Wilson County North Carolina | Development Services

Wilson County Permit Requirements for a Bi-Directional Amplifier (BDA) and Emergency Responder Radio Coverage Systems (ERRCS) Systems

(Items 1- 10 need to be submitted as separate documents)

1) Permit Application
2) Initial Survey – Heat/Grid Map
3) System Plans
4) Product Data Sheets for the Equipment used in the BDA/ERCCS System
5) FCC Radio Technician License (GROL) of the installing technician (General Radio Operators License)
6) Projected BDA/ERCCS Coverage (Heat MAP) for the completed installed system
7) IB Wave Leakage Map – (Signal Leakage outside of the Building Envelope when the BDA is operating)
8) FCC BDA Class B Booster ID
9) Test Equipment Operator Certification – PC Tel or Anritsu or equivalent with current Calibration Certificate
10) As per NCFPC 510.4.2.5(4) the monitoring of the RF Emitter Operational Status is required. A KNOX Box Kill Switch is required to be installed on all BDA Systems installed in the County of Wilson, NC. The KNOX BOX kill switch will be located within 5 feet of the BDA. When the KNOX BOX kill switch is turned on it will shut off the active RF emitting device and provide a supervisory failure signal indicating that the active RF emitting device is off. This signal should be monitored through the fire alarm panel to ensure RF emitting device is off. This should be tested at the time of inspection.
11) All projects consisting of multiple buildings **shall have no more than one** Public Safety BDA with integrated Fiber Head-End Dedicated Public Safety Active DAS. In conjunction with this, this BDA will be required to be tested, maintained and monitored in accordance with FCC Title 47, Section 90.219. This requirement is subject to verification and monitoring under the authority of the 911 Radio Systems Manager.

***** Special Note *****

Conditional Approval for the Installation of a BDA System for the Building will be issued at the time of application if a FCC BDA Class B Booster ID is not provided at the time of application.

A Certificate of Occupancy WILL NOT BE ISSUED UNTIL THE REQUIRED FCC BDA CLASS B BOOSTER ID is Presented to the Inspections Department before the time of the Final Inspection. A certified third-party testing report is required to be submitted prior to final approval. The BDA CANNOT BE POWERED UP for online operation until the FCCBDA CLASS B BOOSTER ID CERTIFICATE is presented.

Note: POWERING UP the System for testing purposes only is approved and after testing is completed, the BDA System must be turned off until the final acceptance test and the Letter of Retransmission is issued.

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Wilson County

Emergency Responder Radio Coverage Systems

A Guide for Building Owners/Managers, General Contractors, Vendors and Installers of ERRC Systems Refer to Section 510 of the NCIFC

October 1, 2022

1. GENERAL

The North Carolina Fire Prevention Code requires that the City/County Public Safety Radio System be fully operable in the interior of most new buildings. Some modern energy-efficient construction techniques and materials (such as Low-E glass, cementitious coatings, and steel roofs) tend to attenuate the radio signals penetrating the exterior of some new buildings. Per North Carolina 2018 Fire Code Section 510, all new buildings constructed after January 1, 2019 (except for one- and two-family residences) 7500 square feet or larger (and buildings with more than one floor above grade plane, underground buildings and buildings with basements regardless of sq footage) are required to ensure that the Wilson County Public Safety Radio System has sufficient radio signal strength to be fully operable throughout the interior of the building.

New building owners subject to the NC 2018 Fire Code Section 510, are required to submit a Radio Signal Strength Study demonstrating existing City Radio System signal levels meet the Code,

or they will be required to install an Emergency Responder Radio Coverage System (ERRCS) to boost the radio signals up to the required levels. All owners of new buildings as well as their general contractors *and* ERRCS vendors/installers, should be familiar with all provisions of the relevant codes and standards. This guide augments those documents with further clarification as to how the codes and standards are implemented in Wilson County.

Because the Radio Signal Strength study cannot be performed until the building is nearly complete, and because of the lead time in procuring and installing an ERRCS, building owners/managers are well advised to consider the strong possibility that accommodating an ERRCS installation late in the building process may well delay final building acceptance and add cost beyond what would have been required for a pre-planned ERRCS. Some steps may be taken during building design and early construction that can help alleviate some of the delays and expense should an ERRCS be required. Such steps would include pre-planning a roof penetration and conduits for the coax cable feeding the roof-top donor antenna as well as ceiling conduits for the interior DAS cabling. Building owners are encouraged to make sure their building designers are aware early on of the possibility of the need for ERRCS installation and plan accordingly.

2. Wilson County RADIO SYSTEM

The County of Wilson utilizes the NC VIPER (Voice Interoperable Protocol for Emergency Responders) radio system as our primary emergency services communications solution. The County of Wilson does not own any specific frequencies or tower sites/radio equipment on the VIPER system, beyond end user radio equipment. To obtain specific frequency information or tower locations, please contact NC VIPER at (336) 239-0662.

