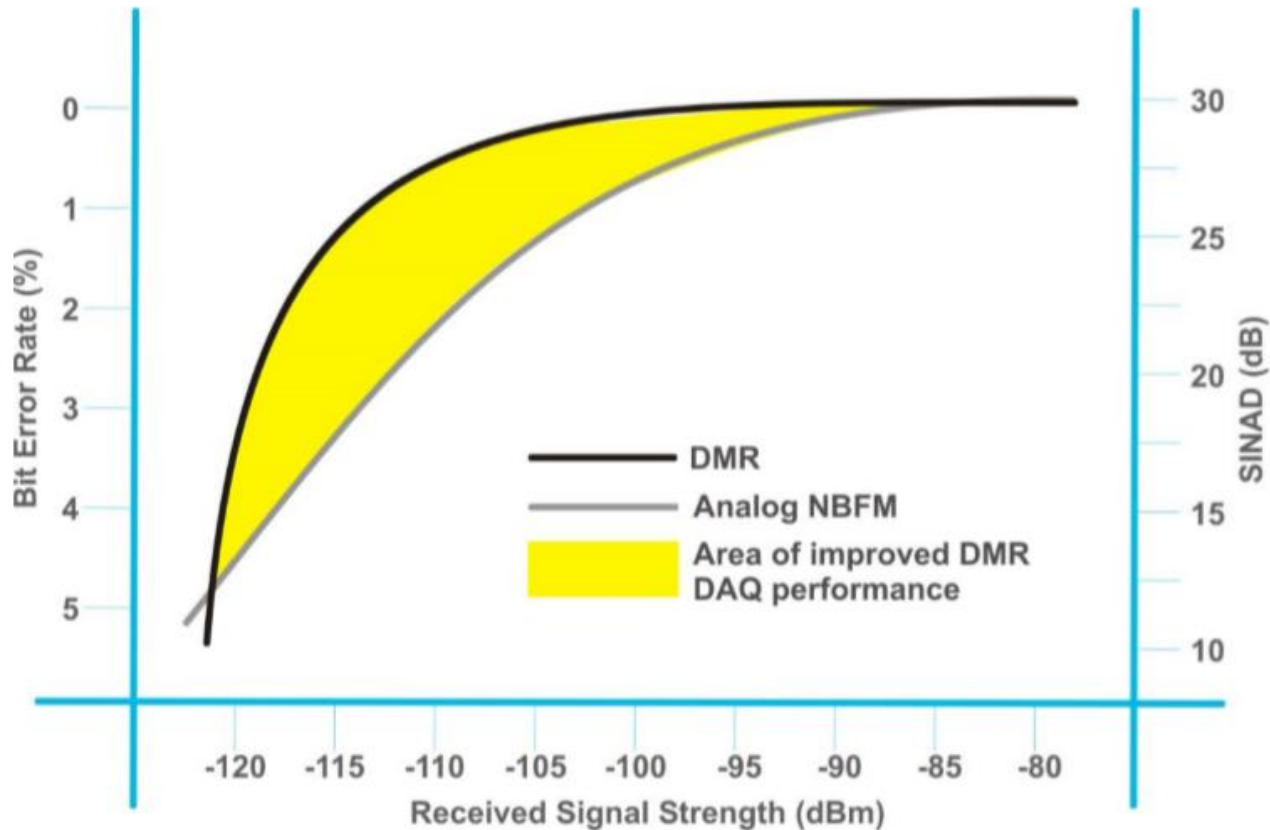
# NFPA & IFC INBOUND & OUTBOUND CODES

CODE REQUIREMENTS	NFPA*			IFC	
	<u>NFPA 72 - 2013</u>	<u>NFPA 1221 - 2016</u>	<u>NFPA 1221 - 2019</u>	<u>IFC 510 - 2015</u>	<u>IFC 510 - 2018</u>
Signal Strength and Area Coverage Required	Inbound -95 dBm - Section 24.5.2.3.1 Outbound -95 dBm – Section 24.5.2.3.2 90% General - Section 24.5.2.2.2 99% Critical - Section 24.5.2.2.1	Inbound DAQ 3.0- Section 9.6.8.1 Outbound DAQ3.0- Section 9.6.8.2 90% General - Section 9.6.7.5 99% Critical - Section 9.6.7.4	Inbound DAQ 3.0 - Sec. 9.6.8.1.2 Outbound DAQ 3.0 - Sec. 9.6.8.2.2 90% General - Sec. 9.6.7.4 99% Critical - Sec. 9.6.7.3	Inbound -95 dBm - Section 510.4.1.1 Outbound -95 dBm-Sec. 510.4.1.2 95% General - Section 510.4.1 99% Critical - Not Specifically Addressed in Section 510	Inbound DAQ 3 dBm – Sec. 510.4.1.1 Outbound DAQ 3.0-Sec. 510.4.1.2 95% General - Section 510.4.1 99% Critical - Section 510.4.2 Reference to NFPA 1221-2016

# ANALOG VS DIGITAL

## Link Budget

The diagram below shows the behaviour of SINAD vs Received Signal Strength for an Analog NBFM system, and that of BER vs Received Signal Strength for DMR in a static, non-faded environment.





# ERCES SURVEY DRAWINGS

What should you expect to see on a ERCES Site Survey?

- Detailed Cover Page with City/County Tower Information
- Map view showing the Tower, Building and Distance
- Frequency Info
- Survey Notes

## Key Notes:

### 1) Closest Communication Tower

North | Tower 1234285 - Mid/South Zone  
800MHz P25 System  
3.00 Miles Away  
1255 Pasadena Avenue, S.  
St. Petersburg, FL 33707

### 2) Next Communication Tower

Northeast | Tower 1030948 P25 Backup  
700MHz P25 System  
6.60 Miles Away  
1429 Arlington Avenue, N.  
St. Petersburg, FL 33705

### 3) Frequencies Used For Testing

Control Channel\*  
Alternate Channel  
Voice Channel

### Tower 1030948 - P25 Backup

#### **P25 700MHz System:**

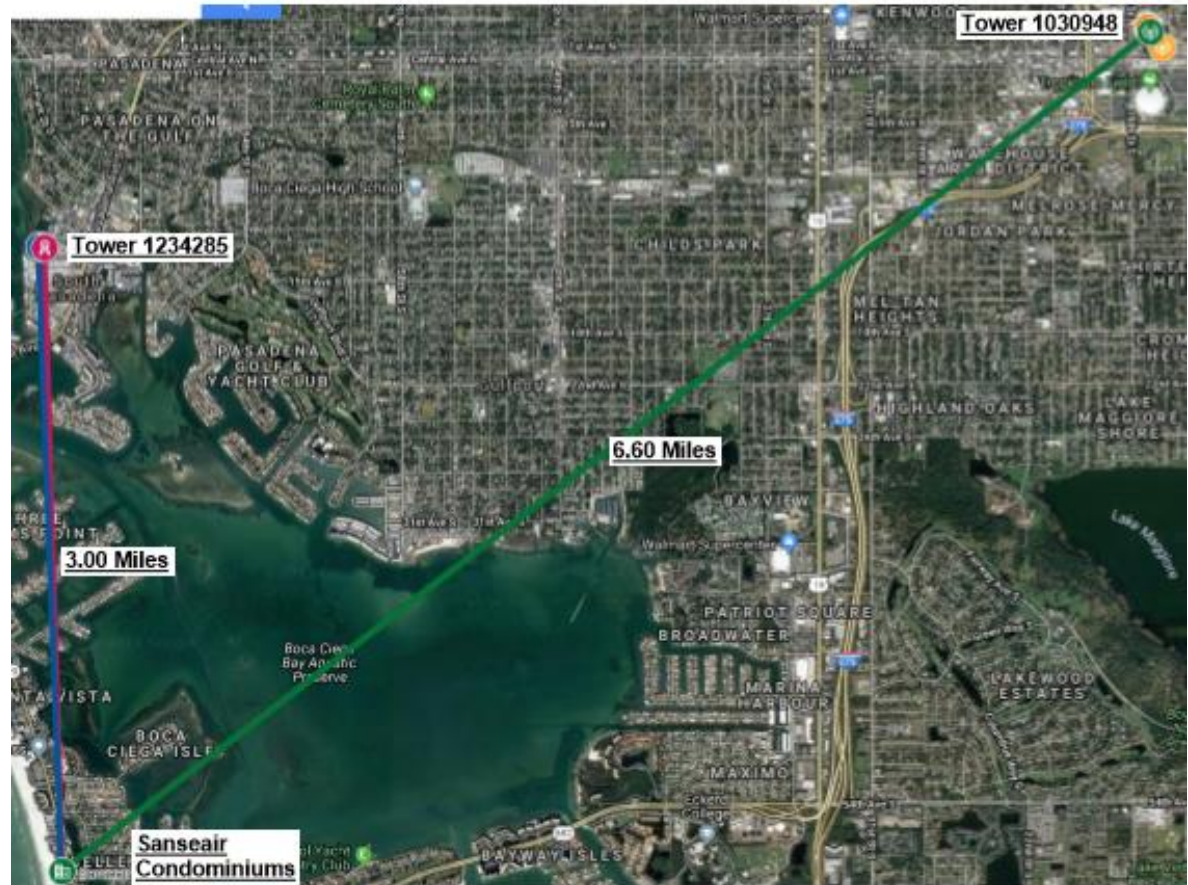
100W Transmit Power  
Site Elevation = 13.7m  
Height w/o Appurtenances = 88.3m  
Height w/ Appurtenances = 94.4m

### WQQA282 | LOC #3

Frequencies:  
**769.10625000c**  
**769.50625000c**  
**770.00625000c**

### **All Used Tower Licenses:**

WQQA282 - LOC #3



# TYPICAL ERCES SIGNAL SURVEY REPORT

## Inspection Notes:



Indicates **CRITICAL AREA**

One reading will be taken from the center of each General and Critical Grid Square. Readings will be taken approximately every 35'. Critical Areas must have 99% passing Signal Readings, General Areas must have 90% passing Signal Readings. Test will be deemed failed if two or more adjacent Grids do not meet the required Signal Level.

Signal strength (dBm) Inbound Readings will be taken using a Tait/Harris Model TP9425 P25 - 700MHz/800MHz Public Safety Radio. Signal Strength Inbound and Outbound Readings will be shown using Color Legend provided on each page. All readings reflect Inbound Signal Strength. Outbound Signal Strength shall be calculated based on path loss.

All frequencies used for testing were provided by Pinellas County Radio Administrators (PCR&T). Signals tested are indicative of all frequencies required for use by first responders in the City of Clearwater jurisdiction.

The below are the opinions of the FCC GROL licensee, based on current applicable codes. The AHJ reserves the right to make final determination on coverage requirements.

