



In-Building Communication When You Need It Most

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Safer Buildings Coalition Webinar Series

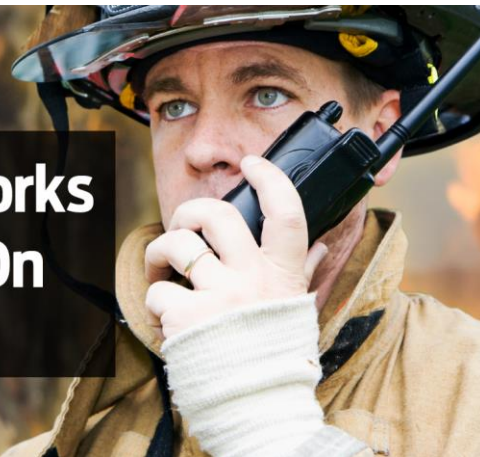
The Lifecycle of a Public
Safety Network
January 24, 2019



WEBINAR

Deploy Public Safety Networks First Responders Can Rely On

With the Safer Building Coalition, C² Systems and iBwave



Today's Panel



John Foley

General Manager
Safer Buildings Coalition



Scott Pollister

Director, Bus Development
C²Systems



Alex Jovel

Manager, Sales Engineering
iBwave Solutions



Member SHOWCASE

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Who We Serve:



AFU Wireless Industry First Responders Buildings and End Users



Design - Engineer - Architect Fire Alarm and Protection Construction Low Voltage and Specialty

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Thu Jan 24, 2019
[Webinar: Deploy Public Safety Networks](#)



- Online Resources
- Education
- Code Development
- Policy Advocacy

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AGENDA

 **C² Systems**

- Define The Need
- Technology Basics
- Integration Tasks
- Maintenance and Monitoring

 **iBwave**

- Solutions
- Fire Code Requirements
- Design Tool Demo
- Key Takeaways

 Q&A

This Webinar is being recorded – you will receive a link to replay

C² Systems - Overview

Consulting source and software developer (founded in 1999) for communication professionals and organizations seeking to establish, manage, or expand communication networks

Software Development | **Radio Frequency Services** | **In-Building** | **WLAN**



Auburn, NH

| East Syracuse, NY

| Clifton, NJ

| Beltsville, MD

Why the Need?

- Radio signals have limited propagation through various materials and therefore negative impact on reliable communications.



Concrete/metal construction, larger buildings



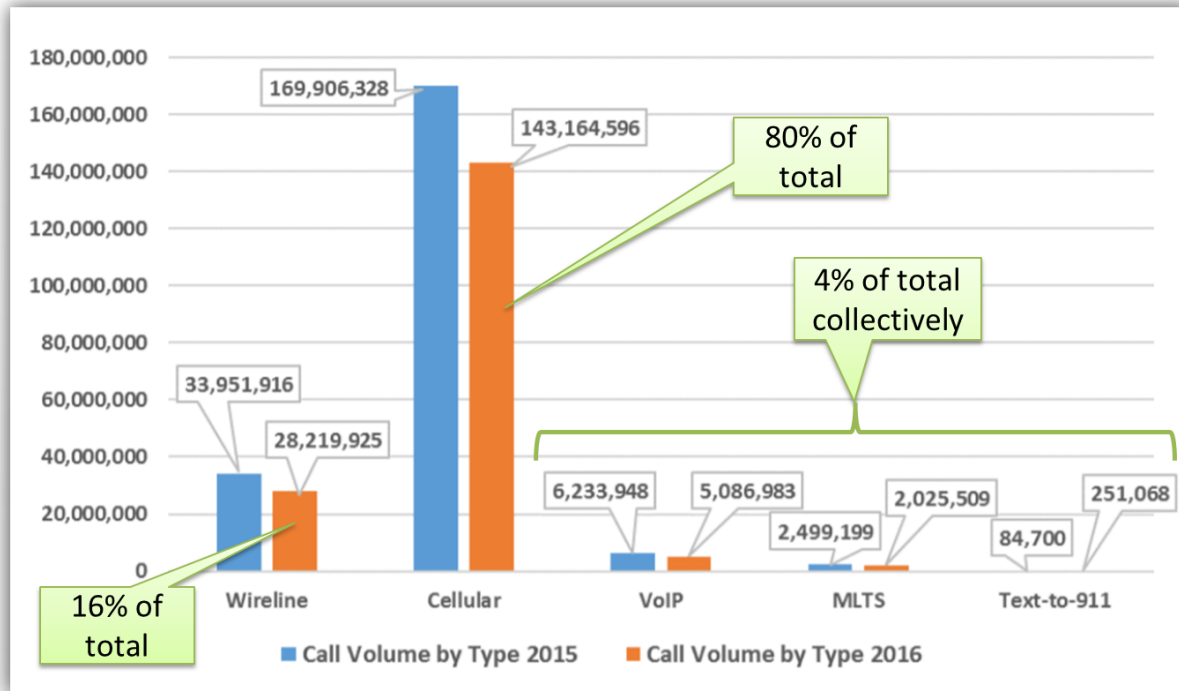
Low E-Glass and other energy saving cladding



