DESIGN GUIDELINE 273523
EMERGENCY RESPONDER RADIO COVERAGE

Scope

Provide two-way Emergency Responder Radio Coverage (ERRC) in new buildings and in high rise major renovations to enable communication between emergency responders at the exterior perimeter of the building and emergency responders within the building. All areas of the building shall have code compliant radio coverage. New buildings which will achieve radio coverage without amplification are exempt.

Related Sections

U-M Design Guideline Sections:
SBA 5.4 – Telecommunications Rooms
SBA-C-H – Telecommunications Rooms in UMHHC Facilities
260513 – Medium, Low and Control Voltage Cables
260526 – Grounding and Bonding for Electrical
260533 – Electrical Materials and Methods
272000 – Voice and Data Communications

U-M Master Specification Sections:
260513 – Medium, Low and Control Voltage Cables
260526 – Grounding and Bonding for Electrical
260533 – Electrical Materials and Methods
272000 – Voice and Data Communications

Reference Documents:
Federal Communications Commission Regulations, http://www.ecfr.gov/
IFC, "International Fire Code"
MBC, "Michigan Building Code"
Michigan Public Safety Communications System, http://michigan.gov/mpscs.
NFPA-72, "National Fire Alarm and Signaling Code Handbook" (Handbook includes the code plus non-binding but informative Annexes and Supplements)

Design Requirements

1. U-M emergency responders include but are not limited to the following:
   - U-M Division of Public Safety and Security (DPSS).
   - U-M Hospitals and Health Care Security and Housing Security.
   - U-M OSEH and Plant Operations Departments.
   - City of Ann Arbor Fire and Police Departments.
   - Washtenaw County Sheriff and Michigan State Police Departments.
   - Huron Valley Ambulance.

2. Provide plan drawings showing equipment locations. Provide a performance-based specification. The detailed technical design of the ERRC should be by the Contractor.

3. Provide ERRC utilizing a bidirectional amplifier (BDA) "leaky" cable system, an amplified distributed antenna system (DAS), or other proven signal amplification technology capable of achieving the required radio coverage.

4. ERRC shall provide coverage on the 800 MHz band.

5. ERRC shall permit the simultaneous use and interoperability of analog and digital modulation radios.

6. ERRC shall be neutral host and nonproprietary.

7. ERRC shall not infringe on or be overrun by adjacent building communication systems or cellular telephone service provider systems.

8. ERRC shall be designed to maintain full system operation during a normal power outage. It shall transfer to and from an Uninterruptible Power Supply (UPS) without interruption.

9. ERRC shall comply with the requirements of and obtain licensee consent from the Michigan Public Safety Communications System.

10. When required by the program documents, add cellular telephone signal enhancement to the ERRC. Coordinate with ITSComm for connections to cellular telephone service provider headend equipment.

11. Do not combine the ERRC with other radio systems such as:
    - Wi-Fi systems.
    - Pager systems.
    - Medical telemetry systems.

12. Provide ERRC expandability to permit future additions and changes to the emergency responder radio frequencies.

13. Design the ERRC to provide signal amplification on every floor of the building. During installation, install infrastructure (equipment space, electrical power and cable pathways) throughout the building. However, install amplification only on floors that fail to pass the Contractor's pre-installation and acceptance tests.

14. ERRC headend including all common equipment shall be located in a room on the main floor or one floor below grade. Locate the headend equipment in the telecommunications Building Entrance (BE) room whenever possible. See Design Guideline SBA-C.

15. Locate the EERC node equipment in Telecommunications Rooms (TRs).

16. Provide a UPS sized to provide emergency power to ERRC headend and node equipment for a minimum of 24 hours. Connect the UPS to a generator-backed emergency power circuit if available.
    - UPS shall be enclosed in a NEMA Type 4 enclosure.
    - UPS batteries shall be of the sealed maintenance-free type.
    - Provide battery ventilation in accordance with code.

17. Provide the ERRC headend room and the TRs containing ERRC equipment with continuous air conditioning to alleviate heat build-up within the rooms. Connect the air conditioning system to normal building power circuits. The ERRC equipment can operate at an elevated temperature during a power outage.

18. Determine whether code requires rooms housing ERRC equipment to be separated from the remainder of the building by rated fire barriers.

