**The ABCs of BDAs**

In this eBook, we will explain what BDAs are, how they relate to first responder communications, and review some requirements that ensure your public safety BDA project is fully code compliant.

**What Are BDAs?**

BDAs, or Bi-Directional Amplifiers, are signal boosters that sustain two-way radio communication throughout facilities using wireless technologies or Radio Frequency (RF) cabling. These amplifiers can cover various frequencies to boost and distribute an RF signal in challenging environments.

A BDA works in tandem with a Distributed Antenna System (DAS), a collective group of RF antennas placed throughout a building wherever additional coverage is needed. The DAS includes a donor antenna that is usually mounted on the roof to grab an existing signal from outside. Bi-Directional Amplifiers are often installed in a closet or some other out-of-the-way place to amplify the signal then send it through the indoor antenna system to provide reliable two-way radio coverage throughout the building.

Communication is key in all types of facilities, especially for first responders. To ensure that firefighters, law enforcement professionals, and EMTs never lose their point of contact in a dire situation, many localities require BDAs to ensure adequate radio signal coverage everywhere inside and around a structure.

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**Did You Know?**

About 90% of public safety systems with first-responder in-building wireless radio coverage did not meet existing or impending fire codes from the NFPA and IFC.*

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Signal Challenges
Older buildings are often built with thick concrete and steel beams. While beneficial for durability and extreme weather conditions, this construction can block wireless signals. Newer buildings often include lots of glass and tighter designs for LEED certification, which inhibit signal coverage. Therefore, a BDA is needed to strengthen that signal.

Signal boosters are especially useful for areas with poor reception, such as stairwells, underground tunnels and hallways, and garages. To meet public safety communication code, BDAs are often required for office buildings, hospitals, schools, university campuses, manufacturing plants, warehouses, stadiums, and more.

About Public Safety BDAs
There are regulations in many states and municipalities requiring two-way radio coverage throughout a facility so that first responders can stay in contact with each other in an emergency situation. Coverage code statutes were developed after the 9/11 tragedies at the World Trade Center where public safety personnel could not communicate with each other.

Public Safety BDA Requirements
Many cities and counties in the United States have enacted local ordinances and codes that make it mandatory to add wireless in-building coverage for first responder frequencies. In general, public safety radios operate on the 450/700/800 MHz bands.

Many local jurisdictions have adopted codes based on statutes from organizations, including:

- National Fire Protection Association (NFPA)
- International Building Code (IBC)
- International Fire Code (IFC)
- Federal Communications Commission (FCC)
After installing MOTOTRBO two-radio systems across their production plants, as operating environments evolve, BearCom continues to design and install BDAs. When the facilities expand, add new machinery, or increase workforce, communication requirements change. The new BDAs maintain strong two-way radio coverage to keep plants more efficient and productive, while increasing safety for maintenance teams, security personnel, and other workers.

CASE STUDY: Major Manufacturer

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ICF-510 code requires 95 percent in-building wireless signal coverage with a minimum signal strength of -95 dB. The NFPA 72 Chapter 24 code requires 90 percent in-building coverage, which jumps to 99 percent for critical areas like fire pump rooms, exit stairs and passageways, and elevator lobbies. In addition, signal booster equipment must comply with FCC rules and regulations.

Installing public safety BDAs also involves a number of other requirements. For instance, public safety BDAs need to work under high heat and high humidity, while being able to function on a backup battery for 12-24 hours (depending on code requirements).

On top of that, all equipment supporting the public safety network should be housed in NEMA 4 compliant enclosures. These enclosures are constructed to withstand a direct water spray from a fire hose, while also providing protection against rain, sleet, snow, and solid objects such as falling dirt or windblown dust.

What If Your Facility Doesn’t Pass a Public Safety Communications Test?

Depending on locality, most facilities need to pass three types of public safety BDA performance tests:

- Commissioning tests performed by the DAS installation contractor to verify RF cable performance with optimized system settings.
- Acceptance tests under the Authority Having Jurisdiction (AHJ).
- Annual system performance and backup battery tests.

If your facility does not pass these tests, authorities may withhold building permits or a certificate of occupancy. Furthermore, first responders will be unable to communicate clearly with each other, thus endangering safety teams and delaying rescue efforts.
By ensuring that two-way radio signal strength passes public safety requirements, you will:

- Add safety for building occupants and visitors.
- Add security for first responders.
- Minimize the risk of property damage.
- Mitigate legal risk.

Providing BDA & DAS Solutions

A great way to ensure that your signal booster infrastructure meets code and performance standards is to work with a knowledgeable wireless systems integrator. An experienced provider can find the public safety frequencies used in your area, as well as understand your jurisdiction’s coverage testing protocols and the relevant FCC guidelines for your project.

It also helps to work with a company that understands the intricacies of two-way radio functionality, along with P25 standards that drive communications interoperability for public safety agencies. P25 is a suite of digital Land Mobile Radio (LMR) communications standards that serve the needs of public safety organizations. When first responders have communications systems that follow P25 protocols, they get improved audio quality, along with a smooth transition when migrating from analog to digital systems. P25 protocols were produced through joint efforts of the:

- Association of Public Safety Communications Officials International (APCO)
- National Association of State Telecommunications Directors (NASTD)
- Selected Federal Agencies and the National Communications System (NCS)

P25 is also standardized under the Telecommunications Industry Association (TIA).
Experience & Technical Expertise
Installing BDAs can be complex, and you may need help with this endeavor. Therefore, it’s beneficial to turn to a time-tested wireless communications provider who can deliver the BDA/DAS solutions and services you need. One such provider is BearCom. As Motorola Solutions’ largest value-added reseller of two-way radio systems, we have deep levels of expertise in wireless communications.

The BearCom Difference
When working with BearCom, you’re partnering with a wireless solutions provider who knows your industry, and provides the wireless voice and data solutions you need to be successful. Our team successfully deploys dozens and dozens of BDA and DAS solutions every year. Our solutions ensure complete two-way coverage for first responders, as well as enhance our customers’ UHF and VHF radio systems.

The BearCom Technical Services Group includes more than 150 highly knowledgeable, highly skilled wireless industry professionals, many of whom hold advanced engineering degrees. Our team stays up-to-date with wireless technology by earning the latest credentials for DMR and P25 networking, R56 site installation, and other key industry certifications. In addition, we are certified to use iBwave software to design the right BDA/DAS solutions.

CASE STUDY: Twin Office Buildings
During a Certificate of Occupancy inspection, the local fire marshal found that the new 18-story headquarters buildings for a large financial services company did not meet NFPA public safety radio coverage requirements. The deficient areas were the parking garage and a pump room. BearCom worked with the builder to integrate a BDA unit into the distributed antenna system and serve both buildings through a coax run across the connecting walkway. BearCom used channelized public safety frequencies and adjusted signal strength on the BDA so as not to interrupt cellular reception.

For a FREE consultation to learn how we can help execute your BDA and DAS plans, call our BearCompliance Hotline today at 844-883-8904. Or visit: bearcom.com/bi-directional-amplifiers-distributed-antenna-systems.