Underground areas and how deep inside the building

- High % of calls for 911 originate from cell phones indoors.
- First responders need their LMR radio coverage, but large majority of first responders report using their smartphones while on the job.
- In emergencies, people rely on dependable voice communication and increasingly on data, telemetry, and location information.

Interesting 911 Call Stats



* 2017 National 911 Progress Report – US Dept. of Transportation, Washington DC

Cellular vs Public Safety In-Building Systems

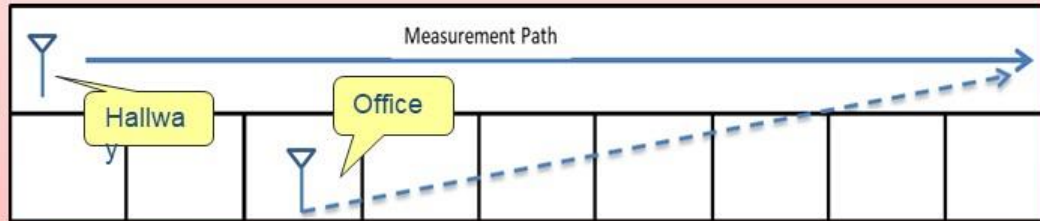
Cell	Public Safety
Meets carrier standards (RSRP, SINR, etc.)	Meets codes (AHJ interpretation / req.)
Freq: 600 MHz, 700 MHz, Cell (850 MHz), PCS (1900 MHz), AWS (1700 and 2100), WCS (2305-2320 and 2345-2360 MHz)	Freq: VHF (156-174 MHz), UHF (450-470 MHz), 700 MHz, 800 MHz
Capacity and coverage driven	Coverage only driven
Coverage in occupied areas (Office, meeting rooms, production areas, etc.)	Coverage in vital areas (fire pump rooms, exit stairs, elevators, fire command centers)
Revenue / customer satisfaction	First responder communication
Higher density required	Lower density / high availability
Typically dedicated signal source	Typically over the air (OTA) signal source
Monitoring typically done at carrier NOC or from 3 rd party maintenance vendor	Automatic-monitoring to dedicated panel is required + potentially others from AHJ
Equipment more standard and available	Equipment custom with longer lead times
Typically active fiber DAS (RF to optical)	Typically passive DAS (BDA with passive eq)

