

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

The following document should be presented to the agency having jurisdiction to confirm that there are no discrepancies with any local ordinance or code. In case of discrepancies, the local ordinance or code will prevail unless the agency having jurisdiction decides differently.

Important notice

- 1) *A Designer/Installer of a new BDA should contact the City of Miami Beach Fire Department, Attn: Captain Jorge Linares at (305) 673-7000 Ext. 2883 or at JorgeLinares@miamibeachfl.gov to confirm the frequency band to be used.*
- 2) *In order to establish if a new building requires a radio coverage solution, the Building Owner or General Contractor must produce (through a qualified Company) a preliminary assessment or baseline report of the in-door radio signal. The report should include floor plans showing the radio signal levels throughout the facility, as well as recommendations of the areas (if any) where radio signal improvement is required. The preliminary/baseline in-door radio signal report should be conducted before the building has all doors and windows installed as this can affect the RF signal penetration. A secondary preliminary/baseline in-door radio signal report should also be conducted with all door and windows closed after they have been installed.*

The City of Miami Beach Radio System Administrator or his designee shall then validate the reports to confirm that an in-building radio solution is actually needed or not, and that all the areas of interest have been effectively addressed in the first and second in-door radio signal preliminary/baseline report.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

1. Objective

The purpose of this document is to provide general guidance for the deployment of an in-building solution to enable Public Safety Radio Communications in the City of Miami Beach 800 MHz frequency band once it has been established that the new building requires an in-building radio coverage solution.

The in-building solution shall allow the Public Safety Agencies to properly communicate inside a given facility.

This document **“does not”** constitute a Design or Construction Plan, and **“does not”** substitute or supersede partially or entirely any guidelines, codes or specifications coming from the agency having jurisdiction where the in-building solution is being deployed.

Designer/Installer Qualifications

To ensure personnel safety, all construction tasks shall be conducted in accordance with OSHA safety and/or local safety regulations (whichever is more stringent). Contractors must comply with applicable Federal, State and Local Codes and requirements, including the Florida Building Code. All site development and equipment installation work shall comply with all applicable codes in use by the Authority Having Jurisdiction. Government and local codes shall take precedence over the requirements of this document provided they offer added safety.

Contractor must be knowledgeable of the following industry standards and codes:

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

- NFPA 1, National Fire Protection Association Fire Code
- NFPA 70, National Fire Protection Code or “National Electrical Code” (2011)
- NFPA 72, National Fire Alarm and Signaling Code (2010)
- NFPA 780, “Standard for the Installation of Lightning Protection Systems”
- Motorola R-56, “Standards and Guidelines for Communication Sites”
- TIA Bulletin TSB-88.1-C, Wireless Communications Systems Performance in Noise-Limited Situations, Part 1: Recommended Methods for Technology-Independent Performance Modeling
- Florida Building Code
- ANSI/TIA-222-G, Structural Standard for Antenna Supporting Structures and Antennas
- IEEE STD 142 “Green Book”, “Recommended Practice for Grounding of Industrial and Commercial Power Systems”
- ANSI/TIA/EIA-568-B, “Commercial Building Telecommunications Cabling Standard
- ANSI/TIA/EIA-569-B, “Commercial Building Standards for Telecommunications Pathways and Spaces”

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

- ANSI/TIA/EIA-606, “The Administration Standard for the Telecommunications Infrastructure of Commercial Building”

- ANSI/TIA/EIA-607, “Commercial Building Grounding and Bonding Requirements for Telecommunications”

- All other applicable Federal, State and Local Building Codes and Requirements

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

2. General Scope of Work

The Designer/Installer shall provide a “turn-key” solution for the design, installation and testing of an in-building RF coverage system capable of meeting the requirements detailed in Section 8 (“Test procedures and measurement parameters”).

For the downlink signal, a minimum signal strength of negative (-) 95 dBm throughout the entire facility with a DAQ of 3.4 or better, is required 100 % of the time.

