WEBINAR:
RF BASICS OF DONOR FED IN-BUILDING ERRCS
(EMERGENCY RADIO RESPONDER COMMUNICATIONS SYSTEM)

EMPHASIZING THE IMPORTANCE OF THE AHJ’S ROLE IN THE ERRCS PROCESS

PRESENTED BY:

WITH SPECIAL GUESTS
OVERVIEW

TOPICS THAT WILL BE DISCUSSED:

• **UNDERSTANDING THE ERRCS SYSTEM**
• **COMMON MISCONCEPTIONS ABOUT ERRCS SYSTEMS**
• **Common problems found in ERRCS systems**
• **STAKEHOLDERS IN ERRCS DESIGN/DEVELOPMENT**
• **MOST IMPORTANT FACTOR IN CREATING A SUCCESSFUL DEPLOYMENT**
• **ELIMINATING COMMON ERRCS PROBLEMS AND CREATING A SUCCESSFUL DESIGN AND DEPLOYMENT**
• **HOW THE AHJS CAN HELP TO ensure a successful design and deployment**
• **Q&A**
WHAT WE HOPE TO ACCOMPLISH ON THIS WEBINAR

• TO ASSIST THE AHJs AND SYSTEM INTEGRATORS TO DEPLOY ERRCS SYSTEMS THAT WORK BETTER WITHOUT CAUSING INTERFERENCE AND OTHER PROBLEMS

• ASSIST AHJs IN INCORPORATING BETTER RF PERFORMANCE REQUIREMENTS IN THEIR JURISDICTION’S SPECIFICATIONS

• MAKE IT EASIER FOR THE SYSTEM INTEGRATORS TO OBTAIN FROM AHJs THE RF RELATED INFORMATION REQUIRED FOR THEM TO PROPERLY RESPOND TO ORDINANCE REQUIREMENTS

• GUIDANCE IN VETTING SYSTEM INTEGRATORS FOR THEIR RF EXPERIENCE AND CAPABILITIES

• KEY RF COMPONENTS AND CONSIDERATIONS FOR DESIGN SUBMITTAL PACKAGES

• KEY SYSTEM DESIGN AND COMMISSIONING CONSIDERATIONS – TO ASSIST IN BETTER UNDERSTANDING WHAT SHOULD BE EVALUATED DURING THE AUTHORIZATION TO PROCEED INSPECTION
UNDERSTANDING THE ERRCS SYSTEM
WHAT IS ERRCS?
ERRCS – EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM

- **It is an extension** of the Public Safety Radio Network
- Improves in-building coverage for voice communications
- **ERRCS enables first responders to communicate with the public safety radio network**
- Beneficial for first responders by reaching poor signal areas affected by factors like Low-E glass, interior/exterior walls, interior clutter, external obstructions, etc.

- **IFC/NFPA establish minimum standards guidelines for ERRCS and AHJ to adopt/enforce as part of their ordinance and is typically a requirement for an occupancy permit**

- **ERRCS systems are governed by the FCC, learn more here:** [https://www.fcc.gov/](https://www.fcc.gov/)
What does an ERRCS system look like?
COMMON MISCONCEPTIONS ABOUT ERRCS SYSTEMS
COMMON MISCONCEPTIONS
ERRCS – EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM

ERRCS IS:
- ERRCS ARE IN-BUILDING COMMUNICATION SYSTEMS
- ERRCS ARE DESIGNED BASED ON **RF PERFORMANCE** AND OTHER FACTORS
- RF PERFORMANCE OF THE **ERRCS** SHOULD BE THE PRIMARY FOCUS OF THE DESIGN AND DEPLOYMENT OF THE SYSTEM

ERRCS IS NOT:
- **ERRCS** ARE NOT A FIRE ALARM SYSTEM
- **ERRCS** IS NOT DESIGNED FOR FIRE CONTROL
- **ERRCS** IS NOT A FIRE SUPPRESSION SYSTEM
COMMON MISCONCEPTIONS (CONT’D)

ERRCS – EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM

**ERRCS IS:**
- **ERRCS** is a technical solution that requires RF expertise.
- **ERRCS** is a solution that requires upfront knowledge of specific factors about the public safety radio network.
- **ERRCS** system design and tuning for performance is a complex undertaking.
- **ERRCS** must be designed by qualified designers.
- **ERRCS** must be deployed by qualified integrators/installers.

**ERRCS IS NOT:**
- **ERRCS** are not “plug ‘n play”
- **ERRCS** are not simply a collection of hard wired parts.
COMMON PROBLEMS IN ERRCS SYSTEM DEPLOYMENTS
What is the problem today with ERRCS designs and deployments?

