

# Beyond Code Requirements: How Distributed Antenna Systems are Critical to Building Operations

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**A**s a follow up to the first Technology & Trends column on two-way radios, in this column I discuss how facilities management (FM) must also understand the importance of distributed antenna systems (DAS). Even among some professionals, incorrect terminology and questions abound about DAS.

The topic mainly comes up during initial scope discussions for qualifications and proposals for new construction or major renovation projects, but it may be revisited at any time during a project—and hopefully *before* construction begins!

There are really two distinct purposes for DAS, although they are often mistakenly linked in discussions. One is for cell phones, and the other is for public safety communications, such as police, fire, and emergency medical services (EMS). These first responders use licensed-frequency radios that are in many cases similar to radios used by FM, campus security, housekeeping, and engineering professionals.

A DAS may or may not be needed in a building, depending on the radio frequency (RF) conditions of the built environment of the facility and surrounding areas. Per the National Fire Protection Association (NFPA) and International Fire Code (IFC), public safety radio reception is an absolute requirement. While cell service is not required by code, it is always expected by all occupants and visitors.

Traditionally, the default approach to both radio reception and cell service has been to simply build the building and “see what happens.” This approach can work in some areas where there are emergency responder antennas as well as cell towers in close proximity to the facility, in which case you might expect these services to sufficiently penetrate the building. But with the increase in steel structures

and low-emissivity (Low-E) glass envelopes (which reflect many higher radio frequencies), waiting to see what happens results in continued disappointment. If the building has subgrade levels, parking garages, or utilized high-efficiency Low-E glass, you likely will require a DAS.

## PUBLIC SAFETY DAS

- Also commonly referred to as first responder DAS, emergency responder DAS, or emergency responder radio communications system (ERRCS).
- Supports first responder VHF and UHF frequencies.
- Required by NFPA and IFC with stringent signal strength and floor-area coverage requirements. Occasionally there are additional requirements beyond the NFPA and IFC that many authorities having jurisdiction (AHJs) require. Many jurisdictions have a public safety DAS specification, guide, or document clearly outlining the additional performance, documentation, commissioning, and verification requirements for their jurisdiction.
- Public safety DAS is similar to a cellular DAS passive system, except for some additional fire-rated components, National Electrical Manufacturers Association (NEMA) enclosures, emergency power requirements, acceptance test procedures, etc. Depending on the jurisdiction and floor plans, certain components of the two systems may even be combined, except in larger buildings and those with high occupancies per square foot.

## CELLULAR DAS—PASSIVE SYSTEM

- Typically used in smaller, less complex stand-alone buildings.

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- A passive system uses bi-directional amplifiers (BDAs), essentially a repeater system taking the off-air signal from the roof and boosting it within the building. Passive systems are relatively easy to design and install. For 4G and earlier technologies, there are also minimum requirements for carrier approvals and negotiations, since they are simply rebroadcasting the macro network signal.
- Some BDA manufacturers are beginning to support 5G—although not with all carriers yet, and they are currently classified by the Federal Communications Commission (FCC) as industrial devices and require carrier approval for now. This should change in the next year, as more 5G BDAs come to market and the various carriers determine their 5G strategies.

### CELLULAR DAS—ACTIVE SYSTEM

- Usually deployed in larger, more complex facilities such as campus environments, airports, stadiums, large venues, and buildings typically greater than 500,000 sq. ft.
- Active cellular DAS or neutral host DAS can require a significant amount of coordination with the cellular carriers and approval processes. Owners and contractors can quickly become bogged down in the legal contracts between owners and carriers as well as the various market dynamics. Active systems are expensive due to the neutral host headend equipment as well as the cost of base stations that must be provided by the carriers. There can be a significant amount of equipment in a data room or in an isolated carrier service provider room.