For General Structure Areas, the in-building RF solution shall provide the above specified coverage in 95% of the floor area as suggested in Section 8 of this document. General Structure Areas are defined as living areas, basements, parking garages, administrative offices and conference rooms.

For Critical Areas, the in-building RF solution shall provide the above specified coverage in 99% of the floor area.

Critical Areas are defined as mechanical and utility rooms, public bathrooms, elevators, stairwells, exit stairs, exit passageways, Police holding areas, elevator lobbies, fire pump rooms, sprinkler sectional valve locations, elevator shaft and other areas considered by the agency having jurisdiction. The Designer/Installer shall contact the agency having jurisdiction to confirm critical areas (i.e. fire command room, fire pump room, generator, etc.) in the new construction.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

Testing the uplink signal of a BDA is a difficult task for the Contractor since it would imply conducting measurements directly in the infrastructure of the Public Safety radio system. Refer to Section 8 (“Test procedures and measurement parameters”) for suggestions on this topic.

The system shall provide the required coverage in the frequency bands or channels specified by the agency having jurisdiction.

In the specific case of City of Miami Beach, the downlink and uplink frequency bands of the 800 MHz Public Safety signal booster are 851-861 MHz and 806-816 MHz, respectively.

To obtain information about a benchmarking/monitoring frequency in the City of Miami Beach 800 MHz bands and other questions about in-building solutions for 800 MHz, please contact Steve Sawicki Radio System Administrator, (305) 673-7000 Ext. 3799, or stevesawicki@miamibeachfl.com

Be advised that no transmissions are allowed on the benchmarking/monitoring frequency. The in-building Public Safety radio coverage system and other radio systems operating within (or in the vicinity of) the facility shall not interfere with each other.

Signal boosters shall be FCC-type accepted and must operate in accordance with FCC rules.

For Class B signal boosters, it is the responsibility of the Contractor to register the signal booster(s) with the FCC as per “Part 90 Class B Signal Booster Registration & Discovery Report and Order”, released on February 20th, 2013. Please visit <http://wireless.fcc.gov/signal-boosters/part-90-boosters/index.html> for additional information

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

about the registration procedure and labeling requirements for Class B signal boosters.

The signal booster shall be installed in a fire engine-red NEMA 4 (or 4X) enclosure with locking mechanism. All power components must be inside of a NEMA 4 (or 4X) enclosures and must capable of providing a minimum of four hours or of interrupted emergency power supply.

Maximum VSWR measured in any RF branch of the DAS shall not exceed 1.5 (15 dB Return Loss).

3. Electrical power requirements.

All active components of the BDA shall be powered via dedicated (“home run”) and generator protected electrical circuits. In addition, twelve-hour battery backup for the in-building system operating at 100% capacity is required. If the BDA is not connected by a generator electrical circuit, the BDA must contain a 24hour operational time.

NEMA twist-lock electrical plug and receptacle set shall be utilized to connect the active components of the BDA to the AC power.

Surge protection device(s) shall be used to protect active components of the BDA from electrical transients.

4. Alarm and Monitoring System.

An automatic monitoring system is required with a dedicated panel in the Fire Command Room and can be constantly monitored at the

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

fire alarm panel. The system must monitor and produce an alarm in the event of antenna system malfunction or signal booster failure.

Additionally, in case that an in-building solution based on RF/Fiber Optics converters is selected, the system shall also be capable of alarming in the event of malfunction of the main and the expansion hubs.

A separate alarm for oscillating amplifiers is also required. The selected signal booster shall be capable of “AGC Overdrive” and “Oscillation Control” features.

This includes, but is not limited to, an alarm and automatic shutdown for oscillating amplifiers. These features are intended to minimize interference due to oscillation of the signal booster(s).

Power supplies must, at a minimum, alarm at loss of ac power, failure of the battery charger, and low battery charge (defined as 20% minimum of capacity).

5. Propagation Delay

The maximum radio signal propagation delay introduced by the in-building coverage solution shall not exceed 12 μ s. If a delay greater than 12 μ s is expected by design, then further analysis should be conducted in conjunction with the agency having jurisdiction to evaluate potential signal degradation in areas where the direct signal coming from a radio site coincides with the BDA output signal.