• There is very little emphasis on the RF performance side of ERRCS requirements

• There is too much emphasis on the non RF side (electrical, survivability, etc.)

• ERRCS systems are being treated as fire alarms, or fire detection or prevention systems (in most cases)

• ERRCS systems are not being treated as extensions of the public safety radio network (in most cases)

• Local ordinances that mandate ERRCS systems typically do not provide adequate RF performance requirements

• Many AHJs may not have resources who are RF knowledgeable

• Some integrators designing and installing ERRCS systems are not competent or qualified
WHAT IS THE RESULT OF IMPROPERLY DESIGNED AND DEPLOYED ERRCS SYSTEMS?

- **ERRCS** systems that do not provide satisfactory communications for the first responders
- **ERRCS** systems that inject too much noise onto the radio network
- **ERRCS** systems that can actually make a donor site/tower inoperative for anyone trying to talk to the tower
- **ERRCS** systems that can cause other problems or difficulties for the radio network
STAKEHOLDERS
IN ERRCS DEPLOYMENTS
WHO ARE THE STAKEHOLDERS IN ERRCS DEPLOYMENTS?

• The Building Owner – Compliance is required to obtain their CO

• The AHJ – Requires reliable in building coverage while not causing any problems for the radio network

• The Jurisdictional License Holder

• The ERRCS System Integrator – Wants to provide a cost effective, excellent performing system (and make a reasonable profit)

• The Local Building and Electrical Code Departments (for compliance with their local codes)

• The Most Important Stakeholder – The First Responders who will be relying on the system to save lives
POLLING QUESTION TO GO HERE
CREATING SUCCESSFUL DEPLOYMENTS
WHAT ARE THE MOST IMPORTANT FACTORS THAT EVERY ERRCS MUST ADHERE TO?

FCC Rule Section 90.219

Authority to operate.
PLMRS licensees for stations operating on assigned channels higher than 150 MHz may operate signal boosters, limited to the service band for which they are authorized, as needed anywhere within the PLMRS stations' service contour, but may not extend the stations' service contour.

PLMRS licensees may also consent to operation of signal boosters by non-licensees (such as a building owner or a signal booster installation contractor) within their service contour and across their applicable frequencies, but must maintain a reasonable level of control over these operations in order to resolve interference problems.
FCC Rule Section 90.219

Authority to operate.

Non-licensees seeking to operate signal boosters must obtain the express consent of the licensee(s) of the frequencies for which the device or system is intended to amplify. The consent must be maintained in a recordable format that can be presented to an FCC representative or other relevant licensee investigating interference.
WHAT ARE THE MOST IMPORTANT FACTORS THAT EVERY ERRCS MUST ADHERE TO?

Good engineering practice must be used in regard to the radiation of intermodulation products and noise, such that interference to licensed communications systems is avoided. In the event of harmful interference caused by any given deployment, the FCC may require additional attenuation or filtering of the emissions and/or noise from signal boosters or signal booster systems, as necessary to eliminate the interference.

In general, the ERP of intermodulation products should not exceed −30 dBm in 10 kHz measurement bandwidth.

In general, the ERP of noise within the passband should not exceed −43 dBm in 10 kHz measurement bandwidth.

In general, the ERP of noise on spectrum more than 1 MHz outside of the passband should not exceed −70 dBm in a 10 kHz measurement bandwidth.
WHAT ARE THE MOST IMPORTANT FACTORS THAT EVERY ERRCS MUST ADHERE TO?

The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.
ELIMINATING PROBLEMS IN ERRCS SYSTEMS AND CREATING SUCCESSFUL DEPLOYMENTS
BAD ERRCS SYSTEM:
LACK OF DAS DOMINANCE

Inside the building - the direct signal produced by the public safety tower is stronger than the signal produced by the DAS system
GOOD ERRCS SYSTEM:
ADEQUATE DAS DOMINANCE

DAS signal inside the building is stronger than the direct signal produced by the public safety tower.
BAD ERRCS SYSTEM: CONTRIBUTING EXCESSIVE NOISE TO THE NETWORK

BDA Gain Set to 93 dB, NF 8dB, donor antenna gain 6db

Noise rise at site = approximately 6 dB

one antenna on floor
BAD ERRCS SYSTEM:

CONTRIBUTING EXCESSIVE NOISE TO THE NETWORK

Coverage area 78 miles

All radios in red area contend with interference caused by BDA

BDA raises noise by 6 dB
GOOD GRRCS SYSTEM:
NOT CONTRIBUTING EXCESSIVE NOISE TO THE NETWORK

BDA Gain Set to 43 dB, 8 dB NF, 6 dB donor antenna gain

No noise rise at donor site due to BDA gain at a fixed low value. Noise power decays to the noise floor in 10 feet off of donor antenna.