**Critical Areas Pass**

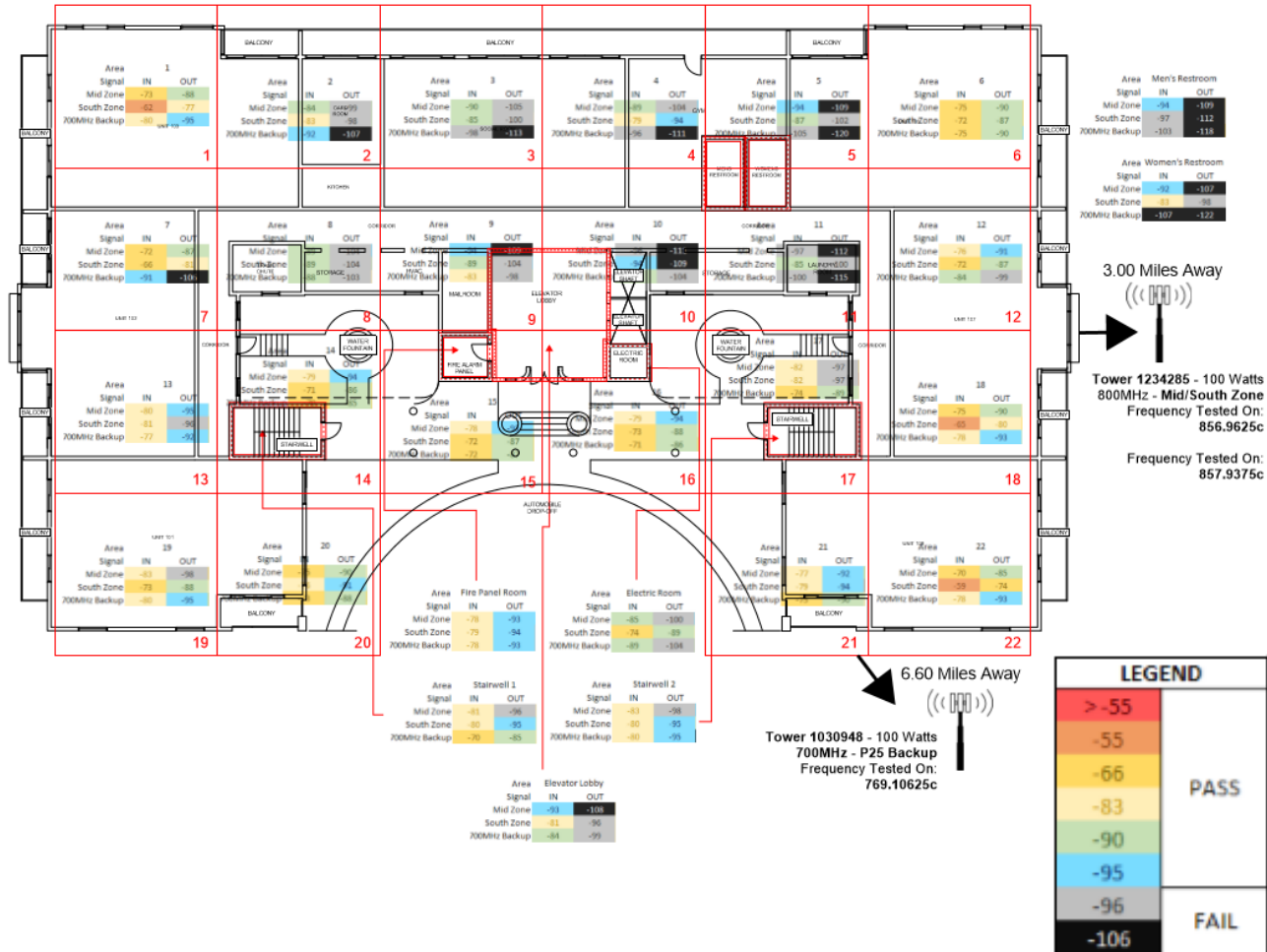
01/09/2020 5:20:51 PM

**General Areas Fail**

01/09/2020 5:21:43 PM

**Significant BDA Coverage Required**

01/09/2020 5:22:03 PM



Simple to read color code. **GRAY & BLACK FAIL!!**

# NFPA 1221

- (2) The communications link between the dedicated monitoring panel and the two-way radio communications enhancement system must be monitored for integrity.

**9.6.14 Technical Criteria.** The AHJ shall maintain a document of technical information specific to its requirements that shall contain, as a minimum, the following:

- (1) Frequencies required
- (2) Location and effective radiated power (ERP) of radio sites used by the public safety radio enhancement system
- (3) Maximum propagation delay (in microseconds)
- (4) List of specifically approved system components
- (5) Other supporting technical information necessary to direct system design

## Chapter 10 Computer-Aided Dispatching (CAD) Systems

### 10.1 General.

10.1.1\* Computer-aided dispatching (CAD) systems, when required by the AHJ, shall conform to the items outlined in this chapter.

10.1.2\* Where a CAD system is used for emergency dispatch service operations, and an enhanced 9-1-1 emergency number telephone system is in use, the CAD system shall contain all hardware and software components necessary for interface with the 9-1-1 system.

### 10.4 Alarm Data Exchange.

10.4.1 The CAD system shall have the capability to allow alarm data exchange between the CAD system and other CAD systems.

10.4.1.1\* Alarm data exchange between two PSAPs shall comply with the elements contained in 10.4.1.2 through 10.4.1.7.

10.4.1.2 Alarm data elements for alarm processing shall contain the following items from the sending CAD system:

- (1) Street address or intersection of event
- (2) Latitude/longitude of event
- (3) Reporting party name
- (4) Reporting party address
- (5) Reporting party callback number
- (6) Event type
- (7) Any remarks entered to that point

10.4.1.3 The new alarm information shall display as a pending event in the receiving CAD system.

10.4.1.4 The receiving CAD system shall automatically send a confirmation message to the sending CAD system that it received the call.

10.4.1.5 It shall be up to the AHJ to decide whether or not to use or display this information.

# POLL QUESTION

(2 of 3)

DO YOU CURRENTLY HAVE AN  
ERCES SPECIFICATION AVAILABLE?  
YES OR NO

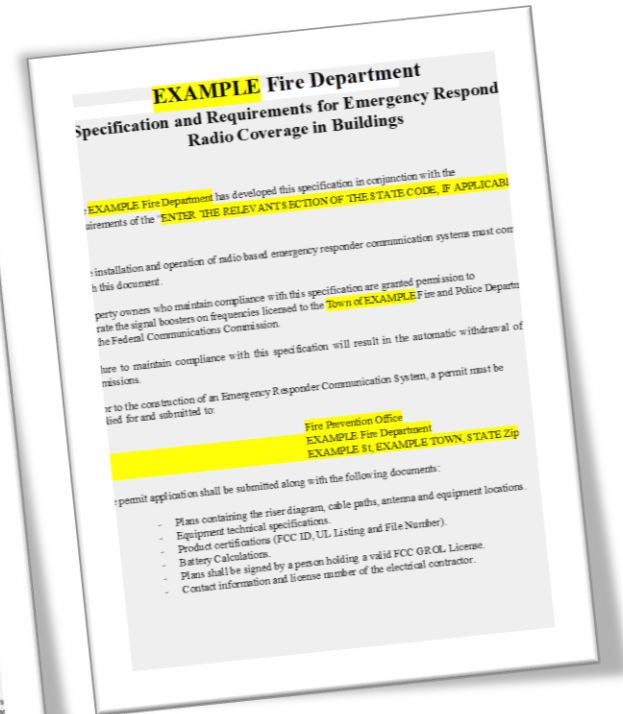


# **HOW DO AHJS SPECIFY AND ENSURE COMPLIANCE?**

# AHJ ERCES SPECIFICATION DEVELOPMENT

Honeywell Distributors & BDA Team can help you develop your specifications.

Editable A&E and AHJ Specifications and Sample AHJ Specifications from around the US.



# ELEMENTS OF THE AHJ ERCES SPECIFICATION

## Technical

Frequency Coverage

Radio Site Locations

Permitting Process

Testing & Acceptance

UL Listing, Regulatory Requirements

It's a Performance-Based Specification, "no need to over-specify"

## Administrative

AHJ Contact Information

Permitting & Certification Forms

Submittal Documentation Requirements

Maintenance Contract Requirements & Certifications

Applicable Code References

Installer Qualification Requirements

# FCC CERTIFICATION AND REGISTRATION REQ.

Signal Boosters must be FCC certified (manufacturer product brochures and product labels must include FCC ID number)

BDAs are FCC certified to operate on the licensee's frequencies

FCC Requires frequency licensees (FD, PD, municipality, etc.) to register all signal boosters that operate on their frequencies

Registration is free and FCC has a simple on-line registration tool:

<https://signalboosters.fcc.gov/signal-boosters>

Registration needs to be done by the AHJ (frequency licensee) because it requires the licensee FRN (federal registration) number and FCC password.

BDA vendor can assist if needed



# AHJ CONCERNS ABOUT ERCES

# CONCERNS ABOUT ERCES SYSTEMS

Improper installation or a failure could lead to oscillation (donor antenna signal feeds back into the DAS), creating harmful interference to Public Safety Radio System.

Noise on uplink can potentially add up & cause signal degradation for firefighter radio systems.

Failure of a system component may go unnoticed without proper monitoring & supervision (required by NFPA 1221), resulting in the system NOT being available when you need it most.

“Competency” of System Designer & Installer  
How do AHJs specify & ensure compliance?



# UL 2524 = NFPA COMPLIANCE, SAFETY, AND RELIABILITY

## IFC & NFPA Compliance

- Supervision & Monitoring
- UL-Listed Power Supplies
- Battery Backup (24 hrs @ 20% derated)
- Monitoring of Secondary Power Supply
- Type 4 Enclosure (certified as an assembly)
- Supervised Dedicated Monitoring Panel

Electric Shock & Fire Safety (UL 60950)

Product Reliability (O.O.I. & 1ST Edition)

FCC Compliance

Oscillation Suppression



# UL 2524-LISTED ERCES / BDA SYSTEMS SHALL BE NPFA COMPLIANT

## Oscillation Prevention

BDA Detects Oscillation & Reduces Gain in 5dB steps until no further oscillation

BDA Sends Trouble Signal to Fire Alarm Control Panel

BDA Indicates Trouble on Remote Annunciator / Monitor

BDA Continues normal operation with the maximum allowable gain

## Zero Noise Squelch

Most BDAs normally generate a small amount of noise when idle.

The cumulative effect of all this noise raises the “noise floor” on a frequency.