Requirements / Survey / Testing

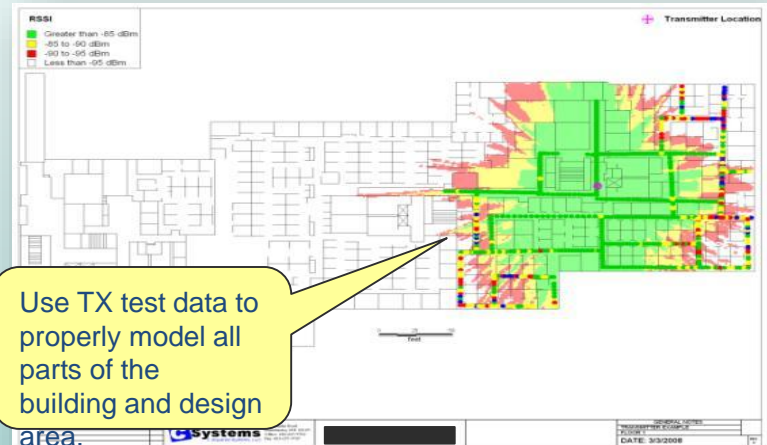
Requirements:

- ❑ Is public safety system needed?
Contact AHJ / Fire / Police / EMS
- ❑ Gather information (frequencies / coverage goals / existing systems / RF source)
- ❑ Code requirements (battery backup / enclosures / coverage requirements)

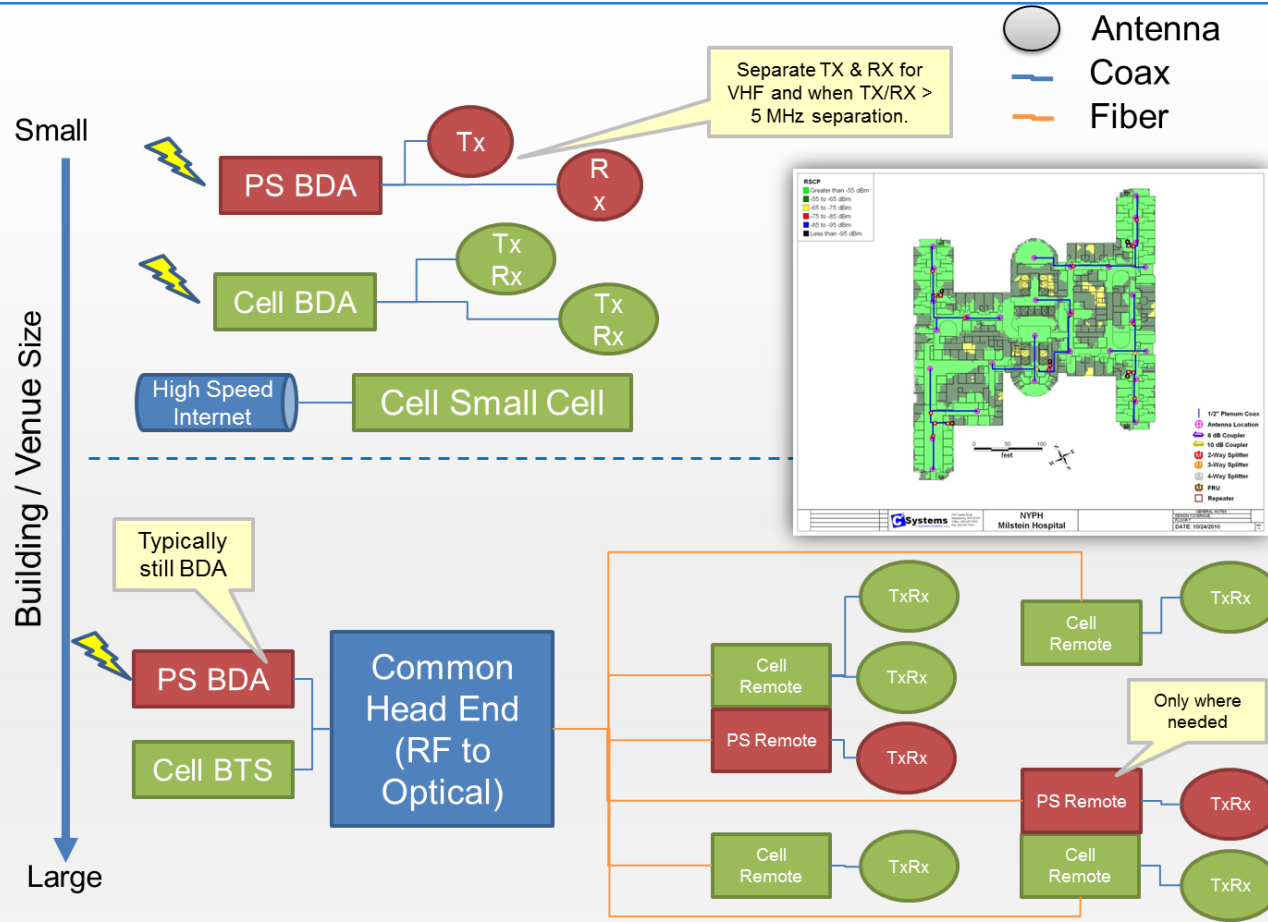
TX test to classify different path loss variables