6. Exterior Antenna System

The orientation of the donor antenna shall be determined in coordination with the agency having jurisdiction.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

If required by FAA regulations, obstruction lighting and/or marking shall be installed.

All exterior antennas are to be high-gain, vertically polarized and specified for the operating frequencies. Yagi or corner reflector-type antennas are recommended.

The antenna installation, including the coaxial cable shield, shall be suitably connected to the building's electrical ground system at the base of the antenna mast and at a coaxial lightning protector as per Motorola R56.

A weatherized coaxial lightning protector designed for the proper frequency band shall be installed in the coaxial cable feed outside the facility.

Typical requirements for coaxial lightning protectors are the following:

- Impedance: 50 Ω
- Frequency range: as needed to the respective bands
- VSWR: 1.1:1 or better
- Insertion Loss: 0.1 dB or better
- Impulse Discharge Current : 10KA or better
- Turn-on voltage: 600 V
- Turn-on Time: 2.5 nS for 2kV/nS
- Energy Throughput Rating: 5 nJoule for 3 kA (8/20 μ S waveform)

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

- Continuous handling RF power: 100 W or better at the respective frequency bands

A rooftop donor antenna installation shall meet the wind loading requirements of the Florida Building Code that is in affect ANSI/TIA-222-G.

7. In-Building Antennas

The in-building antenna system shall consist of a sufficient number of antennas distributed within the building and attached structures to meet the coverage criteria previously specified.

Splitters and any other active or passive components installed shall be mounted in a separate 2 hour rated/fire resistance color yellow code junction box conspicuously located so as to be easily accessible for maintenance while maintaining them secure from unauthorized tampering. The entire communication riser must meet the survivability requirements for life safety systems.

8. Test procedures and measurement parameters

Before turning on the BDA you must get an approval from the City of Miami Beach Radio System Administrator Steve Sawicki (305) 673-7000 Ext. 3799, or stevesawicki@miamibeachfl.com

- System isolation

Before conducting any further tests, the Contractor/Designer shall verify that the isolation between the donor and the in-door antenna systems is at least 15 dB greater than the gain of the BDA.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

- Downlink Signal Strength Measurements

Downlink signal levels shall be measured to ensure the system meets the requirements mentioned in Section 2; that is, a minimum signal strength of negative (-) 95 dBm throughout the entire facility with a DAQ of 3.4 or better, 100% of the time.

To measure the signal strength in the downlink, it is advisable that two (2) traces be defined in the spectrum analyzer to be used for testing. The first trace would be holding maximum values of the Radio Signal Strength of the RF frequency (ies) under test, and the second trace would be holding minimum values of the RSSI. The “true” signal strength in a given test point would be the average of the two readings, taken during a minimum 30 second interval.

For the benchmarking of the facility, as well as a part of the As-built documentation of the project, the Contractor/Vendor shall reflect in appropriate floor plan(s) the maximum and minimum RSSI readings obtained at each test point to show “before” and “after” measurements.

- Uplink

As previously mentioned, testing the uplink signal of a BDA is a difficult task for the Contractor since it would imply conducting measurements directly in the infrastructure of the Public Safety radio system.

Calculations of the link budget may be used to estimate the necessary gain in the uplink to produce a signal strength of -95 dBm at the donor site.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

However, as a rule of thumb it is advisable to set up the uplink gain of the BDA at values ranging between 10-20 dB less than the downlink gain, depending on the distance to the donor site.

During the acceptance test of the system, the agency having jurisdiction might request a re-adjustment of the uplink and/or the downlink gain(s) of the BDA.

9. Coax

Miami Fire Department requires all coax in EMT metal conduit and must meet the 2 hour survivability.

10. Acceptance Test by the AHJ

During the final acceptance test of the system, the agency having jurisdiction will perform random voice tests and RSSI measurements throughout the entire facility. The tests will be based on the Scope of Work and the "Before and After" floor plans depicting the readings submitted to the agency having jurisdiction.

