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# PROCESS AND TECHNICAL REQUIREMENTS FOR EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEMS

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## INTRODUCTION

Building owners or developers must submit plans for the design and obtain permits for any proposed Emergency Responder Communications Enhancement System (ERCES) installations to Fairfax County's Department of Information Technology (DIT), Emergency Communications Branch, Radio Services Center staff for review, approval, and selection of a donor site. The County has defined the following process for owners or developers planning new buildings or modifications to existing buildings that install an ERCES voluntarily or as required by the Virginia Construction Code – Part 1. Complete the following steps in the sequence outlined to ensure all Federal Communications Commission (FCC) and Fairfax County (FFXC) regulations and requirements are met.

The following terms describe In-Building Emergency Communications Coverage systems, which provide in-building two-way radio coverage for first responders:

- Emergency Responder Communication Enhancement System (ERCES)
- Emergency Responder Radio Communications Systems (ERRCS)
- Bi-Directional Amplifier Systems (BDA)
- Distributed Antenna Systems (DAS)
- Signal Booster
- Public Safety Repeater

This document will use ERCES as the term to describe these systems.

## STEP 1 – CONDUCT SYSTEM PLANNING AND DESIGN

The applicant shall base the design of the system on the requirements found in the [Virginia Construction Code – Part 1](#), [NFPA 72, National Fire Alarm and Signaling Code](#), and [NFPA 1225, Standard for Emergency Services Communications](#) to ensure a compliant ERCES project design and installation. A qualified integrator or installation firm shall design, install, and activate the ERCES as a part of the building project. DIT provides consultation assistance to the integrator / installer and directs the selection of the donor site(s) for the proposed ERCES. Whether the installation is part of new construction or in an existing building, the applicant must obtain separate building; electrical / low voltage voice/data (ELEC); emergency fire communication coverage (FCOMM); and fire alarm system permits (FFALEM). Please reference the requirements for building, electrical / low-voltage, FCOMM, and fire alarm system permits that are issued by Land Development Services (LDS) and the Office of the Fire Marshal (OFM) in the [Emergency Responder Communication Enhancement System Submittal and Permit Requirements Guidelines](#) document.

Use the following requirements for the system design:

- a) Minimum equipment for the system should include cable, donor antenna, and In-Building Communications Interface Box.
- b) Bi-Directional Amplifier Systems (BDA) must be class A with a minimum of 20 channels.
- c) Isolation: the amplification cannot exceed isolation +20 dB (Example, if isolation is -100 dB max amplification is -80 dB).
- d) Indoor levels must be:

- Minimum level in coverage area -95 dBm
  - Maximum level in coverage area -50 dBm
  - Antennas cannot be installed if outside levels are above -95 dBm
  - Levels from the radio tower site need to be overcome by 15 dB
  - Minimum level on tower site -95 dBm on RX antenna (measured by FFXC DIT personnel)
  - Maximum level at tower site -50 dBm on RX antenna (measured by FFXC DIT personnel)
  - Transmission leaking to the outside must be minimized to avoid interference
- e) The donor antenna must point to the County's closest radio site to avoid multipath interference and should be a single high gain antenna.
- f) Outdoor service antennas or antennas in open, aboveground areas like garages require special permission, but the FCC may or may not be involved.
- g) All performance measurements require the use of professional test equipment calibrated to the manufacture's requirements at one-year intervals.
- h) DIT shall approve the initial design.
- i) Submittal Requirements:
- Pre-grid test with the BDA off
  - Link budget calculation
  - Building plans
  - Locations of all equipment and cable runs
  - BDA / DAS programming
  - Copy of electrical / low voltage permit
  - Rebroadcast Transmission Agreement (RTA) application
  - Calculated heat map
  - Proof of qualification for engineers and installers
- j) DIT will accept test data in the form of a grid test. Downlink measurements must be recorded in dBm (a pass / fail on the coverage test is not acceptable).
- k) Equipment used by the ERCES must be of a type acceptable to the FCC.

## **STEP 2 – SUBMIT RETRANSMISSION APPLICATION (RTA) FOR DEPARTMENT OF TECHNOLOGY REVIEW AND PROCESSING**

Building owners / developers or their representatives must apply for and obtain a [Retransmission Application](#) (RTA) from DIT prior to commissioning the ERCES. The RTA is required by the [FCC § 90.219 - Use of Signal Boosters](#) and is the system operator's proof the County has granted permission to operate equipment that uses radio frequencies licensed to the County. Complete a Retransmission Application for each ERCES system. The [Retransmission Application](#) shall be submitted directly via the application to DIT for review and processing.