Testing (Model Tuning):

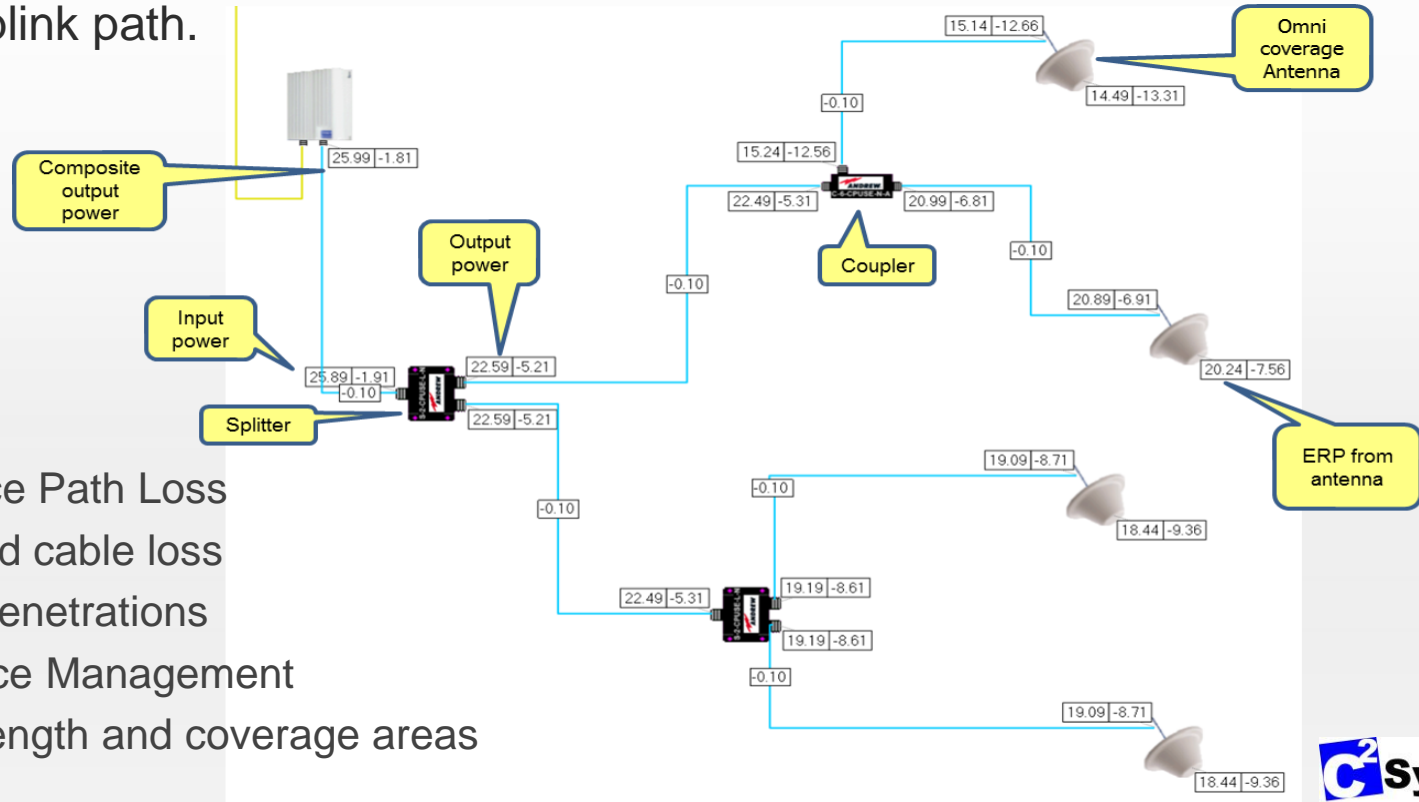


Design (example diagrams)



Actual Design with Link Budgets

Sum of all gains and losses within a RF path. Needed for both downlink path as well as uplink path.



- Free Space Path Loss
- Splitter and cable loss
- # of wall penetrations
- Interference Management
- Signal strength and coverage areas

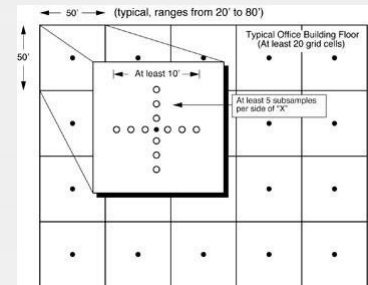
Install, Commissioning and Testing

Installation typically requires all equipment for PS to include NEMA-4 enclosures

- **There are three types of Testing:**
- System commissioning testing (performed by the building owner/contractor)
 - Pre-testing signal strength prior to AHJ acceptance testing with spec A
- Acceptance testing (under the supervision of the AHJ) (Grid Test)
- Annual testing (visual inspection, control channel signal level, no alarms/faults, UPS powers system for min of 4 hrs., donor antenna secure, + others.)

Grid Test

- AHJ allowed some discretion when it comes to testing.
- Recommended that measurements are to be collected while walking in an X pattern
- At least five measurements per side of the X and at least one measurement every five feet.



Maintenance and Monitoring

NFPA 1221 – System Monitoring Requirements

- System supervisory signals to dedicated panel shall include the following:
 - Normal AC power and Loss of normal AC power
 - Active RF emitting device failure (BDA, repeater)
 - Low-battery indication at 70 percent of the 12-hour operating capacity
 - Battery charger failure
 - Donor antenna malfunction
 - System component failure
- Communications link between the fire alarm system panel and the Repeater/DAS