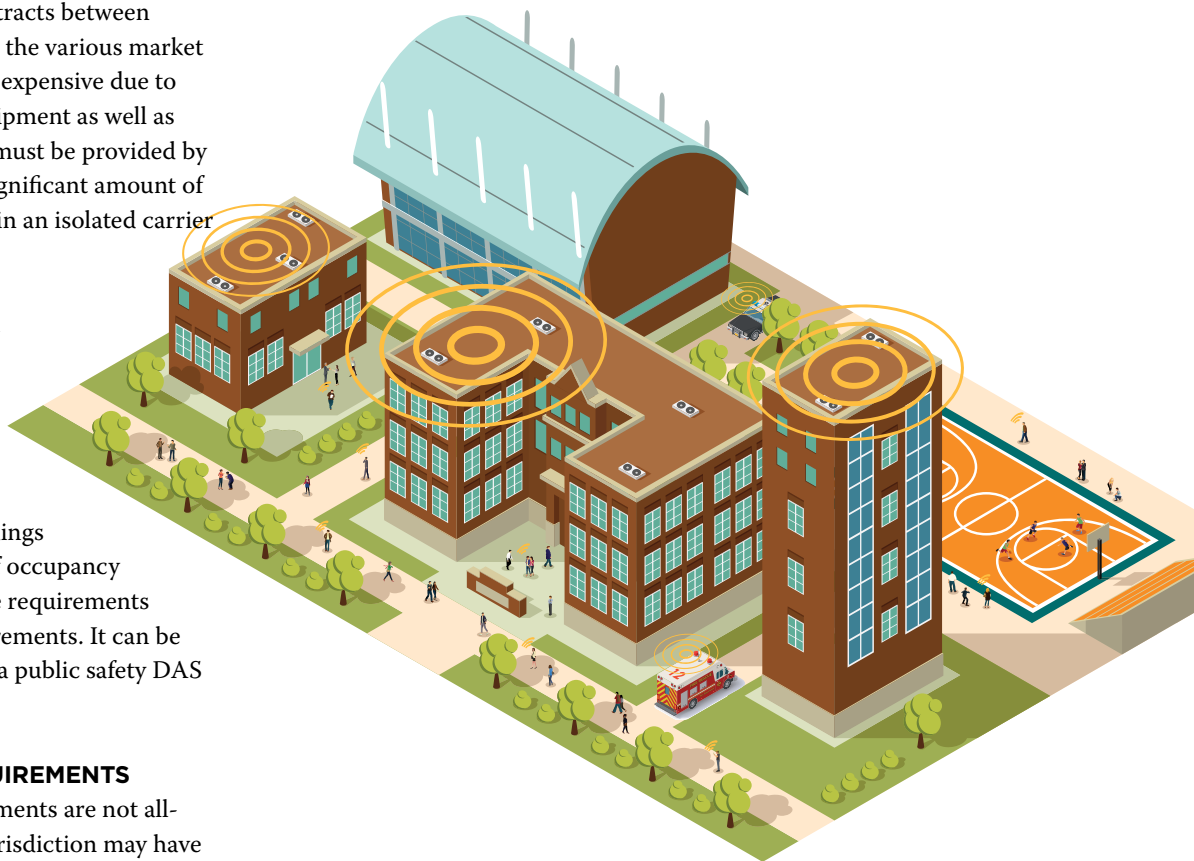
FM staff should at a minimum be conversational in these three different systems and understand what is currently deployed in their existing facilities or planned for new projects. Occasionally buildings do not receive their certificate of occupancy because first responder coverage requirements were not met per the AHJ requirements. It can be costly to retrofit a building with a public safety DAS near the project completion.

### HIGHLIGHTS OF NFPA REQUIREMENTS

Please note that these requirements are not all-encompassing, and your local jurisdiction may have

additional requirements or different guidance on these requirements.

- Critical areas of a building such as the fire command center(s), the fire pump room(s), exit stairs and passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ, shall be provided with 99 percent floor area radio coverage with a signal strength of  $-95$  dBm.
- General building areas shall be provided with 90 percent floor area radio coverage with a signal strength of  $-95$  dBm.
- If the requirements above cannot be met, a public safety DAS shall be designed and installed to provide the required coverage.
- All repeater, transmitter, receiver, signal booster components, and battery system components shall be contained in a NEMA Type 4 enclosure.
- All systems shall be powered by a secondary power supply capable of operation for at least 24 hours.
- Cabling between the public safety DAS equipment shall meet a two-hour fire rating along with the room that contains the equipment. Note that some jurisdictions require all riser cabling and sometimes all horizontal cabling to be two-



hour fire rated as well. This will add significant installation cost to a project.

- All public safety DAS must be inspected on an annual basis or when there is a renovation that changes the original field performance testing. Some AHJs require recertification every five years, but some are beginning to require recertification on an annual basis regardless of any renovations completed, to ensure the system is functioning properly. FM and owners need to be aware of this potential reoccurring requirement.

Most AHJs do not allow any other systems (cellular, customer-owned radio) on the public safety DAS. This ensures there are no interfering signal sources on the public safety system in the case of an emergency. If cellular reinforcement is required, a separate DAS is necessary.

When DAS comes up on your next project or renovation, be certain that everyone is utilizing the same terminology and on the same page about which type of DAS is being discussed and if it is in support

of public safety/first responder radio or cellular service. Also make sure that your designers are considering the appropriate amount of infrastructure and pathway requirements between the rooms housing the DAS equipment, the roof, antennae, uninterruptible power system (UPS) location(s), and repeater antennae throughout the building.

To make matters even more challenging, the higher radio frequencies of the new 5G cell service will have even less building penetration. Previously installed cellular DAS systems may or may not be easily upgraded to support 5G. Stay tuned for a future Technology & Trends column on 5G (as well as Wi-Fi 6, IoT, IBT, and other confusing terms) and its impact on your campus, building, and occupants. ☞

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