VIPER is wholly state owned, and the FCC licensure is issued by the state. We, as a county, are granted permission by the state to operate on the VIPER system, under their license.

All emergency calls for service are received and dispatched by Wilson County 911. Their console equipment is directly tied to the NC VIPER network. The City of Wilson and Police Departments also operate, primarily, on the VIPER system. The City of Wilson owns an EF Johnson 800mHz system that they utilize as a backup system only and the City allows Wilson County to utilize it as a backup as well. Wilson County's end-user radios are programmed with both VIPER and talk-groups as well as EF Johnson talk-groups. The 911 Center has ties directly to this system as well.

The 800 mHz frequencies that the contractors find in their google search of frequencies in use in Wilson County are from the EF Johnson system and are not valid for the VIPER system.

NOTE: NC VIPER will no longer utilize any VHF radio frequencies for emergency communication as of 01 April 2025.

3. RADIO SIGNAL STRENGTH STUDIES

Any builder owner wishing to demonstrate that the existing radio signal levels inside the building meet the minimum criteria as specified in NC 2018 Fire Prevention Code Section 510.4.1 will be required to perform a Radio Signal Strength Study. Such studies will be performed by a suitably qualified engineer or technician with an FCC General Radio Operator's License, or a certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.

Signal studies can only be conducted once the building is closed-in with all windows, doors, dry walls, exterior coatings, and roof in place.

Radio Signal Strength Studies shall be conducted in compliance with the 20-grid method for each floor as outlined in NC 2018 Fire Prevention Code Section 510.5.4. A measurement shall be shown in the center for each grid. Per Section 510.4.1 (Radio Signal Strength) the building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95% of ALL areas on each floor of the building meet the signal strength requirements of Section 510.4.1-510.4.2. The minimum signal strength into the building shall be -95dBm and the minimum signal strength of -95 shall be received by the agency's radio system when transmitted from within the building.

For exceptionally large floor areas such as schools and shopping malls, where dividing a large number of square feet into 20 grids create unreasonably large grids, building owners/managers are strongly encouraged to work with Fire Marshal's Office to develop a sampling strategy that does not leave large areas untested. The Fire Marshal's Office will work with the owner/manager of such buildings on a case-by-case basis.

All signal measurements will be conducted using an approved professional-grade spectrum analyzer that has been calibrated within 12 months of the date of the study. A copy of the most recent spectrum analyzer calibration certificate shall be included with the Radio Signal Strength Study.

4. ERRCS INSTALLATION

For buildings that fail to meet the criteria for sufficient radio signal levels, an ERRCS will be required. An ERRCS captures the radio signal at the rooftop level through an outdoor donor antenna and carries that signal to the interior of the building where it can be amplified by a Bi-Directional Amplifier (BDA), also known as a signal booster. The amplified signal output of the BDA will normally be redistributed within the building via a Distributed Antenna System (DAS). In some cases, it may be necessary to distribute the amplified signal by a "leaky" coaxial cable method. The amplified signal distributed inside the building should not radiate beyond the perimeter of the building or generate interference to any licensed radio service.

Per NC 2018 Fire Code section 510.5.2, no ERRCS shall be installed without prior coordination and approval of the Wilson County Fire Marshal's Office. All ERRCS installation plans shall be submitted to the appropriate *AHJ* for approval. Upon approval, the building owner/manager will be issued a "Letter of Authorization to Retransmit" for radio frequencies licensed to Wilson County. (See also Section 6-FCC requirements)

As specified in Section 510.3 of the NC 2018 Fire Prevention Code a construction permit is required for any installation or modification of an ERRCS. An ERRCS permit shall be obtained from Wilson County once the installation plan has been approved. Fees will apply.

Installation of all ERRCS, to include rooftop antenna components and all required electrical wiring, antenna cables, conduits, bonding, grounding, and lightning protection, will be in compliance with all applicable NC building and fire codes.

When the BDA test is conducted, NC VIPER sends a technician to their tower site (nearest to the installation) to be sure that the BDA itself does not cause any interference within the VIPER radio system.

5. ALARM SYSTEM INTERFACE

Per NC 2018 Fire Code Section 510.4.5, all ERRCS and backup battery systems shall be electrically supervised and monitored by an alarm service. Functions typically available for monitoring from most ERRCS include donor antenna failure, BDA failure, AC power failure, battery failure, and battery charger failure. These fault modes should normally be transmitted to the fire alarm system and displayed on the annunciator panel. The panel display should indicate clearly that the fault is an ERRCS failure and identify the specific ERRCS fault mode. When faults have been rectified, the alarm panel display should automatically reset. ERRCS failures should be monitored by the alarm service and reported to the building owner/manager or the ERRCS vendor, as a trouble alarm, so that restoration of the radio service can occur as quickly as possible. Standby power per Section 510.4.2.3 shall be capable of operating the EERC for a duration of not less than 24hrs. Plenum rated cables shall be installed for EERC systems.