More Proactive Monitoring

- Measure and track RF input and output power over time
- Trend fiber loss between all nodes of the system to identify degradations
- Alarm on parameter changes
- What other events outside the wireless network could cause outages
 - Overheating or HVAC failure
 - Backhaul communications within the building
- Proactive approach is the ability to identify potential issues with the system before they escalate to major problems

Monitoring – Beyond Minimum

How do you know the system is still providing reliable service?

- Options:

- Wait for your Customers, Tenants, or Employees to complain
- Walk the floors upon complaint to determine service level

Or...

- Monitor the equipment statuses and RF levels over time
- Place probes in important locations to monitor user experience
- Logically store and provide compliance info (reports and testing)



Summary & C Squared Systems Overview

Lessons Learned:

- Work closely with the venue owners and AHJs to ensure requirements and goals are defined clearly up front.
- Cellular DAS and Public Safety DAS are treated as two different systems as they have separate goals (not physically separate)
- Design system with maintenance in mind (access to eqpt., etc.)
- Test the system with the proper equipment to ensure the system performs optimally
- Proactive monitoring of the system beyond the minimum to ensure minor issues today don't become major problems tomorrow

In-building Public Safety – What is the “Job to be done”? *(HBS - Clayton Christensen)*

- ✓ Communicate effectively and reliably when needed for all stakeholders involved during emergency situations...

