SRP-MIC Guidelines for

Public Safety Emergency Responder Radio Systems

(Distributed Antenna Systems / Bi-Directional Amplification Systems)

Effective August 1, 2017

SRPMIC Guidelines for Public Safety Emergency Responder Radio Systems

The purpose of these guidelines is to provide minimum standards to insure a reasonable degree of reliability for public safety emergency service communications from certain buildings and structures within SRPMIC. The following requirements are guidelines for design, installation, and testing of Public Safety Radio systems in multi-story, subterranean, and large buildings.

These guidelines apply to new construction permits for:

- Buildings greater than 20,000 square feet
- Existing buildings over 20,000 square feet when modifications, alterations or repairs exceed fifty percent (50%) of the value of the existing building(s) and are made within any 12 month period or the usable floor area is expanded or enlarged by more than fifty percent (50%)
- Initial buildings under 20,000 square feet that are enlarged or exceed 20,000 shall be upgraded

These guidelines shall not apply to:

- Existing buildings or structures for which a building permit has been issued
- Elevators
- Residential structures
- Buildings which meet the public safety radio coverage standards set forth in this document without amplification

Existing SRPMIC Public Safety Radio Systems

SRPMIC utilizes FCC licensed public safety radio frequencies in the 769MHz - 775MHz and 799MHz - 805MHz bands, and shall be readily adaptable to other public safety emergency radio frequencies in the 800MHz radio frequency spectrum, specifically 806MHz - 816MHz and 851MHz - 861MHz bands. The public safety radio amplification system shall be capable of modification or expansion in the event of frequency changes required by the FCC, or additional frequencies made available by the FCC.

SRPMIC only approves the use of donor signals from the SRPMIC Public Safety Radio System. The radio system has 5 broadcast sites available including a 4 site simulcast, with broadcast locations at the following:

- Site 1: Saddleback (Tower) - 10190 E MCKELLIPS RD, SCOTTSDALE, AZ 85256
- Site 2: Talking Stick Resort (Building Top) - 9800 E INDIAN BEND RD, SCOTTSDALE, AZ 85256
- Site 3: Shea-Beeline (Tower) - 33 33 38.9 N 111 42 20.4 W , FORT MCDOWELL, AZ 85264
- Site 4: Granite Reef (Tower) - 33 31 06.57 N 111 41 36.50 W , MESA, AZ 85215

And a standalone site at:

- Site 5: Thompson Peak (Tower) -33 38 39.3 N, 111 48 42.7 W , SCOTTSDALE, AZ 85255

Vendors may contact SRPMIC Public Safety Communications when more information is required.

Minimum Design Requirements:

The following levels of coverage are required for public safety radio communication on the SRPMIC Public Safety radio system:

1. Radio coverage:

   General areas: a minimum signal strength of (-95dBm) in 90% of the area of each floor of the building or structure from both the SRPMIC Public Safety System and from within the building or structure.

   Critical areas: a minimum signal strength of -95dBm in 99% of areas deemed critical such as the fire command center, the fire pump room(s), exit stairs, exit passageways, elevator lobbies and other areas deemed critical by the AHJ.

2. A Delivered Audio Quality (DAQ) of level 3 on each floor of the building or structure, which constitutes audio quality that makes speech understandable with slight effort with occasional repetition required due to noise or distortion.

Delivered Audio Quality	Subjective Performance Description
1	*Unusable, speech present but unreadable*
2	*Understandable with considerable effort. Frequent repetition due to noise/distortion.*
3	*Speech understandable with slight effort. Occasional repetition required due to noise/distortion.*
4	*Speech easily understood. Occasional noise/distortion.*
5	*Speech easily understood.*

3. A frequency range supported from the SRPMIC Public Safety field radio of 799MHz - 805MHz, and a frequency range supported to the SRPMIC Public Safety field radio of 769MHz - 775MHz, on each floor of the building or structure.

The Public Safety Radio System design shall be in accordance with NFPA 72 (2013 edition), The National Electric Code (2014 edition), the International Fire Code (2015 edition), the International Building Code (2015 edition), and the SRPMIC Ordinances, policies, and standards, unless specifically discussed otherwise herein these documents.

