Emergency Responder Radio Systems

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Learning Objectives

1. Understand the National Fire Protection Association (NFPA), and Ohio Fire Code (OFC) requirements for in-building communications coverage.
2. Identify the major differences between a distributed antenna system (DAS) for public safety versus cellular service.
3. Learn how radio frequency testing is conducted for ERRS, what standards must be met for installation of a corrective system.
4. Describe best-practice specifications for a ERRS, including the cabling, RF design, power, and pathway survivability.
5. What opportunities may be available to your company in your area.
Houston Firefighter Mayday
Basic Design:

- **Donor Antenna (Roof Mounted)**
- **BDA Bi-Directional Amplifier**
- **Indoor Antennas (Ceiling Mounted)**
- **Antenna Taps or “splitters”**
- **Coaxial Cable**
- **Indoor Antenna**

**BASIC DISTRIBUTED ANTENNA SYSTEM COMPONENTS**
ERRS Codes and Standards

- Ohio Building Code - 915
- Ohio Fire Code & IFC Code – 510
- NFPA 72
- City of Columbus Communications Guidelines
- Fire Prevention Bureau Guidelines
Ohio Building Code Section 915

915.1 General. Emergency responder radio coverage shall be provided in all new buildings in accordance with Section 510 of the fire code.
Ohio Fire Code Section 510

• 510.1 - All buildings shall have approved radio coverage for emergency responders within the building
  • This paragraph shall not require improvement of the existing public safety communication systems.
  • Exceptions:
    • 1. Where approved by the building official and the fire code official, a wired communication system shall be permitted to be installed or maintained in lieu of an approved radio coverage system.
    • 2. Where it is determined by the fire code official that the radio coverage system is not needed.
Ohio Fire Code Section 510

• 510.2 The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95% of all areas of each floor of the building meet the signal strength requirements

• 510.2.1 A minimum signal strength of -95 dBm

• 510.2.2 A minimum signal strength of -100 dBm shall be received by the agency's radio system when transmitted from within the building.
NFPA 72 Chapter 24

• **24.5.2.1.2 Approval and Permit.**
  • Plans shall be submitted for approval prior to installation.
  • At the conclusion of successful acceptance testing a renewable permit shall be issued for the public safety radio enhancement system where required by the authority having jurisdiction.
NFPA 72 Chapter 24

• **24.5.2.2.2 General Building Areas.**
  • General building areas shall be provided with 90 percent floor area radio coverage.

• **24.5.2.2.3 Amplification Components.**
  • Buildings and structures that cannot support the required level of radio coverage shall be equipped with a radiating cable system or a distributed antenna system (DAS) with FCC-certified signal boosters, or both, in order to achieve the required adequate radio coverage.
• **24.5.2.3 Signal Strength.**

  • **24.5.2.3.1 Inbound.**  
    • A minimum inbound signal strength of −95 dBm, or other signal strength as required by the authority having jurisdiction, shall be provided throughout the coverage area.

  • **24.5.2.3.2 Outbound.**  
    • A minimum outbound signal strength of −95 dBm at the donor site, or other signal strength as required by the authority having jurisdiction, shall be provided from the coverage area.
NFPA 72 Chapter 24

• 24.3.13.8.1 Pathway Survivability
  • Level 1, Level 2, or Level 3.
  • 24.3.13.8.1.1 The feeder and riser coaxial cables shall be rated as plenum cables.

• 24.3.13.8.3* Riser coaxial cables shall be rated as riser cables and routed through a 2-hour-rated enclosure.

• 24.3.13.8.4 The connection between the riser and feeder coaxial cables shall be made within the 2-hour-rated enclosure, and passage of the feeder cable in and out of the 2-hour-rated enclosure shall be firestopped to 2-hour ratings.
NFPA 72 Chapter 24

• **24.5.2.5.4 Signal Booster Components.**
  • FCC certification prior to installation.
  • Compatible with both analog and digital communications simultaneously at the time of installation.

• Section 24.4.2.8.5.6 of NFPA 72 also requires the radio system components to be protected by a 2-hour rated enclosure, a 2-hour rated room or equivalent as approved by the code official.
  • **Exception:** A 1-hour rated room in existing buildings equipped throughout with an approved automatic sprinkler system is considered equivalent protection.
EMERGENCY RESPONDER RADIO SYSTEM (ERRS)

Coverage Acknowledgment Form

All buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems at the exterior of the building. This requirement is based upon Ohio Building Code 08C (2011) 9/10 (New Building) and Ohio Fire Code (2011) 9/10 (New and Existing Buildings). The requirements pertain to all new commercial and multi-family buildings and existing buildings based upon the following time frames established by the Columbus Division of Fire (CPC 510.3.8):

1. New Buildings or Change of Use Group of an existing building
2. Greater than three million dollars in renovations or additions to an existing building
3. Deficiencies in existing building coverage identified through normal delivery service

Complete the form, print and initialed indicated. Sign the last page and submit the completed form with each set of the building plans to Building and Zoning Services. Mail a copy of this form to: Columbus Fire Prevention Bureau - ERRS, 3639 Parsons Ave., Columbus, Ohio 43207.