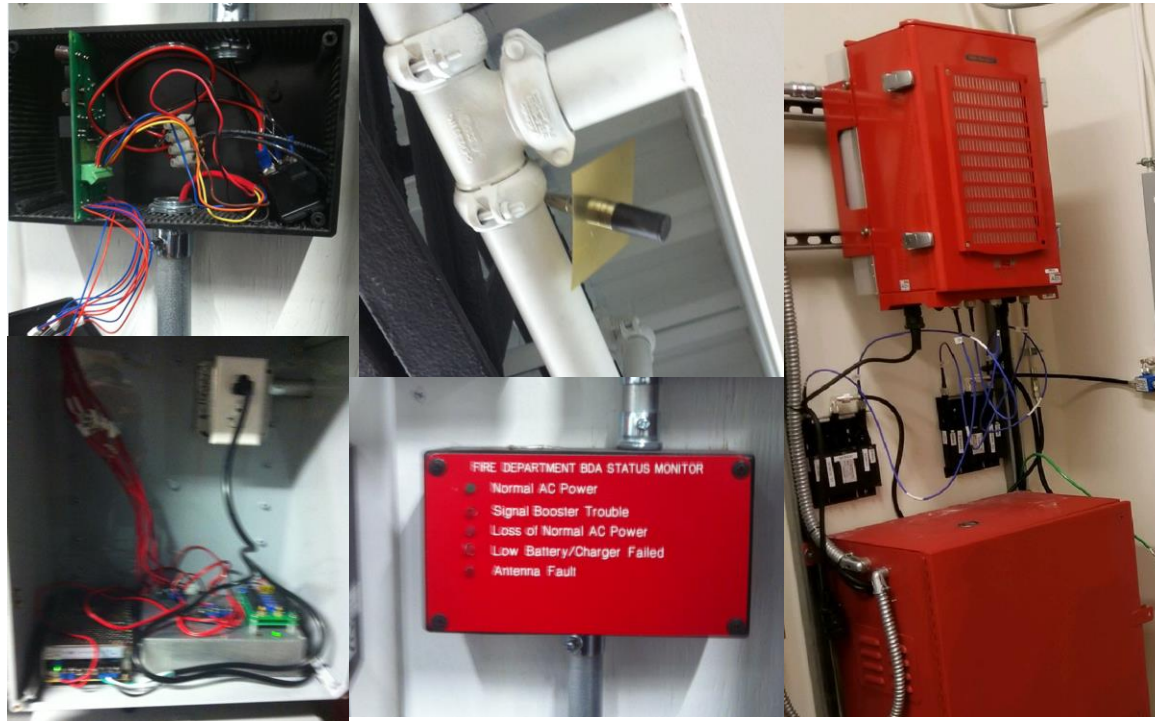
Honeywell BDAs operate in “stand-by mode” and do not transmit any noise while idle.



2524

**Address Key Concerns of AHJs**

# SHOULD ERCES PRODUCTS BE REGULATED?



Is this what you want installed!?

# **SIGNAL BOOSTER CLASS A VS. CLASS B**

# SIGNAL BOOSTERS – CLASS A VS. CLASS B

## What is the difference?

FCC classifies signal boosters as either Class A or Class B.

FCC Definitions per 47CFR90.219 rule:

- Class A signal booster: “A signal booster designed to retransmit signals on one or more specific channels. A signal booster is deemed to be a Class A signal booster if none of its passbands exceed 75 kHz.”
- Class B signal booster: “A signal booster designed to retransmit any signals within a wide frequency band. A signal booster is deemed to be a Class B signal booster if it has a passband that exceeds 75 kHz.”

**NOTE:** This classification is different from Class A and Class B fire alarm circuit wiring.

# CLASS A AND CLASS B COMPARISON

Class A	Class B
Maximum Passband is 75KHz. Intended to amplify no more than one channel at one time	Maximum Passband is more than 75KHz. It can amplify more than one channel at the same time It can either be broadband or band-selective.
Mobile use allowed	Fixed use only
Introduces signal delay (aka "group delay") of over 50 microseconds resulting in signal distortion and interference in signal overlap areas	Very low to negligible signal delay (less than 2 us). Does not introduce signal distortion and interference in signal overlap areas.
Higher power consumption, higher heat dissipation = lower efficiency	Lower power consumption, less heat dissipation = higher efficiency



# CLASS A AND B – MYTH VS. FACT

**Myth:** Class A signal boosters are better because they only amplify the select channels, thus eliminating unwanted interference to the BDA.

**Fact:** Using Class B signal boosters ensures that radios will work for all public safety users, regardless of what frequency channels they use within the 700MHz and 800MHz public safety frequency bands. Class A signal boosters have a limited number of channels that can be amplified and it is usually 32 or less.

**Myth:** Class B signal boosters can oscillate and produce harmful interference, and that is not the case with class A signal boosters

**Fact:** BDA oscillation can

happen with either class A or class B signal boosters equally, there is no difference based on the class of the signal booster. What does make a difference is the Oscillation Prevention Function of the signal booster.

**Myth:** Class A signal boosters are less prone to intermodulation interference. Class B signal boosters can produce intermodulation interference because they allow multiple carriers.

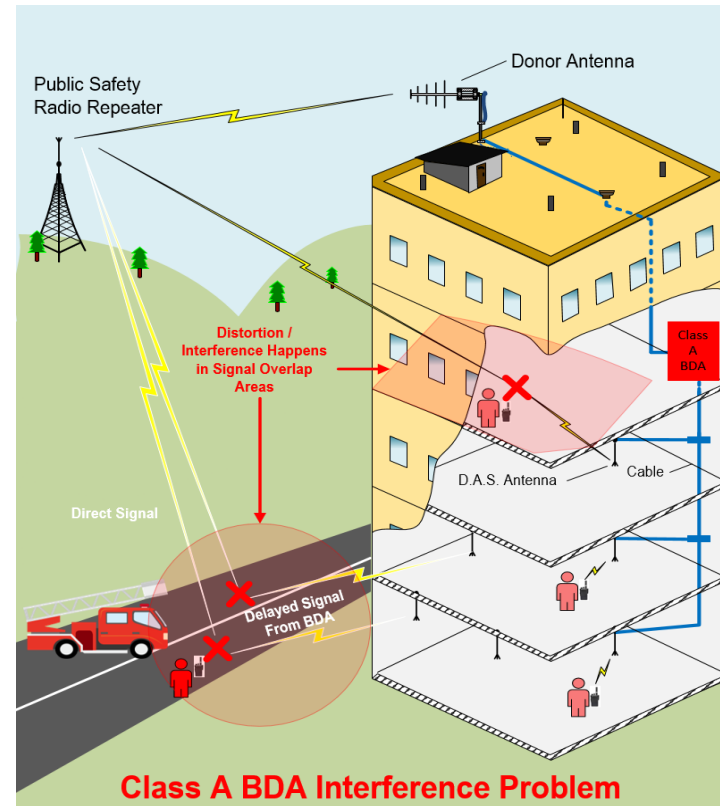
**Fact:** Intermodulation interference can equally happen with either class A or class B signal boosters, all it takes is two or more RF carriers. What does make a big difference is the

quality of the design and the immunity of the LNA (low noise amplifier) stage to high RF signals.

# CLASS A AND B – MYTH VS. FACT

**Myth:** Class A signal boosters do not create interference

**Fact:** Probably the least understood, yet the biggest shortcoming of class A signal boosters is the fact that they distort the radio signal by delaying it by more than 50 microseconds, which degrades the signal in the overlap areas and creates harmful interference.



# DEPLOYMENT

# TYPICAL DEPLOYMENT PROCESS

**DESIGN:** documents are created using the ERCES Signal Site Survey and then submitted to the AHJ for review and approval.

**PERMIT:** for installation of a BDA system is obtained by the BDA vendor, as required by the AHJ.

**INSTALL:** The Licensed Life Safety Contractor installs the cable, connectors, antennas, terminations and other RF components, and makes connections to the fire alarm system.

**TEST:** BDA vendor commissions, tests and documents the system in accordance with NFPA specifications.

**FINAL REPORT:** is submitted to the AHJ along with a request for inspection.

**INSPECT:** AHJ inspects the system and does several radio checks from different parts of the building and all critical areas.

**COMPLIANCE:** AHJ signs off on the system and provides a compliance certificate.

# TYPICAL ERCES SIGNAL SURVEY REPORT

**Inspection Notes:**

**Indicates CRITICAL AREA**

One reading will be taken from the center of each General and Critical Grid Square. Readings will be taken approximately every 50'. Critical Areas must have 99% passing Signal Readings. General Areas must have 90% passing Signal Readings.

Signal strength (dBm) Inbound Readings will be taken using a TechTravis Model 19923 P25 - 700MHz/800MHz Public Safety Radio. Signal Strength Inbound and Outbound Readings will be shown using Color Legend provided on each page. All readings reflect Inbound Signal Strength. Outbound Signal Strength shall be calculated based on path loss.

All frequencies used for testing were provided by City of St. Pete Beach. Signals tested are indicative of all frequencies required for use by first responders in the City of St. Pete Beach jurisdiction.

**Technician Notes:**

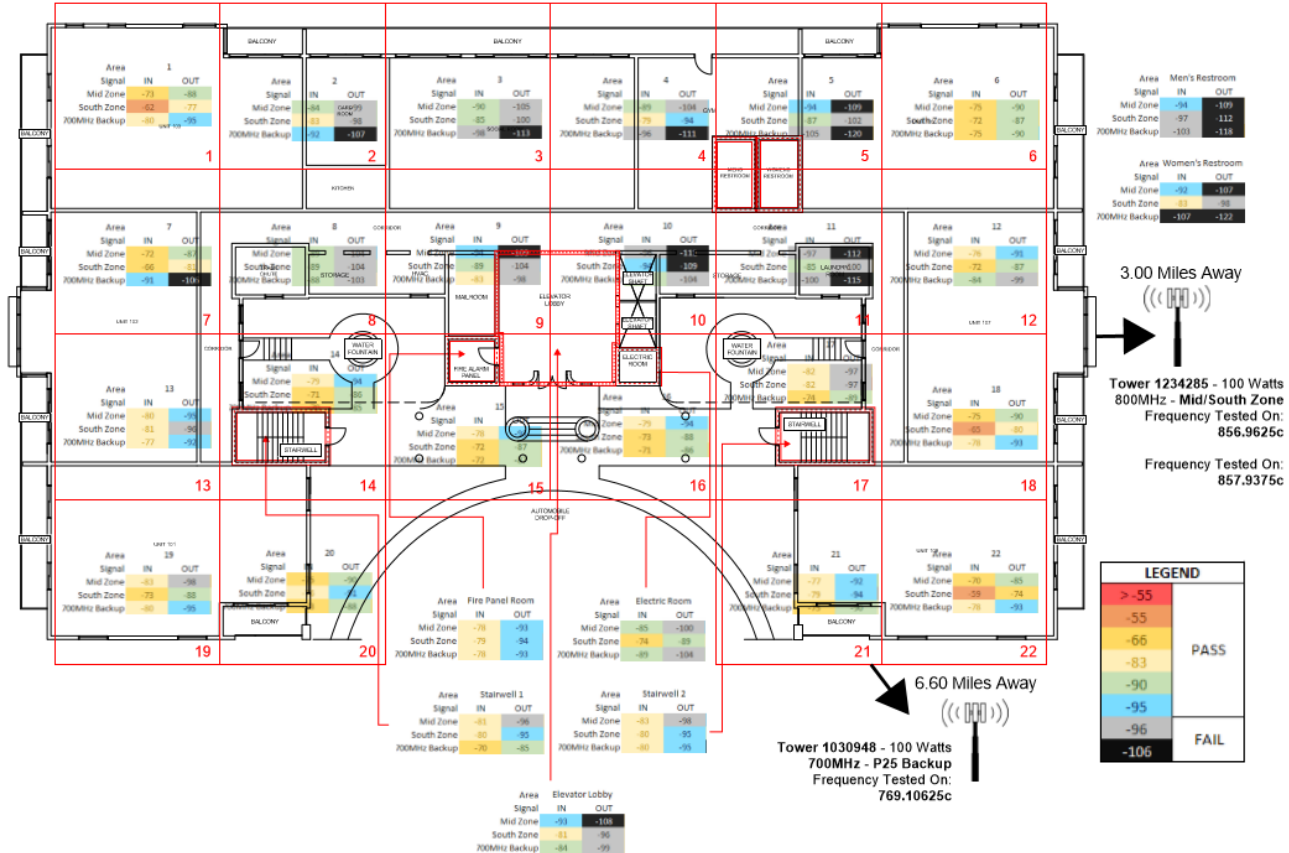
**Date of Testing:** November 28th, 2019

**Conditions During Testing:** Clear, Sunny Skies

**Building Materials Present:**

**Work Routines:** North Stairwell viable place for vertical run to roof, through landing concrete | Electric Room beside Elevator Shaft has Verizon provided through, potential viable trough

**Antennas:** Donor Antenna on center point of roof, either on higher roof above Electric/Elevator Room on Roof, or beside Nghter roof, due to locations of grounding locations Line-of-Sight visibility.