### **STEP 3 – OBTAIN DEPARTMENT OF INFORMATION TECHNOLOGY REVIEW AND PROVISIONAL FREQUENCY TRANSMISSION AUTHORIZATION**

DIT conducts a technical review of the proposed design. Upon approval of the design, DIT issues a signed Provisional RTA to the owner, which authorizes operation of the system for the purposes of installation, testing, and optimization. The Provisional RTA is valid for a period of one year from the date of issuance. The applicant must obtain, or coordinate building and electrical / low voltage permits from LDS to cover the installation of the ERCES. The applicant must obtain or coordinate with the fire alarm contractor a fire alarm system permit application for the integration of the signals generated by the ERCES into the fire alarm panel.

### **STEP 4 – DEPARTMENT OF INFORMATION TECHNOLOGY CREATES AN ENTRY IN THE FEDERAL COMMUNICATIONS COMMISSION’S SIGNAL BOOSTER DATABASE**

As the FCC licensee for the proposed ERCES frequencies, DIT utilizes the contact information provided in the Retransmission Application to create an entry for the ERCES in the FCC’s Signal Booster database. ***Applicants, integrators, and installers should not create entries in the FCC Signal Booster database for proposed ERCES that will operate on frequencies licensed to the County.***

### **STEP 5 – PERFORM SYSTEM INSTALLATION**

The integrator / installer shall proceed with installation of the approved system in accordance with the project’s plan and schedule. Substantial design changes from those specified in the initial design require approval by DIT. For example, changes in the selection of a different donor site, selection of different model BDA, selection of a different donor antenna, additions, or changes to number of line amplifiers in the design, and changes to equipment room location in building require DIT approval.

A coverage test with ERCES on and off is required to determine final antennal locations. The coverage test shall be a grid test. The test requires that the building skin, doors, and windows be in place. Send the test results to DIT for review and final approval.

DIT review and approval is not required for minor changes not affecting the number of active amplification devices used by the system or impacting the donor site (e.g., changes to the number or location of indoor coverage antennas in the design).

The ERCES shall not be activated for optimization and testing without prior DIT approval. DIT staff may, at their discretion, require that an initial desense test be conducted prior to initial activation to ensure that no harmful interference occurs to the County’s 800 MHz radio system.

Integration with the fire alarm system for supervisory notifications must be compliant with the requirements of NFPA 72 and NFPA 1225 and completed prior to fire alarm and ERCES testing.

### **STEP 6 – PERFORM PRE-COMMISSIONING ACTIVATION AND OPTIMIZATION**

Integrator / installer shall post the Provisional RTA at the headend location(s). The integrator / installer shall notify DIT staff when ready to activate the system for the first time. If required by DIT, an initial desense test is coordinated for the first activation of the system. Upon approval by DIT, the integrator / installer is free to conduct system activation and optimization.

## **STEP 7 – PERFORM FIRE ALARM / EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM TESTING**

The integrator / installer shall coordinate scheduling of system testing with the fire alarm contractor at the site. Testing shall include integrator / installer staff, fire alarm contractor, OFM acceptance testing staff, and DIT staff. Testing shall follow the requirements found in NFPA 72 and NFPA 1225 to ensure compliant coverage and supervisory alarm panel signals.

The integrator / installer and DIT staff conduct final desense testing at the donor site(s) for full and partial systems. DIT reviews the test documentation and provides comments and the DIT signoff to the OFM.

## **STEP 8 – SUBMIT AS-BUILT DOCUMENTATION**

The integrator / installer shall submit full system as-built documentation, close out, and pre- and post-grid test documentation to DIT in soft copy (e.g., PDF) format. DIT issues a Final RTA valid for a period of one year from date of issuance. The integrator / installer shall post the Final RTA at all headend location(s). DIT adds the as-built documentation to the system archives.

## **STEP 9 – ANNUAL TESTING / MAINTENANCE / RETRANSMISSION AGREEMENT RENEWAL**

The building owner shall retain the services of a qualified firm to conduct annual preventive maintenance and assist with annual testing. The building owner shall coordinate the annual testing of the ERCES in conjunction with the annual testing of the building's fire alarm and fire safety systems. The annual testing of ERCES systems shall conform to the requirements of NFPA 72 and NFPA 1225. RTA are valid for one year from the date of issuance and require annual renewal. To renew, submit annual test documentation and application for RTA renewal to DIT electronically at [DITDistributedAntennaSystems@fairfaxcounty.gov](mailto:DITDistributedAntennaSystems@fairfaxcounty.gov). DIT shall issue a new RTA for a period of one year from the date of issuance.

## **STEP 10 – RETRANSMISSION AGREEMENT COMPLIANCE REQUIREMENTS**

The building owner is responsible for complying with all prevailing FCC regulations that pertain to the use of retransmitted frequencies. At the discretion of the County, failure to abide by FCC and Fairfax County Retransmission Agreement requirements will result in termination of the Retransmission Agreement.