In installations where the ERRCS enclosure is not co-located with the fire alarm panel, the fire alarm panel room will be outfitted with a switch that can remotely shut down the ERRCS in the event of a radio interference issue. The location of the switch shall be in a secure area only accessible to authorized personnel.

6. FCC REQUIREMENTS

Beyond the provisions of the NC codes, the Federal Communications Commission (FCC) imposes additional rules and regulations on the installation of any ERRCS. All ERRCS designers and installers should be familiar with the provisions of FCC Title 47, Part 90, Section §90. 219 (Use of Signal Boosters).

All ERRCS systems shall use only boosters (also known as BDAs) that are type-certified by the FCC.

Per §90. 219, the FCC requires that specific documentation be issued to an ERRCS operator that allows the ERRCS system to operate on radio frequencies licensed to Wilson County. As noted above in Section 4, once the ERRCS installation plan has been approved by Wilson County, the 911 System authorization form (below) will be filled out by the plan reviewer and emailed to the appropriate radio frequency license holder(s). Once this authorization is signed by both parties, it is

to be returned to the reviewer to be sent out for the C of O/Acceptance testing. This Letter of Authorization to retransmit will be issued to the building owner/manager to cover this requirement. This Letter of Authorization should be stored or displayed prominently on or near the ERRCS enclosure. The Authorization Letters are valid for one year and must be re-issued for each annual re-inspection (see Section 10 - Annual Re- inspections).

In addition, the FCC requires that all Class B ERRCS systems be registered in the FCC Signal Booster Data Base, which can be accessed online at:

www.fcc.gov/signal-boosters/registration

The ERRCS installer is responsible for entering any Class A and B ERRCS installed in Wilson County into the FCC Signal Booster Database. An FCC Registration Number (FRN) is required to enter boosters into the database. If the installer does not already have an FRN, one can be obtained from the FCC CORES system online at:

https://apps. fcc.gov/cores Web/public Home.

Once the ERRCS has been registered in the database, a Booster ID will be issued by the FCC to the applicant. A copy of the booster registration, including the Booster ID, shall be forwarded to Wilson County. There is no FCC requirement for registration of Class A boosters.

No ERRCS shall transmit on any Wilson County frequencies until the Letter of Authorization to retransmit has been issued. Additionally, for any ERRCS, the ERRCS shall not transmit on any frequency until the ERRCS has been registered in the FCC database and the Booster ID number reported to Wilson County.

7. MINIMUM PERSONNEL QUALIFICATION REQUIREMENTS

Minimum qualification for the ERRCS system designer and lead installer are specified in NC 2018 Fire Prevention Code Section 510.5.3.

8. CERTIFICATE OF OCCUPANCY INSPECTION

Acceptance testing for installed ERRCS shall be conducted by Fire Marshal's Office using Fire Department radios in accordance with NC 2018 Fire Code Section 510.5.4. An ERRCS

acceptance test will be conducted as part of the Certificate of Occupancy inspection. The building owner can contact Wilson County to request an ERRCS acceptance test and final inspection once the installation is complete, and all alarm panel interfaces duly tested.

A set of approved plans shall be maintained on site and available during the inspection.

Acceptance testing will also include demonstration of the alarm panel interface, to include simulations of all possible fault modes. Final acceptance testing will also include an electrical inspection to ensure compliance with all NC electrical codes, to include electrical wiring, conduits, antenna cabling, grounding, bonding, and lightning protection.

All buildings will be checked during the Certificate of Occupancy inspection for radio coverage, regardless of if an ERRCS was recommended during the analysis. If the building fails, an ERRCS will need to be installed to get a certificate of occupancy.

If a radio signal strength test does not pass and no ERRCS system has been installed within the building the inspector will consider issuing a TCO to allow the building to open, while an ERRCS is being installed. Details of allowing the TCO will follow the rules and policies of the inspecting department.

9. LABELLING

All ERRCS systems should be labelled at the BDA enclosure. The enclosure should be labelled with the words "ERRCS - Emergency Responder Radio Coverage System." In addition, instructions should be posted on how to completely disable the ERRCS in case of radio interference issues.