Who is iBwave?

WORLDWIDE STANDARD

for in-building network design and documentation

CONTINUOUS INNOVATION

simplifying tasks and streamlining workflows

COMPLETE SOLUTIONS

enabling all phases of in-building lifecycle

TRUSTED BY OVER 1,000

Corporations in 100+ countries





IBWAVE SOLUTIONS

FOR PUBLIC SAFETY

Solutions guiding you through every step of the **Public Safety** network design lifecycle



INITIAL RF TESTING



DESIGN and SUBMIT



INSTALL & COMMISSION



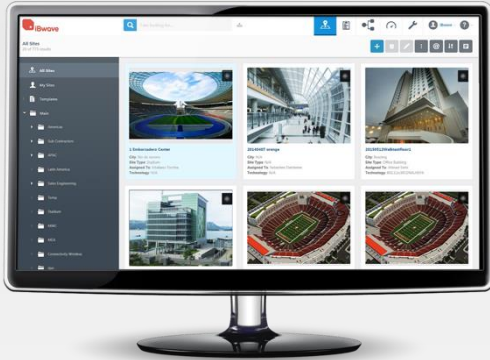
ACCEPTANCE TESTING



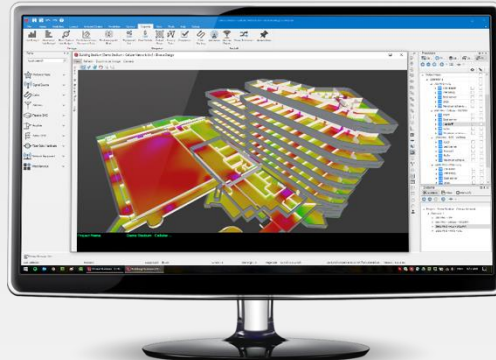
**We provide a suite of products and training
for planning, designing and delivering
dependable Public Safety networks.**



iBwave
UNITY



iBwave
DESIGN



iBwave
MOBILE



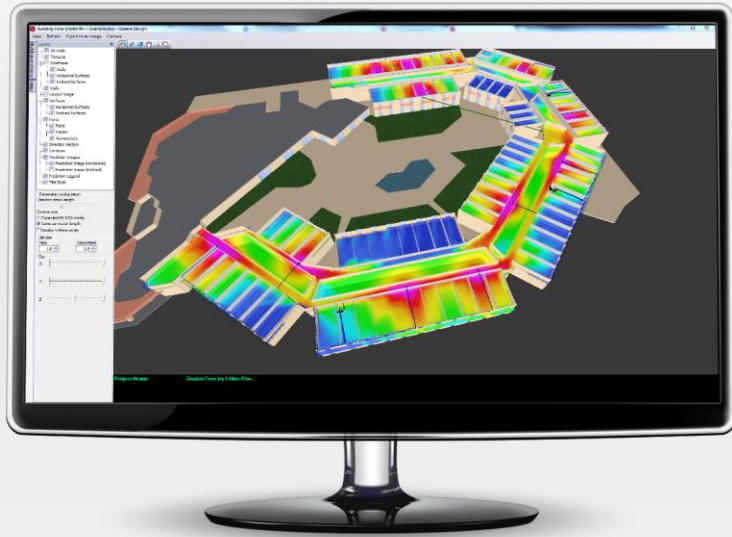


iBwave Viewer

Perfect tool for AHJs, project managers, construction crew or building owners to view, validate compliancy and print RF design projects in .ibw file format.

- Design plans, Floor plans
- Output maps, Survey measurements
- Compliancy results
- Print various reports to create proposals
- **Free Download**

Allow to view any iBwave Mobile project on the desktop and print survey report including Floor plans, annotations and Survey measurements.