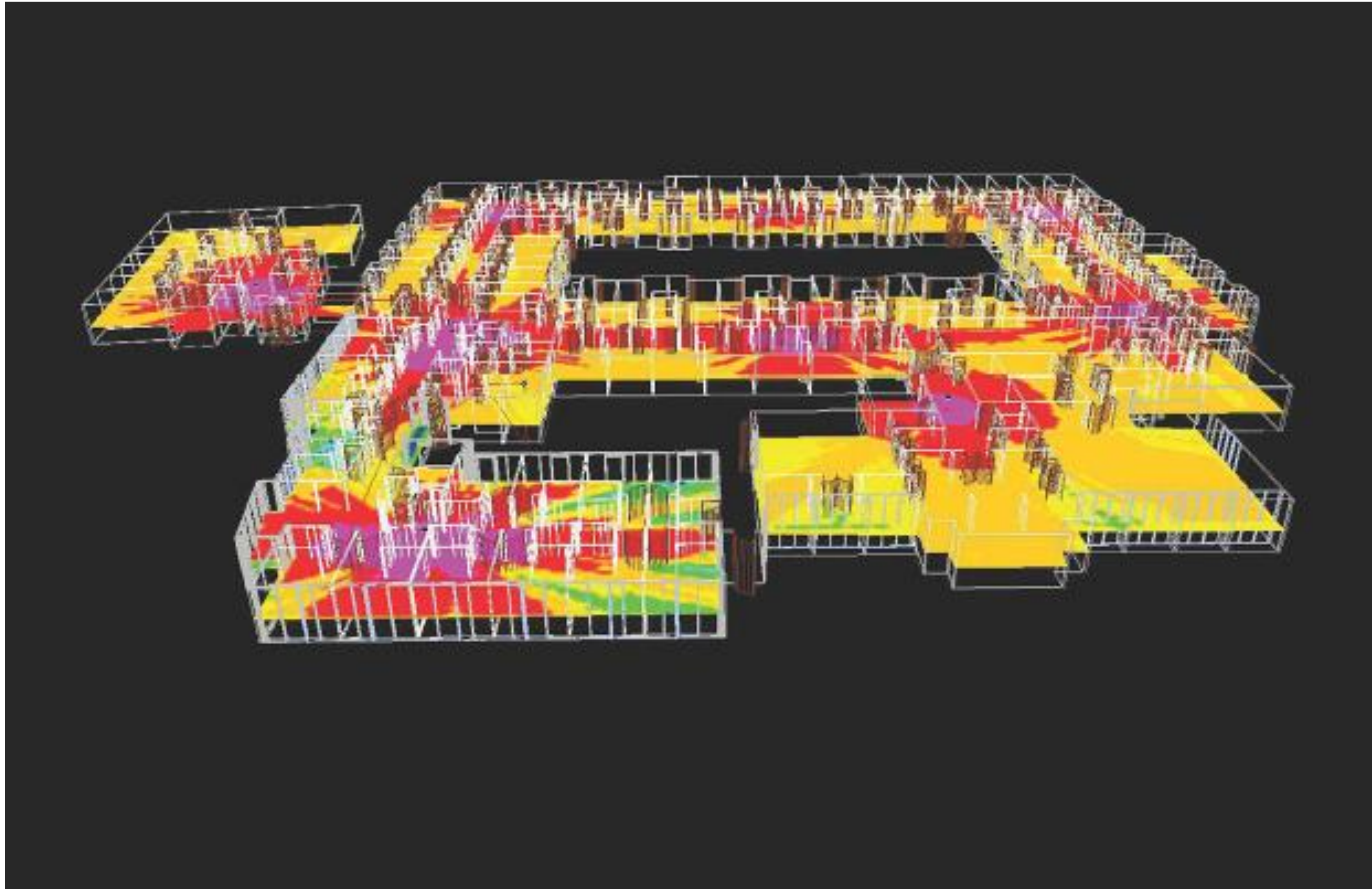


Simple to read color code. GRAY & BLACK FAIL!!

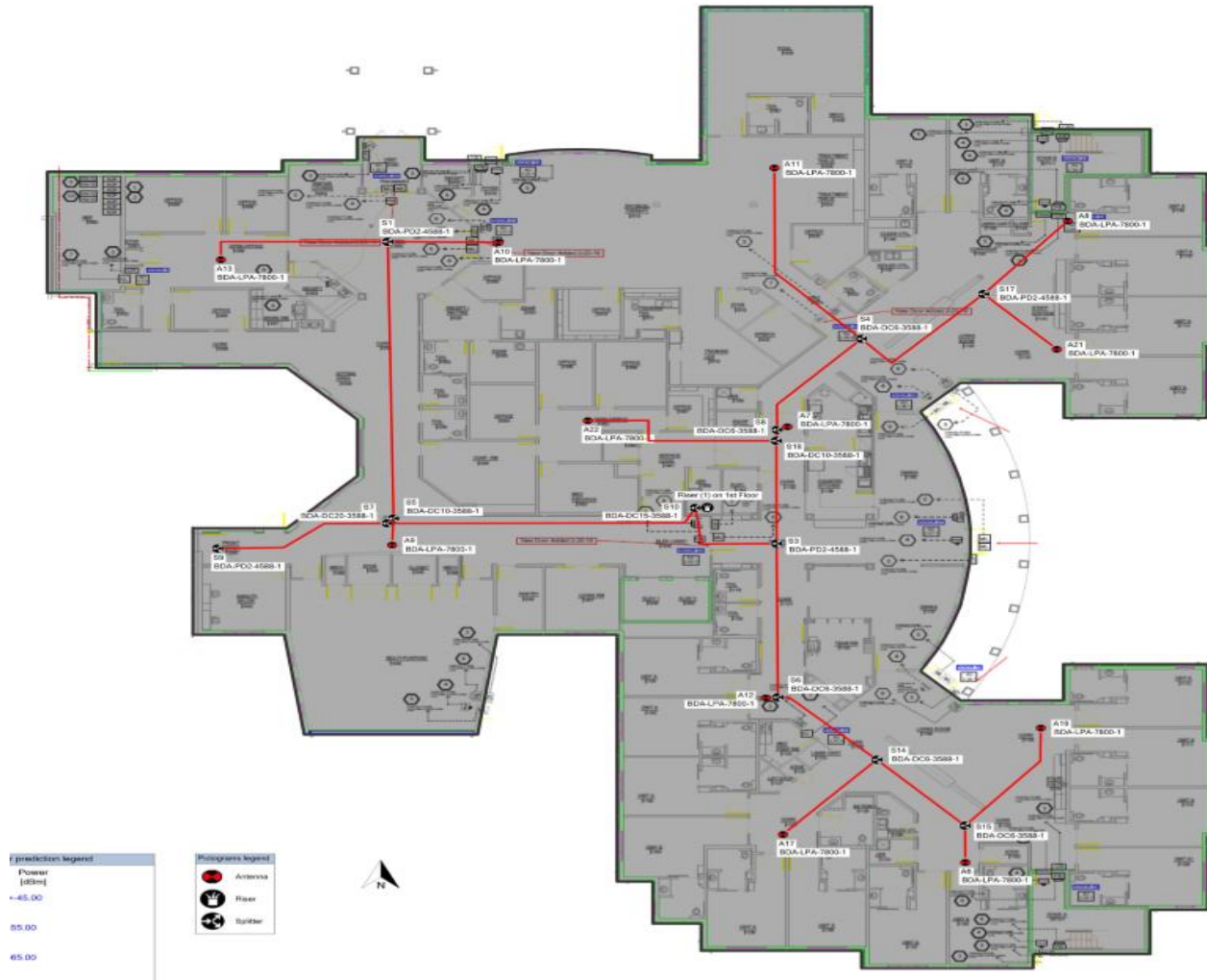
# HEAT MAP AFTER DESIGN



# IBWAVE 3-D HEAT MAP MODELING

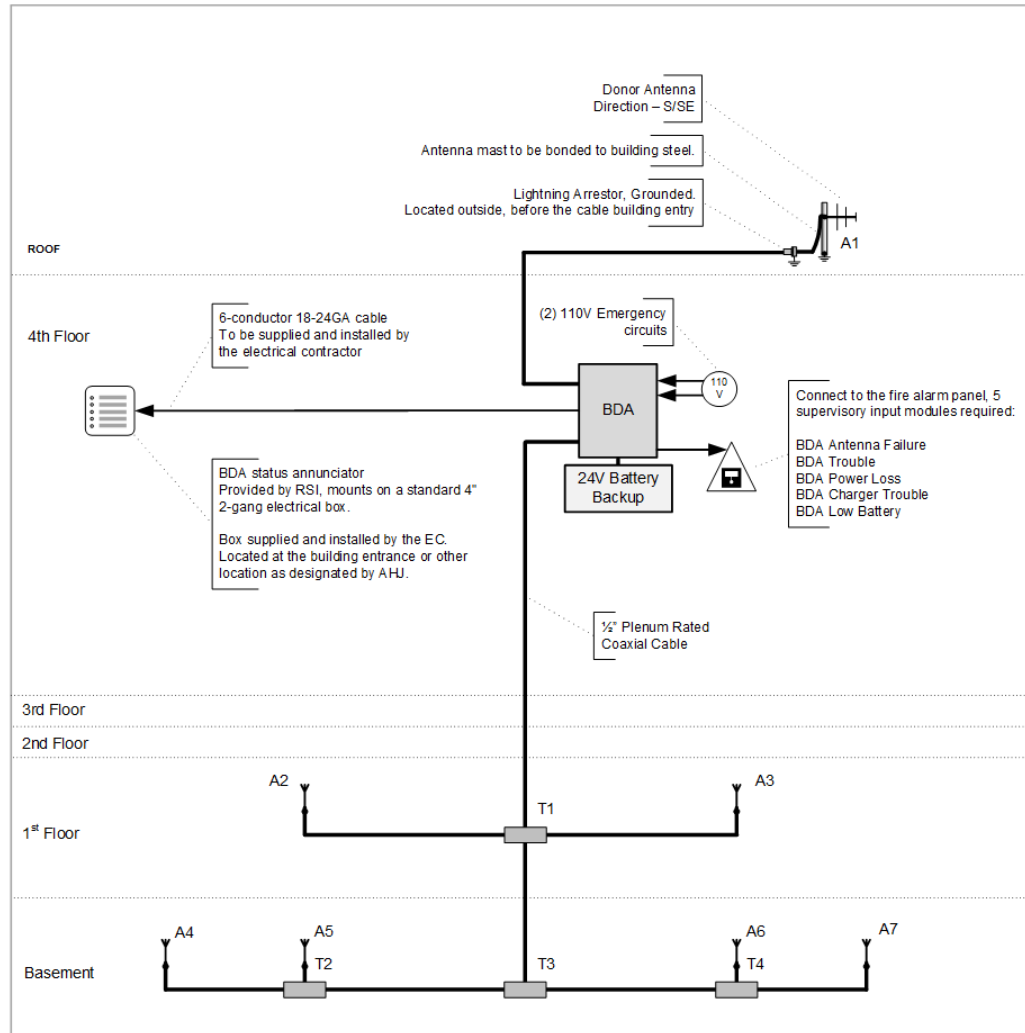


# INSTALLATION DRAWINGS





# RISER DIAGRAM OF A TYPICAL BDA SYSTEM



# INSTALLER REQUIREMENTS

**Must meet one or more and AHJ accepted: Based on State/Local Agencies supporting Code Licensure Regulations**

- Registered, Licensed, or Certified by AHJ/State
- Nationally recognized certification organization
- Brand/System Specific Factory Trained and Certified Fire Alarm and Emergency Communication System Installers