ERRC ACCEPTANCE TEST CHECKLIST

Does the contractor have a valid ERRC permit from Wilson County? Permit # _____

Electrical Inspection

- ☐ Is the rooftop donor antenna mast and sled appropriately grounded?
- ☐ Are the antenna connectors on the roof property sealed with drip loops?
- ☐ Is the lightning arrestor located near the building penetration and appropriately grounded?
- ☐ Is the wiring of the amplifier box and back up batteries up to code standards, including proper grounding?
- ☐ Are the amplifier and backup battery enclosures NEMA compliant?
- ☐ Does the backup battery or generator meet the 12-hour run-time requirement?
- ☐ Has dedicated standby power or provided with 2-hour standby batteries and connected to the facility generator power system in accordance with Section 604?

Fire Alarm Interface

- ☐ Is the ERRCS system monitored 24/7 by a remote alarm monitoring service? If not, is it monitored by a manned post located near the BDA?
- ☐ Demonstrate that all the possible fault alarms from the ERRCS and battery backup are successfully transmitted by simulating the standard fault conditions: (a) AC power failure, (b) Battery Charger failure, (c) Battery failure, (d) Donor antenna failure, and (e) BDA internal failure.
- ☐ Each of the above alarms should display with a specific, meaningful name that corresponds to the actual fault, e.g., "ERRCS Battery Failure."
- ☐ Demonstrate that clearing the fault in the ERRCS will clear the alarm condition at the panel.
- ☐ How will the alarm company respond to an ERRCS failure? (They should notify the building owner or the ERRCS installer. There should be no fire alarm dispatched for an ERRCS failure. Building owner should notify appropriate AHJ if the outage lasts more than 12 hrs. and follow up with a second notification when the system is restored to service.)

Radio System

- ☐ Do the FD radios work well outside of the building with the BDA powered on?
- ☐ Does the installer have the necessary FCC General Radiotelephone Operators License?
- ☐ Does he also have a training certificate from the company that provides the BDA system?
- ☐ If not, are these requirements waivered based on previous satisfactory experience?
- ☐ Does the installer have a current certificate of calibration (less than 12 months old) for the spectrum analyzer used by the installer to test coverage signal strengths?
- ☐ Is the BDA FCC-certified?
- ☐ The Fire Zone Map shall note the BDA points?
- ☐ A BDA Zone map be installed beside the system?
- ☐ Letter of transmission shall be framed and installed beside the unit?
- ☐ If the BDA is not co-located with the alarm panel, is there a remote cutoff switch to disable the amplifier from the alarm panel room?
- ☐ The room door shall be labeled. ERRCS or BDA?
- ☐ Is the BDA box labelled "ERRCS - Emergency Responder Radio Coverage System"? If a Knox box is in use, is it clearly labeled "ERRCS Remote Cutoff Switch"?
- ☐ If a Knox device is in use, test the ability to kill the ERRCS from the Knox device.
- ☐ Are instructions posted at the BDA for disabling the ERRCS?

Wilson County North Carolina | Development Services

2201 Miller Rd S, Wilson, NC 27893
P: 252-399-2965 | wilsoncountync.gov

Retransmission Authorization

Expiration Date: _____

Wilson County, North Carolina hereby grants authorization to **Company Name:** _____ to operate a Two-Way Radio Signal Booster device on 800 MHz frequencies licensed to Wilson by the Federal Communications Commission (FCC) under the call sign KNNU209 at the following location:

Site Name: _____

Site Address: _____

Latitude: _____ **Longitude:** _____

FCC Booster ID: _____

Primary Site Contact: _____ **Phone:** _____

Secondary Site Contact: _____ **Phone:** _____

This authorization is subject to the following conditions:

1. The Retransmission Authorization is valid for one year from the date of issuance and will be renewed annually upon request when the annual retesting results have been provided to the Fire Marshal of the authority having jurisdiction, in accordance with the appropriate jurisdictional county and municipal ordinances.
2. The System shall be operated, maintained, and tested annually in accordance with the manufacturer's instructions, FCC rules and regulations, and requirements of the appropriate jurisdiction ordinances.
3. The System shall not cause interference to radio systems or equipment within the jurisdiction, or any other FCC licensee.
4. The Operator shall promptly resolve any interference that occurs to radio systems or equipment, or any other FCC licensee, up to and including deactivation of the System if necessary, until such time that the interference is corrected.
5. In the event of an outage of the System, the Operator shall notify the Wilson County Fire Marshal in accordance with the regulations, policies, and procedures for reporting any fire alarm/fire safety system outage.
6. The Operator shall provide access to the System for inspection upon request by the Fire Marshal of jurisdiction or the FCC.
7. A separate Retransmission Authority is required for each headend used in the system design and shall be posted conspicuously with the headend equipment.
8. Wilson County Emergency Management, as FCC licensee for its frequencies, reserves the right to terminate this Authorization at any time at its sole discretion.
9. **Please send the above completed form for authorization to:** jwood@wilsoncountync.gov

---------- Staff use only. Do not write below this line. ----------

_____ Date: _____

Jason Wood, Chief Inspector/Fire Marshal