



## BDA (BI-DIRECTIONAL AMPLIFIER) AND DAS (DISTRIBUTED ANTENNA SYSTEM) SOLUTIONS

CSLS, LLC has deployed hundreds of BDA solutions in all types of buildings and facilities across the public, commercial, and industrial sectors.

### RECENT EXAMPLES OF CSLS, LLC INSTALLATIONS:

**Twin Office Buildings** During a Certificate of Occupancy inspection, the local fire marshal found that the new 18-story headquarter building 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. CSLS, LLC 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. CSLS, LLC used channelized public safety frequencies and adjusted signal strength on the BDA so as not to interrupt cellular reception.

**Distribution Center** At a 1 million-square-foot robotics distribution center in Minnesota, CSLS, LLC provided full RF engineering, design and deployment expertise while working with the general contractor, electrical contractor, and fire department to install a BDA solution that amplified 800 MHz public safety communications. The CSLS, LLC team successfully integrated the BDA into the existing two-way radio system and donor antenna to achieve radio signal coverage throughout the building, including the four-story section on one end.

**Hospital Campus** At one of the country's most respected healthcare and research facilities, CSLS, LLC installed systems in each of the seven buildings to boost radio signal strength. To enhance patient care and safety, a core goal of the project was to improve communications efficiency between the central dispatch center and facilities/maintenance staff. During design and deployment, CSLS, LLC successfully solved significant deployment challenges because many buildings had "clean areas" where installing cabling or equipment was not permitted.

**Schools** When CSLS, LLC is aware of new school construction projects, our team is proactively meeting with decision-makers, project managers, and fire marshals to help contractors meet signal strength coverage requirements for public safety frequency bands. In two recent new school projects near Houston, we helped spec in BDA systems early in the design process and then deployed the solutions during construction.

**Major Manufacturer** After installing MOTOTRBO two-way radio systems across their production plants, CSLS, LLC continues to design and install systems as operating environments evolve. When the facilities expand, add new machinery, or increase work force, communication requirements change. The new systems maintain strong two-way radio coverage to keep plants more efficient and productive while increasing safety for maintenance teams, security personnel, and other workers.

**Corporate Campus** Across their seven-building headquarters, a national insurance company wanted to increase coverage of their trunked UHF MOTOTRBO system while meeting state code for first responder signal strength. To record the signal strength of both systems, CSLS, LLC conducted a site walk using iBwave software on an RF analyzer. The final design included two BDA's on separate bands. To save the customer money by using a single cable run, CSLS, LLC installed a broadband antenna that covered frequencies for both the public safety bands and the UHF radio system, along with a diplexer to share the distributed antenna system.

*(See back for additional solution examples...)*

### NO ONE KNOWS BDA SOLUTIONS LIKE CSLS, LLC.

CSLS, LLC has deep levels of experience planning and deploying signal boosters.

- Our team has deployed several hundred systems
- Specialists at complying with Emergency Responder Radio Coverage (ERRC) codes
- FCC General Radiotelephone Operator License (GROL) licensed
- Expertise complying with IFC, NFPA, FCC and P 25 public safety standards
- iBwave Design Certified Level III
- Anritsu Site Master Line Sweep Certified
- Anritsu DAS Certified



#### QUICK FACT

CSLS, LLC designs and delivers high-performance wireless voice and data communication solutions that boost operating efficiency and increase safety. CSLS, LLC serves customers in all sectors of public service, public safety, industrial, and commercial environments.

## Additional Public Safety DAS Deployments:

**Distribution Center** After introducing robotics pick-and-pack equipment with Faraday cage enclosures, an internet retailer experienced RF issues that compromised communications for first responders, as well as their operational teams. They collaborated with CSLS, LLC to install Distributed Antenna Systems with Bi- Directional Amplifiers. These in-building signal boosters ensure optimal performance while fulfilling mandated signal coverage codes.

**Children's Hospital** CSLS, LLC added a BDA during construction at a new children's hospital to enhance the two-way radio system we deployed. The wireless network uses fiber optic cable to distribute signal between three LEED certified buildings. Our engineers commissioned iBwave software to develop the best possible design and the hospital has reported no signal issues since installation.

**Refinery** Even though their two-story, blast-proof building was relatively small, it was not possible to get a two-way radio signal from the inside to the outside. The original system design for radio coverage called for antennas on both floors, however, there was no access between the floors. By analyzing radiation patterns, CSLS, LLC solved signal issues with a design and deployment that mounted one BDA on the first floor and added antennas on the ceiling to boost signal strength to the second floor.

**High School** The local fire marshal determined there was insufficient radio coverage at the school to meet first responder code. Built in the early 1960s, the 52-acre campus had undergone add-ons and renovations over the years, which made compliance difficult. Since the facility did not have any fiber optic cabling available, CSLS, LLC achieved coverage by installing two BDA's that deliver a strong RF signal to each side of the building.

**Office Building** After a fire code audit, a 20-story building in the Midwest was notified that areas on three floors did not meet signal requirements for the city's public safety 800 MHz radios. CSLS, LLC installed a BDA unit and antenna to bring the first floor into compliance. Instead of running expensive wiring from the ground floor, our team used a creative design with a second BDA unit installed on the louvered fifteenth/sixteenth floors that housed the building's HVAC equipment.

**Major Midwest Zoo** The penguin exhibit housed in a multi-story building includes an aquatic habitat of more than 300K gallons and an underground section constructed of concrete, steel frames, cryogenic equipment, and glass. This area did not allow first responders to transmit or receive radio signals. CSLS, LLC installed a BDA, which solved communication issues in this challenging environment.

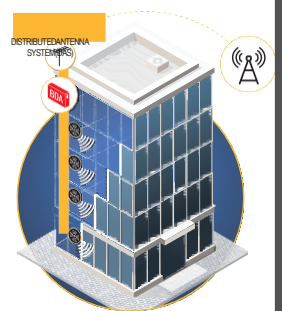
**Research & Development Center.** After a fire code survey indicated that two sections of a large manufacturer's combined office building and research/production facility did not meet radio coverage statutes, our customer entrusted CSLS, LLC to come up with the answer. Our team solved signal issues throughout the facility by deploying a BDA. During final testing, we installed two additional antennas to solve the remaining coverage issues in a shielded instrument room and a hallway where two types of construction converged.

**Church.** When a large church in Texas was planning a new children's wing, the county found dead spots in radio coverage. To meet code, CSLS, LLC is installed a BDA solution in an upstairs closet with a donor antenna on the roof. The county operates on a trunked VHF system, so the deployment includes four rack-mount notch filters covering as many as ten frequencies.

### KEY EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEMS (ERRCS) REQUIREMENTS.

CSLS, LLC has extensive experience meeting signal strength code using Distributed Antenna Systems (DAS) and Bi-Directional Amplifier (BDA) solutions.

- International Fire Code IFC-510 calls for in-building signal coverage of 95%
- National Fire Protection Association (NFPA) Chapter 24 stipulates 95 % coverage, except in critical areas – such as the command center, pump room, and exits – where coverage requirements jump to 99%
- The FCC summarizes their certification standards for BDAs in the document: *Rules to Improve Wireless Coverage Through the Use of Signal Boosters*



Distributed Antenna System (DAS) with BDA

For more information, please contact **Craig Sells** at [csells@cslsllc.com](mailto:csells@cslsllc.com)