Public Safety Radio Systems shall not infringe on or be overrun by adjacent building communication systems or cellular telephone service provider systems.

Amplification System Requirements

1. The amplification system shall include filters to reject frequencies below and above the public safety bands by a minimum of 35 dB.
2. All amplification system components must be 100% compatible with analog and digital modulations after installation without additional adjustments or modifications to a frequency range subsequently established by SRPMIC. If the system is not capable of modification to future frequencies, then a new system must be installed to accommodate the new frequency band.
3. All electrical components must be equipped with independent auxiliary battery power or backup generator to function at full capacity for at least twelve (12) hours.
4. All amplification systems shall be contained in a NEMA 4-type waterproof cabinet(s) or other approved enclosure(s).
5. The amplification system shall be designed with, and consist of passive intermodulation (PIM) certified parts, minimally including coax, coax connectors, and antennas, and any other parts that are available with a PIM certification. The installed system must be tested and approved by a PIM certified engineer or technician, with a certificate of approval being signed and delivered to SRPMIC for record.

Active Device Requirements

1. All electrical components must be equipped with independent auxiliary battery power and/or a backup generator in conjunction with an auxiliary battery power to function at full capacity for at least twelve (12) hours. When an auxiliary battery system is used in conjunction with a backup generator, the battery system must be capable of functioning at full capacity for at least four (4) hours with the combined ability to function at full capacity for at least twelve (12) hours. When an auxiliary battery system is used without a backup generator, the battery system must be capable of functioning at full capacity for at least twelve (12) hours. The auxiliary battery systems batteries shall be replaced per manufacturer's recommendations.
2. Active devices shall be monitored and automatically alert via an approved communication method, that will provide supervisory and trouble signals indicating impairment, operational failure, or loss of power to the SRPMIC, or another SRPMIC approved monitoring entity. Any impairment, operational failure, or loss of power that has not been restored to normal within two (2) hours must also be reported to the SRPMIC Public Safety 911 Dispatch Center @ 480-850-9230 regardless of the monitoring entity. Where these radio monitoring/alarm functions can be performed as described above via the building's sprinkler monitoring or alarm system without interfering with either system's operation, the systems may be permitted to be interconnected. The approved monitoring entity must be clearly posted on the front of at least one piece of BDA/DAS equipment at the head-end, and each of the remote locations, including contact information for 24/7 availability in case of failure.
3. Conduit is only required in spaces where cable is exposed in a manner that can be physically damaged by normal building occupancy and operations. Plenum rated cable is acceptable above drop ceilings or hard lid ceilings that have access panels. Cable trays are required within 20-feet of an MDF or IDF room.

Design Documentation Requirements

1. The design and installation requires a PIM certified vendor responsible for the Public Safety Radio system and compliance with all applicable code and ordinance requirements.
2. The amplification system shall be:
   a. Fully Rebandable to meet FCC requirements.
   b. Classified as Type A (channelized) and FCC approved (FCC ID# sticker)
   c. Supported by manufacturer for 5 years after installation.
   d. Equipped with Uninterruptable Power supply (UPS), or auxiliary battery system.
   e. Equipped with an approved communication device that is programmed to report the assigned BDA/DAS identification to the approved monitoring entity, in the event of system impairment, operational failure, or loss of power, or connect the supervisory and trouble alarm contacts to the building fire alarm system.
3. Drawings shall detail the model numbers for all the proposed equipment (i.e. BDA system, Indoor Antennas, Donor Antenna, UPS, etc.)
4. Rack layout documentation.
5. MDF or IDF power requirements and coordination with backup generator power circuits if available.
6. Fiber optics layout and interconnect (if applicable).

Building Permit Application and Submittal

All recommended in-building solution system components; subcomponents, devices, and equipment shall be clearly shown in the deferred submittal provided to SRPMIC for permit. The permit applicant shall be the building owner or authorized installing contractor.