## **Requirement Verification**

Qualification/Certifications by AHJ

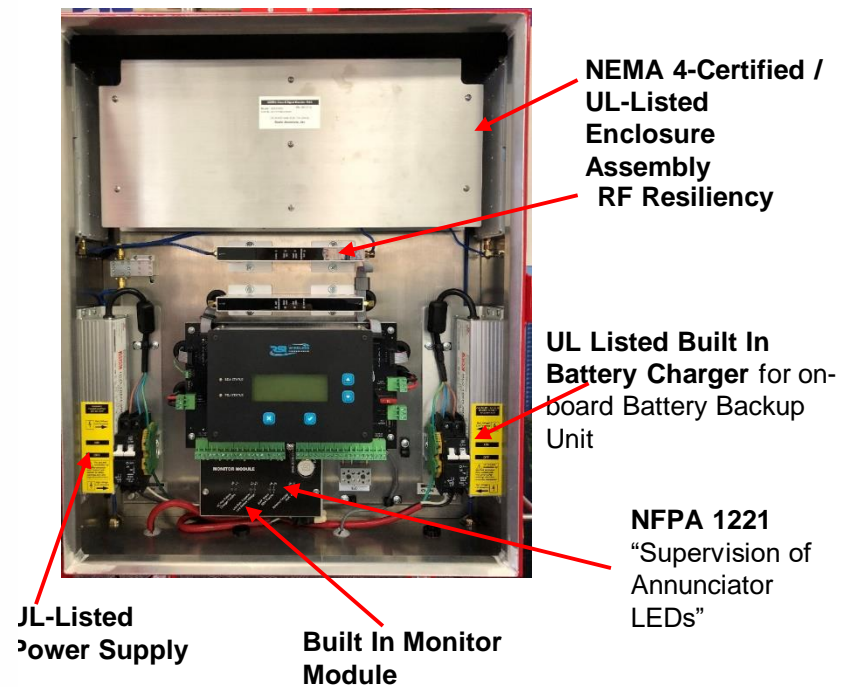
- FCC GROL License
- PS Project References
- Product Certifications

# FCC CERTIFICATION AND REGISTRATION REQUIREMENTS

- Signal Boosters must be FCC certified (manufacturer product brochures and product labels must include FCC ID number)
- BDAs are FCC certified to operate on the licensee's frequencies
- FCC Requires frequency licensees (FD, PD, municipality, etc.) to register all signal boosters that operate on their frequencies
- Registration is free and FCC has a simple on-line registration tool: <https://signalboosters.fcc.gov/signal-boosters>
- Registration needs to be done by the AHJ (frequency licensee) because it requires the licensee FRN (federal registration) number and FCC password.
- BDA vendor can assist if needed

# **BDA SYSTEM COMPONENTS**

# INTEGRATED, ALL INCLUSIVE SOLUTION



**NEMA 4-Certified /  
UL-Listed  
Enclosure  
Assembly  
RF Resiliency**

**UL Listed Built In  
Battery Charger for on-  
board Battery Backup  
Unit**

**NFPA 1221  
"Supervision of  
Annunciator  
LEDs"**

**JL-Listed  
Power Supply**

**Built In Monitor  
Module**

# INTEGRATED, ALL INCLUSIVE SOLUTION CLASS B BDA

- UL2524 for In-building 2-Way Emergency Radio Communication Enhancement Systems listing (OOI)
- CSFM listing
- NFPA 72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018 compliant
- Single portfolio to meet any application across US supporting all public safety frequency bands
- Various models available for UHF, VHF, 700 MHz, 800 MHz and multi-band
- Integrated dual power supply and battery charger with intelligent battery monitoring
- NEMA 4 Type Approved Equipment Enclosure and NEMA 3R Type Approved Battery Enclosure
- Supports higher system gain for efficient link budgeting



Class B  
BDA Update:  
UL 2524 2<sup>nd</sup> Edition  
Q4 2020

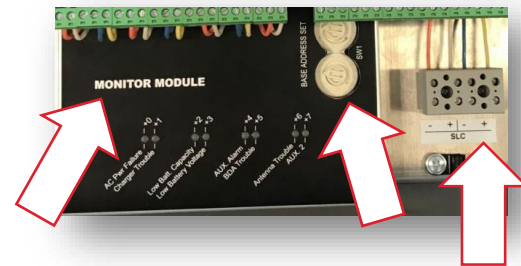
# BDA SYSTEM COMPONENTS

## Fire Alarm Panel Connection

BDAs must be monitored by the building's Fire Alarm System

Supervisory signals normally include:

- Normal AC Power
- Donor antenna malfunction
- BDA Failure
- Low Battery Capacity
- Loss of normal AC Power
- Failure of a Battery Charger



Addressable Monitoring Module is included for simple connection to Gamewell-FCI, or Farenhyt Series fire panels

# BDA SYSTEM COMPONENTS

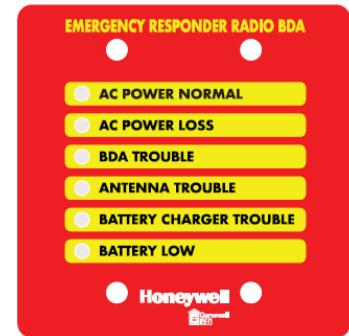
## Battery Backup

- All Honeywell signal boosters come with a fully integrated battery charger and battery diagnostics functions.
- Battery backup enclosure is available with the BDA
- Easy to install, designed to fit below the BDA



## Annunciator Panel

- Dedicated monitoring panel is required
- Specified in NFPA-72 and 1221
- Independent from fire alarm system
- Powered by the BDA power supply and battery
- Annunciator panel included with the BDA
- Easy installation on a standard 2-gang electrical box





# BDA SYSTEM COMPONENTS

## Donor Antenna

- Installed on the Roof of the building
- Pointing to the public safety radio repeater site
- High gain, high directivity
- Does not need line of sight

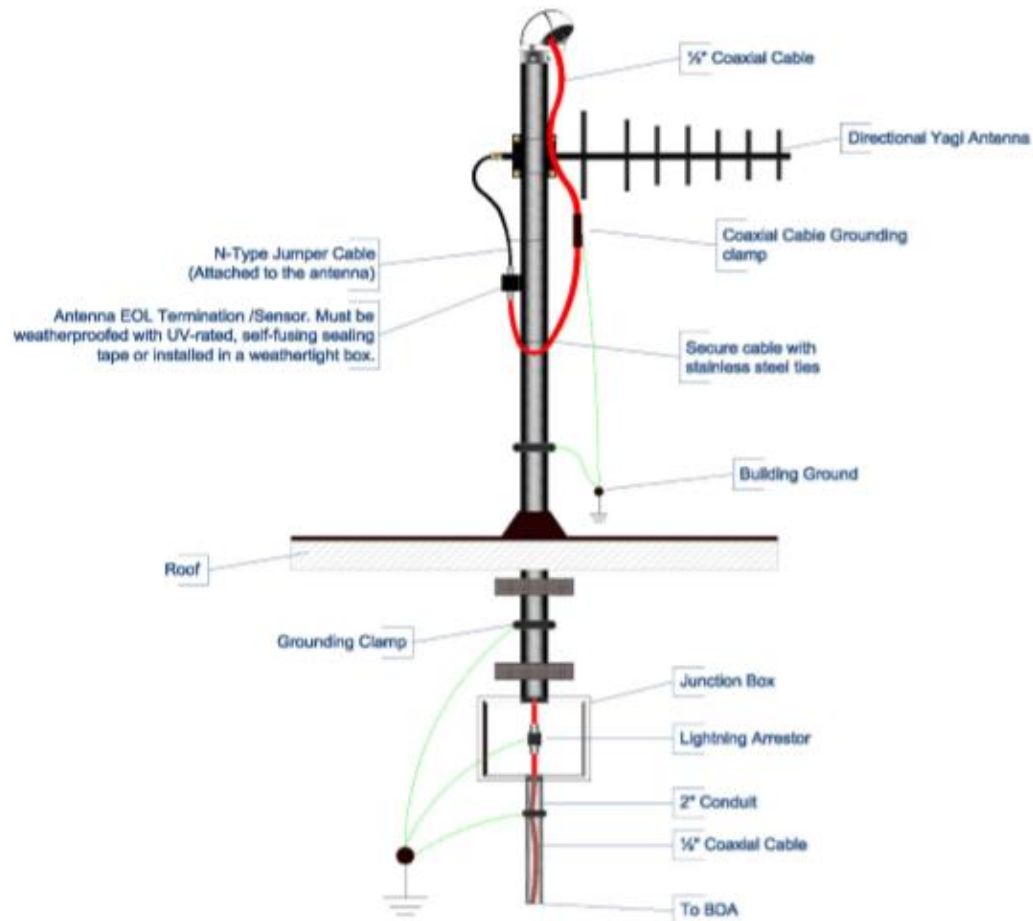


## Coaxial Cable

- Typically Plenum Rated, 1/2" diameter
- Low insertion loss is required
- Red cable
- Some AHJs have special labeling requirements



# DONOR ANTENNA INSTALLATION



# BDA SYSTEM COMPONENTS

## Signal Splitters and Couplers

- Used for signal distribution
- Come in different coupling values



## RF Connectors

- Installed using specialized tool
- Easily done by a trained technician



## DAS Antennas

- Fiberglass “stick” antennas have the best performance
- Other antennas, such as low-profile are available
- Various mounting options are available



# **SIGNAL BOOSTERS – CLASS A OR CLASS B? WHAT IS THE DIFFERENCE?**

**FCC classifies signal boosters as either Class A or Class B.**

**FCC Definitions per 47CFR90.219 rule:**

- Class A signal booster: “A signal booster designed to retransmit signals on one or more specific channels. A signal booster is deemed to be a Class A signal booster if none of its passbands exceed 75 kHz.”
- Class B signal booster: “A signal booster designed to retransmit any signals within a wide frequency band. A signal booster is deemed to be a Class B signal booster if it has a passband that exceeds 75 kHz.”