Job Site Information:
- Change of Use
- Project Cost Over 3 Million
- New Building
- High Rise

Certified Address
- Zip
- Working in Unit/Site/Ar
- Tax District/Parcel Number

If 0 Stories Above Grade
- # of Stories Below Grade
- Gross Sq. Ft. Working Area
- Construction Type
- Use Group

Describe Project/Work:

Property Owner of Record:
- Name
- Address
- City
- State
- Zip
- Telephone Number
- Extension
- Fax Number
- E-Mail Address

Contractor:
- Company/Contractor Name
- Address
- City
- State
- Zip
- Telephone Number
- Extension
- Fax Number
- E-Mail Address

Applicant:
- Owner
- Contractor
- Other

Name (Contact Person)
- Address
- City
- State
- Zip
- Telephone Number
- Extension
- Fax Number
- E-Mail Address

By initialing the items below, I certify that I understand that the above listed building must have approved radio coverage for emergency responders prior to receiving a final certificate of occupancy.

A. I have read and understand the Columbus Division of Fire Emergency Responder Radio System Guidelines.

B. I understand that an initial radio signal strength (Spectrum Analysis) and clarity study is required to be submitted to the Columbus Division of Fire (CDF) once the building is "closed in" 70%-80% completed.

C. I understand if more than one block on a given floor is over the -55db threshold or any critical area has poor coverage. ERRS will be required to be installed before a final certificate of occupancy is issued.

D. I understand that if a system needs to be installed I may need zoning approval for the location of the outside antenna.

E. I understand that the Columbus Division of Fire must provide plan approval before installing the ERRS.

F. I understand that Fire Alarm and Electrical Permits may also be needed from the Building Department.
EMERGENCY RESPONDER RADIO SYSTEM (ERRS)
Coverage Acknowledgement
Agent for Owner:
- Tenant
- Architect/Engineer
- Attorney
- Plan Service Firm
- Other

Name (Contact Person) Street Address City State Zip
Telephone Number Extension Fax Number E-Mail Address

I am the Owner Agent for the Owner of this (all or more) family dwelling Commercial
Print Full Name Date Signature

Fire Prevention Bureau
Emergency Responder Radio System
Permit Application
2700 Parsons Avenue, Columbus, Ohio 43207
(614) 645-3311

Official Use Only: Applicator No: Permit Amount:

JOB SITE INFORMATION:

Certified address Zip Unit/Space/Move (applicable) Tax Account, Permit Number
Building Use

TYPE OF WORK:
- Change of Use
- New Building
- Alteration
- Tenant Improvement

See Emergency Radio System Guidelines for Complete Information

1. Permits are required for any of the following works:
- Installation of a new ERRS
- Alteration to an existing ERRS
2. Initial Permit fee based on number of users (100 or less) and not more than 250. Fees not to exceed 1000.
3. The permit applicant shall be the installing contractor.
4. All existing ERRS shall comply with the Columbus Building Code, as well as the Federal Communications Commission Rules and Regulations. All existing ERRS shall be approved by the City of Columbus Building Department.
5. The Columbus Building Department's approval of the ERRS shall be kept at the project site until final approval of the permit, after which it shall remain in possession of the owner.
6. Equipment shall have FCC certification prior to installation.

PROPERTY OWNER OF RECORD:

Name Street Address City, State, Zip
Telephone Number Fax Number E-Mail Address

CONTRACTOR:

Company/Contractor Name Contact Name
Home Address City, State, Zip
Telephone Number Fax Number E-Mail Address

NOTES:
- One (1) signature per permit fee. Additional signatures must be listed.
- Completion: You must notify Fire Prevention Bureau/Plan Review staff at 60 days prior to 9 a.m. the day of the inspection so as to be able to be inspected.

PLEASE NOTE: Incomplete information will result in rejection of this application.
Basic Design:

- Donor Antenna (Roof Mounted)
- BDA Bi-Directional Amplifier
- Indoor Antennas (Ceiling Mounted)
- Antenna Taps or "splitters"
- Coaxial Cable
- Indoor Antenna

BASIC DISTRIBUTED ANTENNA SYSTEM COMPONENTS
RF Signal Blockers:

- Low-E glass
- Metal wall structure
- Concrete
- Other buildings
RF Testing:
ERRS
Dead Spots:
Courthouse Challenge:
Downtown Density:
Suburban Sightline:
Suburban Sightline:
Case Study: First and Main
Case Study: CCL Label
Case Study: Buggyworks
Case Study: Buggyworks
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Case Study: Buggyworks
## Case Study: Buggyworks

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Yellow represents an average reading of -96db or worse signal strength
Case Study: Buggyworks
Case Study: National Veterans Memorial
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Keep In Mind:

Every situation is unique:

- Proximity and sightline to tower
- Size and location of facility
- Construction (Windows, Walls, Roof & Skin)
- Budget upfront
- Can’t test until core/shell complete
- Local AHJ has final say