RF GUIDELINES

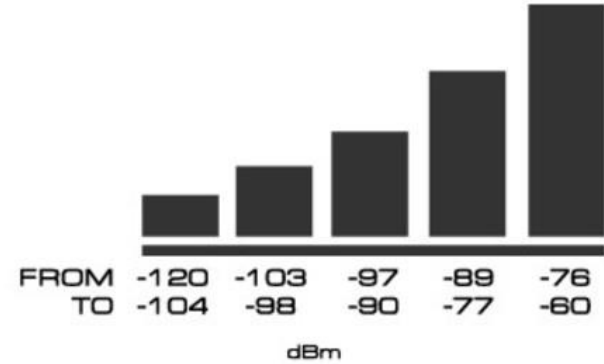
NFPA & IFC STANDARDS

NFPA & IFC STANDARDS

SIGNAL STRENGTH IN dBm

Quick Code Reference - NFPA Codes	NFPA 72 - 2013	NFPA 1221 - 2016
In-Building Solution Required	NFPA 1 Section 11.10	NFPA 1 Section 11.10
Pathway Survivability for	2-Hour for Riser Cable	2-Hour for Riser Cable

Quick Code Reference - NFPA Codes
In-Building Solution Required
Pathway Survivability for
Code
Planning Requirements
Lightning Protection required



Signal Strength & Area Coverage Required

-95 dBm – Sec. 24.5.2.3	DAQ 3.0 - Sec. 9.6.8
90% General – Sec. 24.5.2.2.1	90% General - Sec. 9.6.7.5
99% Critical – Sec. 24.5.2.2.2	99% Critical - Sec. 9.6.7.4

Signal Strength & Area Coverage Required

-95 dBm – Sec. 510.4.1	DAQ 3.0 - Sec. 510.4.1.1
95% General – Sec. 510.4.1	95% General - Sec. 510.4.1
99% Critical – Not Specifically Addressed in Sec. 510	99% Critical - Sec. 510.4.2 Reference to NFPA 1221

Isolation of Donor Antenna Required	Yes, 15 db – Sec. 24.5.2.3.3	Yes, 20 db – Sec. 9.6.9
Battery Backup Required	12 Hours – Sec. 24.5.2.5.2	12 Hours – Sec. 9.6.12.2
Signal Strength & Area Coverage Required	-95 dBm – Sec. 24.5.2.3 90% General – Sec. 24.5.2.2.1 99% Critical – Sec. 24.5.2.2.2	DAQ 3.0 - Sec. 9.6.8 90% General - Sec. 9.6.7.5 99% Critical - Sec. 9.6.7.4

Signal Strength & Area Coverage Required	-95 dBm – Sec. 510.4.1 95% General – Sec. 510.4.1 99% Critical – Not Specifically Addressed in Sec. 510	DAQ 3.0 - Sec. 510.4.1.1 95% General - Sec. 510.4.1 99% Critical - Sec. 510.4.2 Reference to NFPA 1221
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Source:

<https://www.saferbuildings.org/quick-code-reference>
<https://www.phonearena.com/>



DEMO

NFPA & IFC GUIDELINES IN iBWAVE



KEY TAKEAWAYS

KEY TAKEAWAYS

- Having in-building coverage is critical for Public Safety
- Use tools that help you validate you are meeting NFPA/IFC requirements



Visit iBwave at IWCE, booth 3244



**SAFER
BUILDINGS
COALITION**

Knowledge Partner



**INTERNATIONAL WIRELESS
COMMUNICATIONS EXPO**

Conference: March 4-8, 2019

Exhibits: March 6-7, 2019

Las Vegas Convention Center

Las Vegas, NV

Industry Discussion: **Solving the Problem of In-Building Connectivity**

Tuesday, March 5th, 2019 – 8:30 to 11:30 am. Session number T216

- Public Safety Wireless Mandate: In-Building Solutions
- Higher Education Public Safety Challenges
- 2017 Las Vegas Shooting – Communicating in a Crisis

Featuring:

- Alex Jovel – iBwave
- Alan Perdue – Safer Buildings
- Many Others