# CLASS A VS CLASS B COMPARISON

Class A	Class B
Maximum Passband is 75KHz. Intended to amplify no more than one channel at one time	Maximum Passband is more than 75KHz. It can amplify more than one channel at the same time It can either be broadband or band-selective.
Mainly intended for outdoor use (to extend outdoor coverage)	Indoor use only (improve in-building coverage)
Mobile use allowed	Fixed use only
Introduces signal delay (aka “group delay”) of over 50 microseconds resulting in signal distortion and interference in signal overlap areas	Very low to negligible signal delay (less than 2 us). Does not introduce signal distortion and interference in signal overlap areas.
Higher power consumption, higher heat dissipation = lower efficiency	Lower power consumption, less heat dissipation = higher efficiency
Higher complexity, requires digital signal processing	Less complex design, relies on tried and tested analog amplifiers

# CLASS A/B FIELD PROGRAMMABLE BDA / SIGNAL BOOSTER – COMING SOON

(Q3-2020 UL pending, Q4-2020 UL2524 2<sup>nd</sup> Edition)

- Covers both 700 and 800 MHz Public Safety Bands (Jul 2020 UL Pending), Full band UHF model (Sep 2020 UL Pending)
- Dual mode: Field Programmable Class A or Class B operation
- Industry-Leading capacity of 64 programmable channels for 7800 dual model (vs 32 on the competitive products)
- Easy to use PC-based USB programming software
- Channel Filters with programmable bandwidth, selectivity and signal latency, designed to meet requirements of all jurisdictions for either class A or class B operation
- **All-Inclusive design, consistent with our existing models:**
  - Same enclosure dimensions
  - Built-in addressable monitoring module
  - Built-in control panel with familiar user interface
  - Includes the NEW, 4-Wire Supervised annunciator panel with Audible Indication and “Lamp Test” feature
  - Supports up to 4 remote annunciator panels
  - Familiar design and user interface, consistent with our class B models

# **CLASS A/B FIELD PROGRAMMABLE BDA / SIGNAL BOOSTER - COMING SOON**

- **High Power Downlink– Full 37dBm / 5W Composite power output PER BAND = 10W Downlink for 700/800 dual band model !!**
- **High Power Uplink – Full 37dBm (5W)**
- Separate Downlink Amplifier Chains for 700 and 800 MHz bands (strong signals from one frequency band will not degrade or use up the available power from the other band)
- Oscillation Suppression
- Uplink Noise Squelch (group or per channel adjustment)
- Gain adjustment (group and per channel)
- High selectivity cavity duplexers with industry-leading performance and out of band rejection to prevent interference from cellular networks.
- Low noise, high interference immunity, designed for high-RF environments
- Full Diagnostics, built-in logger
- High Power Efficiency
- Includes 12 or 24-hour battery backup
- Extended operating temperature range (target 49C environment UL listed rating)
- Remote 2-wire Shutoff / Standby Control function (shuts off the amplifier stages without activating the supervisory, battery and power supplies remain supervised and monitored)

# UL2524 POWER SUPPLY - COMING SOON

- High Power Rating (7A @ 28.5V)
- 75Ah or 150Ah Battery Capacity
- 12 – 48 Hour Battery Backup (depending on the BDA model and battery capacity)
- Regulated 28.5V DC Output with Either AC or Battery power
- One unit can supply power and battery backup for up to TWO BDAs, including two supervisory lines for up to two BDAs
- Simple Connection to BDA: RJ-45 Jumper for Supervision by the BDA
- High Power Efficiency
- Type-4 Listed (NEMA-4) Sealed Enclosure, Lockable
- Extended Operating Temperature Range (target 49C environment UL listed rating)
- High Reliability with redundant AC Power Supplies
- Current Limited Outputs with Electronic Short Circuit Protection
- Built-in Convenience Power Outlet
- Easily serviced and replaced PSU unit
- Extensive diagnostics with LED indications on the built-in control panel
- Optional Relay Supervisory Module
- Battery wire harness and fuse are included
- 75Ah SLA Batteries Included



# CLASS A/B BDA (Q3/Q4 2020), CLASS B BDA UPDATE (Q4 2020) – COMING SOON



BDA Unit – Same form factor as current Class B



**New Battery Backup - Inside**

# UL 2524



# **WHAT IS THE UL 2524 PRODUCT STANDARD?**

**“The UL 2524 Creates a Product Performance Standard that allows manufacturers to design and list BDA systems to”**

**“UL 2524 Assures AHJs, A&Es, Building Owners & Occupants that Honeywell’s BDA Systems Perform the First Time and Every Time—exactly as prescribed in IFC 510.5.3 and NFPA 1221.”**

# UL 2524 - LISTED ERCES / BDA SYSTEM

## Oscillation Prevention

- BDA Detects Oscillation & Reduces Gain in 5dB steps until no further oscillation
- BDA Sends Trouble Signal to Fire Alarm Control Panel
- BDA Indicates Trouble on Remote Annunciator / Monitor
- BDA Continues normal operation with the maximum allowable gain

## Zero Noise Squelch

- Most BDAs normally generate a small amount of noise when idle.
- The cumulative effect of all this noise raises the “noise floor” on a frequency.
- Honeywell BDAs operate in “stand-by mode” and do not transmit any noise while idle.

**Address key concerns of AHJs**

# UL 2524 PERFORMANCE STANDARD FOR BDA SYSTEMS

<p><b>Areas Addressed by UL 2524:</b></p> <ul style="list-style-type: none"> <li>• Safety (risk of fire and risk of shock) requirements – construction and testing</li> <li>• Compliance with specific performance requirements in accordance with FC-2018 &amp; NFPA 1221-2016 (2019)</li> <li>• Reliability performance requirements applicable for life safety systems – construction and testing</li> <li>• Product marking and installation documentation</li> </ul>		<p><b>Scope:</b></p> <ul style="list-style-type: none"> <li>• Cover products (e.g. repeater, transmitter, receiver, signal booster components, remote annunciators and operational consoles, power supply &amp; battery charging system components) used for in-building 2-way radio emergency radio communication enhancement systems installed in a location to improve wireless communication at that location.</li> <li>• Does not cover passive RF components which are defined in UL 2524 as “any device that RF passes through that does not have an active electronic component that requires external power. This includes, antennas, splitters, couplers, coaxial cable and connectors. Passive components cannot amplify RF signals.”</li> </ul>
<p><b>Performance - Operation:</b></p> <ul style="list-style-type: none"> <li>• Normal AC power</li> <li>• Visual &amp; audible annunciation within 200 secs of fault for Loss of normal AC power, Battery charger failure, Loss of battery capacity (to 70% depletion), Donor antenna disconnection, Active RF emitting device malfunction, System component malfunction other than passive RF component which affects system performance.</li> <li>• Visual &amp; audible annunciation within 24 hrs. of fault for Donor antenna malfunction</li> </ul>	<p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>• NEMA Type 4 or 4X for all repeater, transmitter, receiver, signal booster components, external filters, and battery system components. Note: Rechargeable standby batteries are permitted to be contained in enclosures that comply with the requirements for a Type 3R.</li> <li>• The system shall be sufficiently modular to have the capability to support revised and/or additional system frequencies within the same frequency band of the bi-directional amplifier supplied to maintain radio system coverage as it was originally intended without the need to replace the system.</li> </ul>	<p><b>Reliability:</b></p> <ul style="list-style-type: none"> <li>• Variable Voltage Operation Test</li> <li>• Variable Ambient Temperature and Humidity Tests</li> <li>• Component Temperatures Test</li> <li>• Charging Current Test</li> <li>• Transient Testing</li> </ul>

*Includes UL 60950 Basic Safety, IFC Section 510 - 2018, NFPA 1221 – 2016*  
**Became an ANSI Standard October 2018**

# **BRAND NEW PRODUCT STANDARD FOR ERCES/BDA SYSTEMS**

**Covers products used for 2-way ERCES/BDA systems installed in a location to improve wireless communication at that location.**

**Current UL ensures 100% compliance to:**

- Basic installation & operation safety (UL60950)
- Installation specifications prescribed in NFPA 1221 2016 section 9.6, and
- Performance to the standards defined in IFC 510.5.3 2018, including section 1103.2 for existing buildings

# LISTED VS NON-LISTED PRODUCTS

- Approved, Tested, Certified, Conforms, Complies, etc. **NOT** same as Listed Product
- NRTL used is approved by OSHA to test and list products to UL 2524 standard

## Recent Press Release example:

Comba Telecom's CriticalPoint™ Public Safety Bi-Directional Amplifiers (BDA) and Battery Backup Unit (BBU) Pass UL 2524 Standards

*Comba Telecom conforms to UL 2524 standards meeting the requirements for public safety 2-way emergency radio communications enhancement systems*

2 Aug 2019 - Irvine, CA - Comba Telecom, Inc. today announced that their Bi-Directional Amplifiers (BDA) product line and Battery Backup Unit (BBU) have been certified to meet the UL 2524 standard for In-building 2-Way Emergency Radio Communications Enhancement Systems.

# 5 COMPANIES LISTED TO UL 2524 (CLASS B)



You may choose to <a href="#">Refine Your Search.</a>		
Company Name	Category Name	Link to File
<b>GAMEWELL-FCI</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.S36079</a>
<b>Guide Information</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.GuideInfo</a>
<b>HONEYWELL INTERNATIONAL INC</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.S36082</a>
<b>NOTIFIER</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.S36081</a>
<b>RADIO SOLUTIONS INC.</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.S36013</a>
<b>SILENT KNIGHT BY HONEYWELL</b>	In-building Two-way Emergency Radio Communication Enhancement Systems	<a href="#">UTMH.S36080</a>

UL 2524 listed products and their certification information can be accessed with UL Product iQ™ <https://iq.ulprospector.com/info/> by using the UL Category Control Number *UTMH* in the search filter.