19. Provide pathway (circuit) survivability in accordance with NFPA 72.

20. Provide a risk analysis in accordance with NFPA 72 to determine:
    - Whether the pathway (circuit) survivability level shall be Level 2 or Level 3.
    - Whether the antenna cables shall be plenum rated and/or Circuit Integrity (CI) type cables.

21. Provide supervision of the ERRC antennas, signal boosters, power supplies and UPS.
    - Provide supervisory and trouble alarm output contacts indicating an impairment. Connect the supervisory and trouble alarm contacts to the building fire alarm system.
    - Program the fire alarm system to relay ERRC supervisory and trouble alarm signals to the appropriate supervising station (DPSS, UMHHC Security, etc.). Instruct supervising station personnel to notify the Ann Arbor Fire and Police Departments of an impairment.

22. If outdoor antennas are required, obtain U-M approval of antenna locations. Provide access for maintenance and code-required fall protection.

23. Identify all required outside plant fiber optic cables required to connect ERRC to remote antennas, other services and other buildings. These cables will be provided by others.

Specification Requirements

1. Include the following in the ERRC performance specification.
    - ERRC equipment shall be FCC certified.
    - The Contractor shall be FCC licensed as required by code.
    - The Contractor shall submit detailed shop drawings for approval.
    - Components shall be industry standard and readily available to U-M.
    - Performance specifications for major components.
    - Requirements for a stock of spare parts.
    - ERRC headend and node equipment shall be securely attached to racks or backboards.
    - Antennas shall be securely attached independently from the work of other trades.

- Required separation distances between ERRC equipment and other mechanical, electrical and telecommunications equipment.
- Required separation distances between ERRC antennas and antennas of other radio systems.
- Cables shall be installed hidden from view except in open ceiling areas. Antennas may be installed exposed on the underside of ceilings.
- Components shall be labeled with unique part or address numbers which correspond to numbers shown on the Contractor drawings.
- Label the ERRC headend room door to identify the presence of headend equipment.

2. Plant Radio Shop personnel will operate and maintain the ERRC. Specify the following to support operation and maintenance activities:
   - Four paper copies of operation and maintenance manuals.
   - An electronic file storage device (USB drive, SD card, etc.) containing the final system software including the master program generic to the system, the software associated with each programmable piece of equipment, and the software licenses and passwords required by the Plant Radio Shop to perform programming changes.
   - A minimum of 8 hours of Owner training on operation and maintenance.
   - One year of customer service from the date of acceptance by U-M.
   - A parts and labor warranty for 1 year from date of acceptance by U-M.
   - The first code-required annual operational test at the end of 1 year.

3. Code requires one set of ERRC technical information and documentation to be filed in the Fire Command Center (if one exists) or in the ERRC headend room. Specify one set of the following:
   - ERRC bid specifications and drawings.
   - ERRC as-built drawings.
   - Summary of ERRC frequencies utilized.
   - Summary drawing showing locations of ERRC headend and node equipment, and antenna sites.
   - Table of effective radiated power at antenna sites.

Bidding Requirements

1. Before bidding, forecast which floors will likely require amplification.
2. To bid the work, request a base bid price for the EERC headend and for amplification on just the floors forecast to require amplification. Request an add price for adding amplification on each additional floor and a deduct price for deleting amplification from each floor.
3. As an alternative bidding method, request a base bid price for just the ERRC headend. Request an add price for adding amplification on each floor.

Testing Requirements

1. The Contractor shall perform pre-installation testing for percent coverage and signal strength in accordance with code. Testing shall not be performed until after the building is fully enclosed (roof, exterior skin, doors and windows are installed), and interior ceilings and walls are in place.
   - Measure the percent coverage and signal strength in both the critical and general areas on each floor. Measure the signal strength receivable within the building and the signal strength received when transmitting from within the building.
   - Install amplification only on the floors which fail to have the required percent coverage and signal strength.
   - Provide spare capacity to install amplification later on floors that pass pre-installation testing but may drop below the required percent coverage or signal strength when construction and furniture move-in are completed.

2. The Contractor shall perform acceptance testing for percent coverage and signal strength in accordance with code. Testing shall be performed after furniture move-in. OSEH personnel, U-M Plant Radio Shop personnel and the project's Commissioning Authority will witness the testing.
   - Demonstrate full compliance with IFC and NFPA 72 requirements.
   - Demonstrate full compliance with specification requirements.
   - Modify or add equipment, cables and antennas as required to achieve the code-required performance. Resolve specification deviations.