The applicant shall submit a permit application with three hardcopy sets and one electronic copy in PDF format of the Public Safety Radio System design drawings and documentation to SRPMIC Engineering and Construction Services located at 10005 East Osborn Road, Two Waters Building B, second floor, Scottsdale, AZ 85256. Permit fees are assessed at the time of the permit submittal which will include plan review, installation inspection services, and testing/acceptance.

Design drawings must be a minimum size Architectural D (24”x36”) sheets or similar, with supporting manufacturer documentation and equipment cut sheets on 8.5”x11” pages.

The drawings must identify any coordination with electrical systems, tie-ins, details for penetrations through rated construction assemblies, and/or other information as determined by the Building Official. Generally drawings should show electrical circuit required, backup power, antenna system and any other associated amplification equipment including panel locations and labeling.

Provide 11x17 floor plan drawing showing the signal levels from the BDA system and indoor antennas. Drawing shall show indoor antenna layouts and signal grid layouts of the BDA system for each level.

Signal propagation Map – provide a color map indicating signal strengths as designed and then as installed by As-Built following testing requirements below.

Plans and all revisions to the plans should be dated. If utilizing and existing drawing or portion of a drawing, the area of work shall be highlighted to show the new system implemented.

Installing contractors shall have valid workers compensation coverage, an SRPMIC business license, permit, and approved set of plans kept at the project site during installation.

Permit submittal packages may take up to 6 weeks for review.

Testing and Implementation

It is the building owner's responsibility to ensure that a commissioning test of the radio system occurs. The test shall ensure that two-way coverage on each floor of the building meets the minimum coverage requirements, with initial documentation of such test to be supplied to SRPMIC within 48 hours.

For new buildings, prior to the issuance of a certificate of occupancy for any building or structure to which these guidelines apply, the system shall be tested first by the applicant performing the installation. The applicant shall submit a test report that includes a grid test showing results from the new DAS along with verification of the monitoring system test. A test report shall be submitted by the applicant to SRPMIC for review. Upon review of the results by SRPMIC, the applicant shall schedule a time for inspection by SRPMIC to verify the newly installed system performance using portable radio units, checking radio signal strength, and intelligibility (DAQ) tests in locations throughout the building.

Special consideration should be directed at critical ingress and egress paths (stairwells, lobbies, exit hallways, tunnels, below ground service entrances, rooftop enclosures, or any zone deemed critical by the Building Official).

As-built drawings shall be provided to SRPMIC following installation modifications to the permitted drawings. The plans shall be printed on 24"x36" paper (and electronic pdf copy), including the location of system equipment, routes of all cabling between the equipment and antennas, location of all antennas, and electrical circuits and components serving the system.

Head end cabinet shall be labeled with system contact personnel with phone numbers or authorized vendor information for 24-hour, 7-day emergency response within two hours after notification.

Final sign off and acceptance will be made by SRPMIC Authority Having Jurisdiction (AHJ).

Annual Test

Systems shall be inspected and tested by building owners annually or whenever structural changes occur including additions or remodels that could materially change the original field performance tests.

Testing shall consist of the following:

- Signal boosters shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance.
- Batteries and power supplies shall be tested under load for a period of one hour to verify that they will properly operate during an actual power outage. If within the one-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional one-hour period until the integrity of the battery can be determined. If batteries fail to meet testing requirements, they must be replaced within 30-days and retested. If batteries are beyond the manufacturer's replacement cycle and they pass the one-hour test, they must be replaced prior to the next annual test.
- All other active components shall be checked to verify operation within the manufacturer's specifications.
- Annual test reports demonstrating compliance must be submitted to SRPMIC AHJ for acceptance within thirty days of completion. A one month grace period from the previous annual test date will be given for testing. Those not submitted annually may be subject to non-compliant fees required for the AHJ to re-inspect the system.
- The AHJ has authority to spot check buildings with Public Safety Radio systems registered with SRPMIC at any time.

Building owners with amplification or antenna systems in place for emergency responder radios shall retain all records of initial installation and annual tests.

Applicable Code

International Building Code (2015)

International Fire Code (2015)

2013 NFPA 72

National Electric Code (2014)

SRPMIC 2015 International Code Council Building and Fire Codes