# KEY TAKEAWAYS

# KEY TAKEAWAYS - WHY BDA / ERCES SYSTEMS ?

- Reliable radio coverage for Emergency responders in a building is not a luxury, it is a necessity and lives depend on it
- Most current adopted Fire and Building Codes require Emergency Responder Radio Signal strength and coverage to be measured in all new and some existing construction.
  - ERCES / BDA Systems are required by IBC, IFC and NFPA 1.
  - ERCES / BDA Systems should be installed, serviced and maintained in accordance with NFPA 1221 and NFPA 72.
- Code adoption and enforcement for BDA systems is increasing and it is critical for Engineers and End Users to include it in their building plans and specifications to
  - Reduce the risk to project completion with delays in certificate of occupancy
  - Future proof as code adoption & enforcement goes into effect for both new construction and existing buildings

# KEY TAKEAWAYS - WHY HONEYWELL ?

- **UL 2524 listed (listing by UL Labs) BDA system**
  - UL 2524 is a comprehensive product safety standard that ensure conformance with the critical performance and durability requirements of the ICC (IBC/IFC) and NFPA. These requirements provide firefighters, law enforcement officers and EMT with effective in-buildings communications during all types of emergencies and most importantly they are verified by independent third-party testing organizations such as Underwriters Laboratories.
  - Provides BDA equipment listed for the intended purpose similar to listing requirements for other life safety systems like Fire Systems
  - UL 2524 Listing = Certified Code Compliance
  - Future Proof:
    - 2021 Codes (IFC, IBC, NFPA 1) require UL 2524
    - NFPA 1225 – next version of NFPA requirements for BDA Systems currently in development also require UL 2524 (in current draft, final approvals pending)
- **Address major concerns with competitor and non-compliant BDA Systems**
  - Oscillation Suppression: Oscillation Interference due to improper install or failure can cause harmful interference to public safety radio system. Honeywell BDA detects oscillation and reduces gain till oscillation is neutralized, continuous operation with maximum allowable gain till trouble is addressed

# KEY TAKEAWAYS - WHY HONEYWELL ?

- Noise Suppression: Noise on uplink from BDA can add up and cause signal degradation of radio systems. Honeywell BDAs operate in “stand-by mode” and do not transmit any noise when idle.
- Supervision: Failure of a BDA system component may go unnoticed. Honeywell BDAs support supervised dedicated Annunciator panel and also include dedicated connections for monitoring by Fire Alarm Panel as required by NFPA and UL 2524.
- **Standardized manufacturer training, standardized survey & test tools, standardized manufacturer provided design process using iBwave software, installers with in-depth knowledge of fire life safety codes combined with UL 2524 listed products independently tested against performance standards enable Honeywell ERCES / BDA Solution to provide AHJs, A&Es and Building Owners the 100% assurance and confidence required to adapt these life safety systems and enable reliable in-building public safety radio coverage for emergency responders and save lives.**

**THE  
FUTURE  
IS  
WHAT  
WE  
MAKE  
IT**

**PARTNERCONFERENCE 2020**

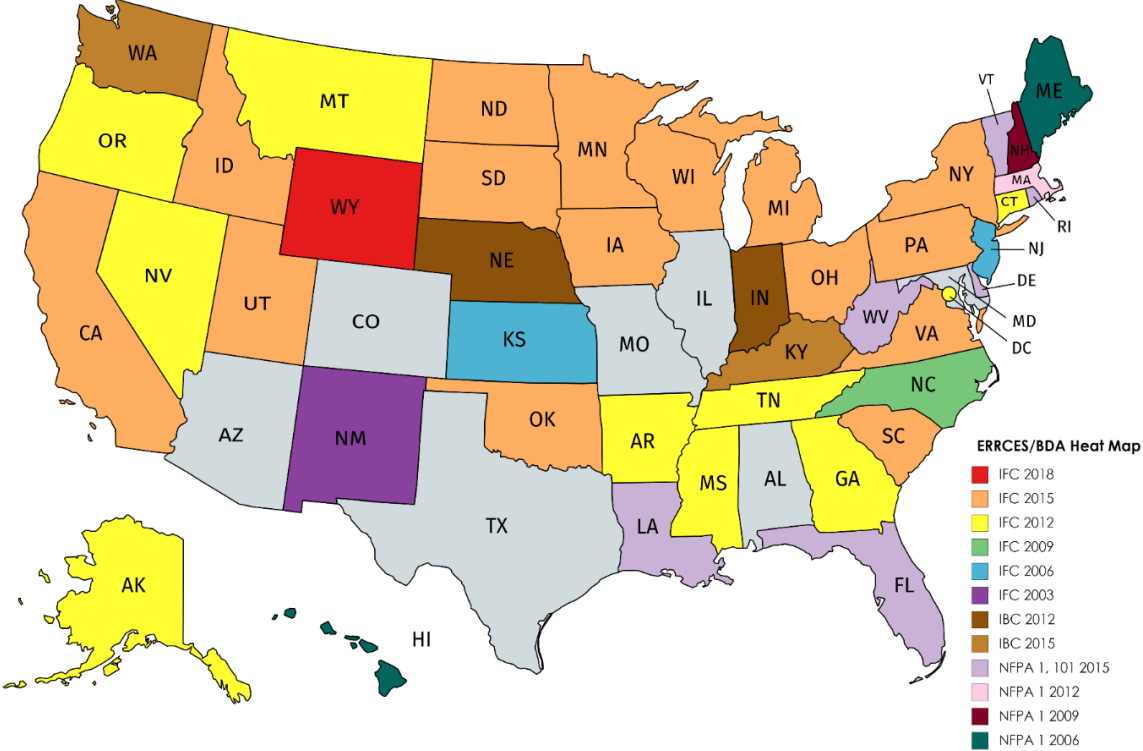
**THANK YOU**

**Honeywell**

# **STATE WIDE CODE ENFORCEMENT - APPENDIX**



# REQUIRED BY CODE IN MOST STATES



**Enforcement Is Growing as AHJs Learn about Life-Saving Benefits of BDAs**

# STATE WIDE CODE ENFORCEMENT

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Alabama	Yes (possibly). ICC website references adoption of IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC) NFPA 1 - Fire Code NFPA 101 - Life Safety Code	<a href="http://bc.alabama.gov/buildingcode.htm">http://bc.alabama.gov/buildingcode.htm</a>	2009 - IFC 2012 - NFPA	2013 Edition Adopted by Reference	2013	
Alaska	Yes, confirmed	International Fire Code (IFC)	<a href="https://dps.alaska.gov/getmedia/5b0d3e53-e7b8-432c-a870-6c66b009a284/13-AAC-50-55b;.aspx">https://dps.alaska.gov/getmedia/5b0d3e53-e7b8-432c-a870-6c66b009a284/13-AAC-50-55b;.aspx</a>	2012	2010 Edition by Reference	2010	
Arizona	No. Enforcement by jurisdiction	There is no state wide fire or building code. Codes are adopted by jurisdiction	<a href="https://www.dfbfs.az.gov/userfiles/files/ofm/Amendments%20to%202012%20IFC.pdf">https://www.dfbfs.az.gov/userfiles/files/ofm/Amendments%20to%202012%20IFC.pdf</a>	Codes adopted by Jurisdiction	Adopted by Jurisdiction	Adopted by Jurisdiction	
Arkansas	Yes, confirmed	International Fire Code (IFC)	<a href="https://up.codes/viewer/arkansas/ifc-2012/chapter/5/fire-service-features#5">https://up.codes/viewer/arkansas/ifc-2012/chapter/5/fire-service-features#5</a>	2012	2010 Edition by Reference	2010	Arkansas currently uses the 2007 AR Fire Prevention Code based on the 2012 IFC
California	Yes, confirmed	International Fire Code (IFC)	2016 CFC	2015	2013 Edition by Reference	NFPA 72 - 2016	The 2016 California Fire (CFC) is based on the 2015 IFC and section 510 has been deleted.



State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Colorado	No. Enforcement by jurisdiction	There is no state wide fire or building code. Codes are adopted by jurisdiction		Codes adopted by Jurisdiction	Adopted by Jurisdiction		Codes are adopted first at the local level in Colorado under "home rule" with state agencies adopting building and safety codes which apply to projects under state purview.
Connecticut	No, section 510 deleted from the 2016 CT Fire Code	International Fire Code (IFC)	<a href="#">2016 CFSC</a>	2012	2010 Edition Adopted by Reference	2010	The 2016 Connecticut Fire Safety Code CFSC is based on the 2012 IFC and section 510 has been deleted. The State Fire Marshal is in the process of creating the 2018 (CFSC) which is based on the 2015 edition of the IFC and will be effective in October of 2018. Section 510 of the 2018 CFSC has not been deleted or amended.
Delaware	Yes, confirmed	NFPA 1 - Fire Code NFPA 101 - Life Safety Code	<a href="#">In-Building Communications Regulation</a>	2015	2013 Edition by Reference	NFPA 72 - 2013	All newly constructed buildings of 25,000 square feet or more are required to have approved radio coverage to prevent "dead zone" areas
District of Columbia	Yes, confirmed	International Fire Code (IFC)	<a href="https://codes.iccsafe.org/content/chapter/9220/">https://codes.iccsafe.org/content/chapter/9220/</a>	2012	2010 Edition by Reference	NFPA 72 - 2010	
Florida	Yes, by Law	NFPA 1 - Fire Code NFPA 101 - Life Safety Code	File available	2015	2013 Edition Adopted by Reference	2013	In March of 2016 HB 535 was signed into law. The language for in-building radio requirements for existing high rise begin on line 1319 of the attached bill.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Georgia	Yes, confirmed	International Fire Code (IFC)	File available	2012	2010 Adopted by Reference	2010	Georgia has a state-wide fire code that is based on the 2012 edition of the IFC. The BDA requirements have not been removed (see the attached state amendments to the 2012 IFC).
Hawaii	Neither of these references show ERRCES to be deleted or amended	NFPA 1 - 2006; IBC-2012	Hawaii Fire Code - <a href="http://labor.hawaii.gov/wp-content/uploads/2013/02/State-Fire-Code-1-1-10-w-signatures.pdf">http://labor.hawaii.gov/wp-content/uploads/2013/02/State-Fire-Code-1-1-10-w-signatures.pdf</a>  Hawaii Building Code - <a href="https://ags.hawaii.gov/wp-content/uploads/2012/09/buildingcode-20170918.pdf">https://ags.hawaii.gov/wp-content/uploads/2012/09/buildingcode-20170918.pdf</a>	2006	2010 Adopted by Reference	NFPA 72 - 2010	Hawaii has had difficulty in adopting current codes because their State Building Code Council has not received funding from the State to move forward with many of their code adoption goals.
Idaho	Yes (possibly). ICC website references adoption of IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)	<a href="https://doi.idaho.gov/sfm/Prevention/Statutes">https://doi.idaho.gov/sfm/Prevention/Statutes</a>	2015	2013 Edition Adopted by Reference	NFPA 72 - 2013	
Illinois	No. Enforcement by jurisdiction	There is no state wide Fire Code. Codes are adopted by jurisdiction.		Codes adopted by Jurisdiction	Adopted by Jurisdiction	Adopted by Jurisdiction	
Indiana	No. Enforcement by jurisdiction	IBC IFC 2012 with Amendments see link	<a href="http://www.in.gov/legislative/iac/20140827-IR-675130341FRA.xml.pdf">http://www.in.gov/legislative/iac/20140827-IR-675130341FRA.xml.pdf</a>		2010 Edition by Reference	2010	
Iowa	Yes (possibly). ICC website references adoption of IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)		2015	2013 Edition Adopted by Reference	NFPA 72 - 2013	