The purpose of the tests will be to verify if the in-building solution complies with the design criteria previously established in Section 2 detailed above ("General Scope of Work"). The agency having jurisdiction will decide what areas of the building will be tested for RSSI and voice quality.

In addition, during the acceptance test of the system, the agency having jurisdiction might request a re-adjustment of the uplink and/or the downlink gain(s) of the BDA. If this is the case, then a new system isolation test might be needed.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

The agency having jurisdiction might also request a test of the UPS and the alarm and monitoring systems.

11. Designer/Contractor Responsibilities

- Survey the facility to demonstrate the necessity of an in-building solution in the new building and submit benchmarking results and corresponding Scope of Work to the agency having jurisdiction.
- Design, commissioning and testing of an in-building RF coverage solution that guarantees a minimum RF signal level of -95 dBm and 3.4 DAQ throughout the entire facility and attached structures under the conditions described in this document or as per the conditions specified by the agency having jurisdiction.
- Plans must be submitted and approved prior to the installation of any equipment: Submit plans to Steve Sawicki Radio System Administrator, (305) 673-7000 Ext. 3799, or stevesawicki@miamibeachfl.com
- Obtain the necessary building permits .
- Record all appropriate signal levels after the system implementation as previously detailed. Prepare and submit to the agency having jurisdiction the “Before and After” floor plans showing signal levels.
- Submit specification of all components such as splitter, ways, antennas, battery, etc. to Steve Sawicki Radio System Administrator at stevesawicki@miamibeachfl.com
- Address any in-building coverage issue discovered during the Acceptance Test.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

- Address any reported interference issue related to the new BDA installation
- Provide the Building Owner/Agency having jurisdiction with project documentation including but not limited to “As-built” documentation, system documents, technical manuals, Return Loss or VSWR readings of the RF lines, diagrams showing equipment placement and routing for antennas, coaxial cables, fiber optics interconnections and AC power.

12. Building Owner Responsibilities

- Keep record of the project documentation including but not limited to “As-built” documentation, system documents, technical manuals, Return Loss or VSWR readings of the RF lines, diagrams showing equipment placement and routing for antennas, coaxial cables, fiber optics interconnections and AC power.
- Have in place a service contract with a qualified Vendor for technical maintenance, repair (including all components of the system), operation and troubleshooting in the event of radio interference involving the in-building radio coverage solution.
- The Building Owner shall provide the contact information of the System Maintenance Vendor to the agency having jurisdiction, so this entity can work directly with the Vendor in case of troubleshooting due to an interference event.
- Provide the agency having jurisdiction with continuous access to the facility for purposes of testing of the Public Safety radio signal.

City of Miami Beach Fire Department

General Guidelines for the Deployment of In-Building Radio Coverage Solutions

13. City of Miami Beach Fire Department procedure for BDA permitting process:

**** AT NO TIME SHALL WORK COMMENCE WITHOUT AN APPROVED SET OF PLANS
AND ISSUED PERMITS ****

1. All new structures or existing structures changing occupancy classification require by Code a preliminary reading of public radio signal coverage that must be submitted for review to Fire *Captain Jorge Linares* at (305) 673-7000 Ext. 2883 or at JorgeLinares@maimibeachfl.gov
2. City personnel will evaluate and test the building to confirm preliminary readings that were submitted by third party contractor.
3. If it is determined that a BDA system is required in the structure, it will be confirmed by Radio System Administrator or his designee and their readings.
4. Plans will be submitted first to the Miami Beach Fire Prevention Bureau for review. Once plan is approved by the Radio System Administrator or his designee it will be stamped and signed on every page.
5. The Radio System Administrator will then e-mail/notify the Miami Beach Fire Prevention Bureau that your plans are ready for review.
6. When Miami Beach Fire Prevention reviews and approves the plans, the Contractor will need to pull the proper permits.
7. When installation work is commenced, the appropriate inspections will be coordinated.