



# TCOMM911 IN-BUILDING ERCES Technical Criteria v2.7

## 1. Definitions

BDA	Bi-Directional Amplifier. Sends and receives radio signals from an external radio network.
DAS	Distributed Antenna System. Antennas inside a building connected to a Signal Booster to facilitate in-building radio communications.
DAQ	Digital Audio Quality – A measure of understandability of a digital radio transmission.
ERCES	Emergency Responder Communication Enhancement System (Often referred to as a BDA/DAS, or DAS).
FCC	Federal Communications Commission. Responsible for radio frequency management nationally.
NFPA 1221	National Fire Protection Agency.
TCERN	Thurston County Emergency Radio Network – Digital P25 Phase 2 radio network providing radio communications to emergency services in Thurston County.
TCOMM911	Owner and operator of TCERN.
WAC	Washington Administrative Code.

## 2. Implementation Date

The date of compliance to the technical criteria defined in this document is **November 1, 2024**.

## 3. Standards

The technical criteria in this document complies with the latest edition of the following codes and standards:

- FCC 47 CFR 90.219 – Use of Signal Boosters.
- NFPA 1221 - Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.
- WAC 51-54A-0510 - Emergency responder communication coverage.

## 4. Signal Booster Specifications

For **new** Signal Booster, either due to new construction or retrofits/repairs:

- The Signal Booster must be capable of FCC Class A channelized operation.
- Segregation of cellular and public safety signals is required at every component and signal distribution level.



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- The uplink signal from the ERCES donor antenna to a donor RF site shall be no stronger than 20dB above the donor site noise floor (-95dBm to -105dBm) as measured at the receiver of the RF donor site.
- All repeaters, transmitters, receivers, signal-booster components, remote annunciators and operational consoles, power supplies, and battery charging system components shall be listed and labeled in accordance with UL 2524, Standard for In Building 2-Way Emergency Radio Communications Enhancement Systems.
- ERCES shall be designed to minimize the near-far effect
- The Signal Booster must support filter configuration for delay of  $\leq 15\mu s$
- The Signal Booster must be equipped with uplink squelch.
- The Signal Booster must be equipped with per filter Automatic Gain Control/Automatic Level Control.
- The Signal Booster must be equipped with anti-oscillation monitoring.
- The Signal Booster must be equipped with a web-based graphical user interface for control and configuration.

## 5. Signal Booster Configuration

- If a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to a minimum of 20dB above system gain.
- Signal Booster filters shall be programmed with a maximum of 3 channels per filter.
- All TCOMM911 frequencies relevant for the installation location shall be programmed into the Signal Booster. Frequency lists will be provided on a case-by-case basis by TCOMM911.
- Signal Booster uplink squelch settings shall be at least 5dB greater than DAS uplink input noise floor.

## 6. Donor Antenna

- Donor antenna shall be a directional antenna.
  - Donor antenna frequency range shall support the 700MHz public safety band, 769-805 MHz.
- For all ERCES projects requesting design approval after September 1, 2024, the donor antenna must comply with the following specifications:
  - A horizontal beamwidth of 30 degrees or less.
  - A vertical beamwidth of 30 degrees or less.
  - Front to back ratio of 20db or greater.



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- The Donor antenna must be permanently installed and oriented with an unobstructed view of one donor site. This criterion is concerned principally with near field obstructions such as parapets, HVAC units, ducting, screen walls, etc. Other obstructions in the line of sight, such as buildings, will be considered by personnel authorized by TCOMM911 during uplink validation.
- The Donor antenna must be oriented to the site specified by TCOMM911.
- Filters are required to mitigate the effects of nearby saturating cellular signals or other saturating signals identified at the site.

## 7. Fiber DAS

- TCOMM 911 recommends that campus and multi-building developments minimize the number of over-the-air ERCES by using fiber DAS.
- For ERCES projects requesting design approval after September 1, 2024, TCOMM 911 recommends that DAS add to campuses or developments, with the characteristics noted below, should incorporate the new building's DAS into the fiber ERCES, rather than adding a new Signal Booster.
  - Existing DAS infrastructure within 1000', as determined by the two nearest points of the buildings,
  - Ownership of the land between the buildings, or,
  - An active easement supporting telecommunications infrastructure to cross a throughfare or other property.

## 8. Signal Testing

- Max per channel donor site uplink receive level shall support DAQ3.0.
- Donor site uplink receive noise floor contribution, as viewed by a spectrum analyzer at the repeater multi-coupler, shall be minimal (i.e. less than 1dB).
- Upon request from -TCOMM911, -the building owner shall demonstrate to the fire code authority that ERCES is necessary to achieve successful public safety radio communications at the property. If the fire code official determines necessity has not been demonstrated, TCOMM911 may deny permission to rebroadcast the TCERN signal at the property.

## 9. Installation Workmanship

Prior to Uplink Validation:

- The donor antenna must be permanently installed and aligned.
- All interior antennas must be installed and connected.



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- All active components must be installed per manufacturer's guidelines and configured for operation.

## 10. Donor Sites

- TCOMM911 will identify the most appropriate donor site on a building-by-building basis

## 11. Frequency tables

- Frequencies will be shared with a vendor on request for a particular ERCES installation

## 12. System Performance

- Maximum Propagation delay of the ERCES (signal booster system) shall be 18us microseconds, or as otherwise approved by TCOMM911.
- Should the maximum propagation delay be exceeded within the building, there shall be a minimum differential of 18 dB between the signal a portable radio receives from the signal booster and the signal a portable radio receives from the macrosystem.
- The downlink gain of the signal booster and design of das antenna locations shall be optimized such that the indoor distribution antennas do not transmit more power than required to prevent bleeding of RF outside the building.
- Macrosystem dominance will be tested at 3 feet from entrance and emergency egresses.
- Exterior DAQ will be tested with the ERCES operational to ensure communications outside the building are not degraded. DAQ of less than 3.0 with the ERCES operational will not be accepted.

## 13. Process

- ERCES vendors must receive a copy of the signed re-broadcast agreement between the property owner and TCOMM911 prior to turning on the ERCES to begin system commissioning and optimization. All ERCES commissioning and optimization activities must be carried out without transmitting on or otherwise connecting to TCERN.
- Permission to transmit on or connect to TCERN will not be granted until UL validation is complete, and a Rebroadcast Agreement is signed with TCOMM911.