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
<b>Kansas</b>	No. The state has adopted by reference the 2006 edition of the IFC	International Fire Code (IFC)		2006	Adopted by Reference	2007	The 2006 edition of the IFC has no requirement for the installation of BDA systems.
<b>Kentucky</b>	No. Section 916 of the Building Code is deleted	International Building Code (IBC)	<u>Kentucky Building Code</u>	2015	2010 Edition by Reference	2010	<b>Kentucky, with amendments, has adopted the 2012 edition of the IFC and is utilized for new construction projects.</b>
<b>Louisiana</b>	No	NFPA 101 - Life Safety Code		2015	2010 Edition by Reference	2010	NFPA 101 only permits BDA systems to be used in lieu of wired firefighter telephone systems in high-rise buildings.
<b>Maine</b>	<b>Possibly. Section 916 of the IBC was not amended or deleted</b>	NFPA 1	Adopted Codes in Maine Maine Building Code - <a href="https://www.maine.gov/decd/meocd/bbcs/index.html">https://www.maine.gov/decd/meocd/bbcs/index.html</a>	2006	2007 Edition	2007	
<b>Maryland</b>	Enforcement by jurisdiction	There is no state wide Fire Code. Codes are adopted by jurisdiction.		Codes adopted by Jurisdiction	Adopted by Jurisdiction	Adopted by Jurisdiction	
<b>Massachusetts</b>	<b>Yes, confirmed.</b>	<b>NFPA 1</b>	<u>State Amendments to NFPA 1</u>	<b>2012</b>	2010 Edition Adopted by Reference	2010	
<b>Michigan</b>	Yes. 2015 IBC and 2015 IFC no amendments		<a href="https://www.michigan.gov/ara/0,4601,7-154-89334_10575_17550-234789--,00.html">https://www.michigan.gov/ara/0,4601,7-154-89334_10575_17550-234789--,00.html</a>	<b>7/7/1905</b>	Adopted by Jurisdiction	Adopted by Jurisdiction	The ICC website claims the state has not adopted the IFC . The NFPA Code Finder website only references the IFGC. So it "appears" there is no state-wide fire code.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Minnesota	Yes, confirmed.	International Fire Code (IFC)	State Fire Code	2015	2010 Edition Adopted by Reference	2010	The 2015 Minnesota Fire Code (MFC) is based on the 2012 IFC and section 510 relating to BDA systems has been deleted from the MFC
Mississippi	yes but only STATE buildings	International Fire Code (IFC)	<a href="https://www.mid.ms.gov/legal/regulations/FM20101reg.pdf">https://www.mid.ms.gov/legal/regulations/FM20101reg.pdf</a>	2012	2013 Edition Adopted by Reference	2013	The MFPC only applies to state owned buildings, places of assembly, buildings over 75' in height, correctional facilities, and private fraternity and sorority houses. Jurisdictions may adopt local fire codes not less stringent than the MFPC, as determined by the Fire Marshal.
Missouri	No. Enforcement by jurisdiction	There is no state wide Fire Code. Codes are adopted by jurisdiction.		Codes adopted by Jurisdiction	Adopted by Jurisdiction	Adopted by Jurisdiction	There is no state-wide fire code. Most jurisdictions are on a recent edition of the IFC, but it's all locally adopted. The only exception would be state-licensed facilities such as day care and nursing homes and with a requirement to follow NFPA 72. Any BDA requirements is left up to the local AHJ to require.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Montana	Yes, confirmed	International Fire Code (IFC) International Building Code (IBC)	<u>Adoption of IFC/IBC</u>	2012	2010 Edition Adopted by Reference	NFPA 72 - 2010	23.12.601(4) The building code adopted by the Building Codes Bureau of the Department of Labor and Industry controls design and construction in Montana. If there is any conflict between the construction standards in the IFC and construction standards set forth in the building code, the provisions of the building code control.
Nebraska	Yes (possibly). ICC website references adoption of the IFC but unconfirmed if section 510 is amended/deleted.	International Building Code (IBC)		2012	2010 Edition Adopted by Reference	NFPA 72 - 2010	
Nevada	Yes, confirmed	International Fire Code (IFC)	File available	2012	2010 Edition Adopted by Reference	NFPA 72 - 2010	The current Fire Code made no changes to section 510 of the IFC. However, attached are the BDA amendments for Southern Nevada which are different than the State Fire Code.
New Hampshire	Yes, confirmed	NFPA 1	<u>State Fire Code</u> <a href="http://www.gencourt.state.nh.us/rules/state_agencies/saf-c6000.html">http://www.gencourt.state.nh.us/rules/state_agencies/saf-c6000.html</a>	2009	2010 Edition Adopted by Reference	NFPA 72 - 2010	Saf-C 6008.02 Exceptions to Fire Prevention Code. Section 11.10 has not been deleted or amended.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
New Jersey	Yes for new construction only, confirmed	International Fire Code (IFC)	<a href="#">2015 NJBC</a>	2006			Section 916 of the 2015 New Jersey Building Code (NJBC) section 510 of the IFC requires BDA systems in new construction. BDA is not required in existing buildings because N.J.A.C. 5:70-4 does not require it?
New York	Yes, confirmed	International Fire Code (IFC)	<a href="#">2016 NYSFC</a>	2015	2013 Edition Adopted by Reference	NFPA 72 - 2013	The 2016 New York State Fire Code (NYSFC) is based on the 2015 IFC and section 510 has been deleted.
New Mexico	No. The state has adopted by reference the 2003 edition of the IFC	International Fire Code (IFC)	<a href="http://www.nmprc.state.nm.us/state-firemarshal/docs/2006SFMOPlansReviewGuidelines.pdf">http://www.nmprc.state.nm.us/state-firemarshal/docs/2006SFMOPlansReviewGuidelines.pdf</a>	2003	Adopted by Jurisdiction	Adopted by Jurisdiction	New Mexico is behind with Fire Code adoption, they are on the 2003 IFC which has no requirement for the installation of BDA systems.
North Carolina	Yes, confirmed	International Fire Code (IFC)	<a href="#">2018 Fire Prevention Code</a>	2009	2013 Edition Adopted by Reference	2013	North Carolina is adopting the 2015 IFC and the only change to the attached amendments is deleting section 510.2 relating to existing buildings (page 72). The effective date of the next edition of the NCFPC is 1/1/19.
North Dakota	Yes (possibly). ICC website references adoption of the IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)		2015	2010 Edition Adopted by Reference	2010	

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Ohio	Yes, confirmed	International Fire Code (IFC)	File available	2015	2016 Edition	2016	The Ohio Fire Code (OFC) is based on the 2015 edition of the IFC. Attached is a SFM bulletin relating to BDA systems. <b>The requirements relating to existing do not apply retroactively to already existing buildings unless the building or system is altered.</b>
Oklahoma	Yes, confirmed	International Fire Code (IFC)	<u>Oklahoma Fire Code</u>	2015	2013 Edition Adopted by Reference	2013	The Oklahoma Fire Code is based on the 2015 IFC and section 510 has not been deleted or amended.
Oregon	Yes, confirmed	International Fire Code (IFC)	File available	2012	2010 Edition Adopted by Reference	NFPA 72-2010	Oregon Building Codes Division (BCD) published a proposed Rule (see attached) that requires BDA systems to be installed in buildings with below grade levels, more than 5 stories and more than 50K square feet as well as exempting BDA systems under certain criteria and requires survivability requirements.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Pennsylvania	Yes, confirmed	International Fire Code (IFC)	File available	2015	2007 Edition Adopted by Reference	2007	The Uniform Construction Code Review and Advisory Council announced the adoption of the of the 2015 edition of the International Fire Code (IFC). The attached document claims there were no state amendments to the IFC.
Rhode Island	Yes, confirmed	NFPA 1	<u>Rhode Island Fire Code</u>	2015	2010 Edition Adopted by Reference	2010	Chapter 11 of the 2012 edition of NFPA 1 has been adopted without amendments. Section 11.10 of NFPA 1 requires all new and existing buildings to have minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ.
South Carolina	Yes, confirmed.	International Fire Code (IFC)	South Carolina Fire Code <a href="https://codes.iccsafe.org/content/chapter/7162/">https://codes.iccsafe.org/content/chapter/7162/</a>	2015	2013 Edition Adopted by Reference	2013	The South Carolina Fire Code is based on the 2015 IFC and section 510 has not been deleted or amended.



State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
South Dakota	Yes (possibly). ICC website references adoption of the IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)		2015	2013 Edition Adopted by Reference	2013	The only state authority is the State Fire Marshal and is authorized to update the codes through the state rule-making process. The state authorizes counties and local governments to adopt model building codes, with the restriction that they adopt the IBC. Jurisdictions are permitted to amend the State Codes to conform to local needs.
Tennessee	Yes, confirmed.	International Fire Code (IFC)	<u>Tennessee Fire Code</u>	2012	2010 Edition Adopted by Reference	2010	The Tennessee Fire Code is based on the 2012 IFC and section 510 has not been deleted or amended.
Texas	No. Enforcement by jurisdiction	There is no state wide Fire Code. Codes are adopted by jurisdiction.		Codes adopted by Jurisdiction	Adopted by Jurisdiction	Adopted by Jurisdiction	There is no statewide adoption of the I-Codes or NFPA standards. The State Fire Marshal (SFM) has jurisdiction over conducting fire safety "inspections" of state buildings, daycare and elder-care centers, foster homes, hospitals, hotels and motels, university and college buildings, and other buildings upon request or complaint.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
Utah	Yes (possibly). ICC website references adoption of the IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)		2015	2013 Edition Adopted by Reference	NFPA 72-2013	
Vermont	Yes, confirmed	NFPA 1/101	<u>Vermont Fire &amp; Building Safety Code</u>	2015	2013 Edition Adopted by Reference	NFPA 72-2013	Chapter 11 of the 2015 edition of NFPA 1 has been adopted without amendments. Section 11.10 of NFPA 1 requires all new and existing buildings to have minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ.
Virginia	Yes, confirmed.	International Fire Code (IFC)	<u>2015 SFPC</u>	2015	2013 Edition Adopted by Reference	2013	The final regulations for the 2015 Virginia Statewide Fire Prevention Code (SFPC) have been published in the Virginia Register and section 510 requires increased amplification of the emergency communication system where required by the AHJ. The 2015 SFPC is based on the 2015 IFC and is effective on 10/16/18.
Washington	Yes, confirmed	International Building Code (IBC)	<u>Washington State Building Code</u>	2015	2013 Edition Adopted by Reference	NFPA 72-2013	The Washington Building Code (WBC) is comprised of the 2015 edition of the IFC. Section 916 of the IBC has been deleted from the Washington Building Code. Therefore, BDA systems are not required. Also, Chief Rogers claims the Spokane FD is not enforcing the BDA requirement because they have no issues with poor radio coverage in buildings.

State	BDA Required	IFC, NFPA 1, NFPA 101 Adoption	Link to Code or Bulletin	Edition Number	NFPA 72 Adoption	NFPA 72 Edition Number	Notes
West Virginia	No	NFPA 1, NFPA 101 and International Building Code	<a href="#">Fire and Building Code</a>	2015	Adopted by Reference	2013	The West Virginia Fire Commission has adopted statewide the 2015 edition of the IBC and section 4.1.j .1. of Title 87 (Fire Commission Legislative Rule) omits the reference to International Fire Code and substitutes with NFPA 101 Life Safety Code 2015 edition. NFPA 101 only permits BDA systems to be used in lieu of wired firefighter telephone systems in high-rise buildings
Wisconsin	Yes, confirmed	International Fire Code (IFC)	File available	2015	Adopted by Reference	2007	BDA systems should be required for new construction soon after the Department of Safety and Professional Services (DSPS) announced the adoption the 2015 edition of the IBC. The attached document has no reference that section 916 of the IBC nor section 510 of the IFC have been removed.
Wyoming	Yes (possibly). ICC website references adoption of the IFC but unconfirmed if section 510 is amended/deleted.	International Fire Code (IFC)	<a href="#">Wyoming Fire Code</a>	2018	Adopted by Reference		