multiple antennas on floor
GOOD ERRCS SYSTEM:
NOT CONTRIBUTING EXCESSIVE NOISE TO THE NETWORK

Coverage area 314 miles
BDA does not raise noise floor at site
BAD ERRCS SYSTEM:
NEAR/FAR PROBLEMS

GRAPHICS SHOWING PROPER NUMBER AND LOCATION
OF ANTENNAS

Show an example of how the near/far problem has been solved – both the “far away guy” and the “right under an antenna guy” are both able to get out to the tower.
BAD ERRCS SYSTEM: NEAR/FAR PROBLEMS

GRAPHICS SHOWING PROPER NUMBER AND LOCATION OF ANTENNAS

Show an example of how the near/far problem has been solved – both the “far away guy” and the “right under an antenna guy” are both able to get out to the tower.

EMT and Police portable transmitting simultaneously.
BAD ERRCS SYSTEM: NEAR/FAR PROBLEMS

Gain reduced due to OLC overload protection on BDA

PD radio signal arrives at site @ above acceptable level

EMT radio signal arrives at site @ below acceptable level
GOOD ERRCS SYSTEM: NEAR/FAR PROBLEM SOLVED

- BDA gain set to 43 dB (no add to site donor site noise floor)
- PD radio signal arrives at site @ above acceptable level
- EMT radio signal arrives at site @ above acceptable level
CREATING SUCCESSFUL DEPLOYMENTS
HOW THE AHJS CAN HELP
WHAT CAN AHJS DO TO HELP?

• HELPING SYSTEM INTEGRATORS
  ➢ MAKE THE ORDINANCE AND OTHER REQUIREMENTS READILY AVAILABLE
  ➢ ENSURE THE RF REQUIREMENTS ARE BASED ON THE FCC RULES
  ➢ CLEARLY STATE OTHER LOCAL EXPECTATIONS FROM AN RF PERSPECTIVE
  ➢ CLEARLY STATE ELECTRICAL AND SURVIVABILITY REQUIREMENTS
  ➢ PROVIDE A PRE-ATP CHECKLIST
  ➢ PROVIDE CONTACT(S) INFORMATION FOR QUESTIONS; INCLUDING RADIO SHOP CONTACT(S) FOR RF INQUIRIES

• FOR HELP ON THE RF SIDE (ESTABLISHING THE REQUIREMENTS; EVALUATING SYSTEM DESIGNS; FINAL TEST/SIGN OFF) - LEVERAGE THE CITY/COUNTY RADIO SHOP – OR CONTRACT WITH A 3RD PARTY SME

• REVIEW AND VET THE SUBMITTAL

• REVIEW AND VET THE INTEGRATOR SUBMITTING THE PROPOSAL
How can an AHJ vet an ERRCS submittal and the integrator?

Questions AHJs can ask to qualify submittals and integrators

- How many ERRCS systems have you deployed in this jurisdiction?
- Are you certified by the equipment OEM to install and commission their equipment? Can you provide the certification document?
- Did you design this system to a specific uplink power level? How did you calculate what that uplink power level should be?
- Do you have an FCC GROL or other FCC certifications?
- How do you plan to provide site support if problems occur after deployment?
- Have you designed this system to eliminate or minimize the near/far problem? How does your design accomplish this?
Questions AHJs can ask to qualify submittals and integrators

- How have you designed this system to provide adequate uplink power without adding excessive noise to the network?
- Can you verify that you are addressing the proper/current version of the local ordinance, amendments, and technical requirements?
- Who have you spoken with to determine all of the requirements (RF, electrical, etc.) that are required for this system?
- Do you know which donor site(s) will be used for this system?
PRESENTERS:
DON HENRY - PUBLIC SAFETY PROGRAM MANAGER/DIRECTOR OF SALES AT COMBA TELECOM
GREG GLENN - SR. DIRECTOR PUBLIC SAFETY AT SOLID

ADDITIONAL PANELISTS FOR TOWN HALL:
MICHAEL ORENDAIN – AREA DIRECTOR AT OPTICAL TELECOM
STEVEN HRONEK - CEO OF COMSEC ASSOCIATES, INC (DEPUTY CIO, CITY OF GLENDALE, RET.)
MATHEW THEISZ - RF ENGINEERING CONSULTANT AT DC OFFICE OF UNIFIED COMMUNICATIONS
MICHAEL W. GOKEY, DIVISION DIRECTOR, COMMUNICATIONS ENGINEERING & TECHNICAL SERVICES COUNTY OF SANTA CLARA.
THANK YOU!