

In-Building Cellular Amplification System Technical Specification
27 50 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

This specification describes technical and performance criteria for deploying a In-Building Cellular Amplification System capable of supporting Wireless Service Providers (WSP). The components specified in this document include: Donor Antennas, Coverage Antennas, Coax Cable, Singlemode duplex fiber, composite fiber with singlemode duplex and 16/2 AWG copper, and analog repeater.

1.02 SYSTEM DESCRIPTION

A. Services: Upon commissioning, the In Building cellular amplification system shall provide coverage for the WSPs listed below on all frequencies currently being used by the designated WSPs in the given market that has an exterior signal level is -105 dBm RSRP or greater.

1. AT&T
2. Sprint
3. T-Mobile
4. Verizon
5. US Cellular

Service	Downlink
Cellular	870 - 894
PCS	1930 - 1995
AWS	2110 - 2155
700 LTE	728 - 756

B. WSP Notification: The Contractor shall register the repeaters with at least one WSP through their web site that the repeaters will be connected to the WSPs' macro networks.

1.03 ALTERNATIVES

A. No alternative component(s) shall be accepted as equal to the components and manufacturers specified in this document

1.04 CODES, STANDARDS AND CERTIFICATIONS

A. All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation, workmanship, maintenance and testing shall comply with the latest editions of the National Electrical Code, National Electrical Safety Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractors Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents noted above, the contractor shall satisfy the most stringent requirements.

B. It is the Contractor's responsibility to ensure that the components comply with local code, ordinances or requirements established by the AHJ.

1.05 ABBREVIATIONS AND ACRONYMS

- A. AHJ: Authority Having Jurisdiction
- B. ATP: Acceptance Test Plan
- C. AWS: Advanced Wireless Service
- D. BDA: Bi-Direction Amplifier
- E. BOM: Bill-of-Material
- F. DAS: Distributed Antenna System
- G. DAQ: Digital Audio Quality
- H. ESMR: Enhanced Specialized Mobile Radio
- I. FCC: Federal Communications Commission
- J. iDEN: Integrated Enhanced Digital Network
- K. LMR: Land Mobile Radio
- L. LTE: Long Term Evolution
- M. MTBF: Mean Time Between Failure
- N. NFPA: National Fire Protection Association
- O. NMS: Network Management System
- P. PCS: Personal Communications System
- Q. PSN: Public Safety Network
- R. RoF: Radio-over-Fiber
- S. RoHS: Restriction of Hazardous Substances
- T. RSL: Received Signal Level
- U. SIMO: Single-Input, Multiple-Output
- V. SISO: Single-Input, Single-Output
- W. SMR: Specialized Mobile Radio
- X. SMS: Short Message Service
- Y. SNMP: Simple Network Management Protocol
- Z. SOW: Statement of Work
- AA. VSWR: Voltage Standing Wave Ratio
- BB. WSP: Wireless Service Provider

1.06 DEFINITIONS

- A. Acceptance: Expressed approval by the customer
- B. Active: Components that require AC/DC power for operation
- C. Channel: A path for an RF transmission between two points
- D. Component: A main system element of the Amplification system
- E. Contractor: The prime contractor bidding the project
- F. Delivered Audio Quality (DAQ): A measure of audio quality over a transmission medium used to quantify the quality of audio heard over a radio system. DAQ levels are defined by the following scale:
 - a. DAQ 1: Unusable. Speech present but not understandable.
 - b. DAQ 2: Speech understandable with considerable effort. Requires frequent repetition due to noise or distortion.
 - c. DAQ 3: Speech understandable with slight effort. Requires occasional repetition due to noise or distortion.
 - d. DAQ 3.4: Speech understandable without repetition. Some noise or distortion present.
 - e. DAQ 4: Speech easily understandable. Little noise or distortion.
 - f. DAQ 5: Perfect. No distortion or noise discernible.
- G. Sub-contractor: A qualified and experienced integrator performing the

deployment for the Contractor.

- H. Head-End Equipment: The equipment that accepts the RF Source, and then typically amplifies the RF source to the interior antennas
- I. Passive: Components that do not require AC/DC power for operation

1.07 PERFORMANCE REQUIREMENTS

A. WSP :

- 1. On a per channel basis, the downlink RSL for each frequency band shall meet or exceed the criteria in Table 1.

Table 1. System Parameters

Parameters	Unit	700 LTE	Cellular, PCS, AWS, Commercial 800 MHz
Minimum downlink receive signal RSRP	dBm	-105	-105

- 2. Contractor shall state the assumed channel loading and frequency bands for the proposed WSP in-building coverage. Prior to installation, contractors shall confirm the channel loading and frequency use in the serving area and shall guarantee coverage for these channels per the criteria in Table 1.
- 3. The system shall deliver coverage per the criteria in Table 1 throughout 95% of the building.

1.08 SUBMITTALS

A. Submittal Requirements:

- 1. Product Data: Submit manufacturer datasheets for the following components:
 - a. Coverage Antennas
 - b. Coaxial Cable
 - c. Singlemode duplex Fiber
 - d. Repeaters
 - e. Masts
 - f. Donor antennas
- 2. Shop Drawings: Submit the following items:
 - a. RF link budget
 - b. Overlay of system Components on floor plans
 - c. Drawings for Donor Antenna and grounding
 - d. Bill-of-Material (BOM)
- 3. Statement of Work (SOW): Submit sample SOW
- 4. Acceptance Test Plan (ATP): Submit sample ATP
- 5. Recommended Spares
- 6. Warranty Documents:
 - a. Submit for all manufactured Components specified in this Section.
 - b. Submit Contractor's System Warranty.
 - c. Submit Manufacturer's Warranty.

B. Submittal Requirements Prior to Start of Construction

- 1. Final RF link budget

2. Overlay of system Components on floor plans
 3. Drawings for Donor Antenna and grounding
 4. RF propagation modeling
 5. Bill-of-Material (BOM)
 6. Maintenance Service Contract
 7. Statement of Work (SOW): The contractor shall submit a SOW that has been accepted by the customer or customer's designated representative.
 8. Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.
- C. Submittal Requirements at Close Out
1. Drawings: Submit as-built drawings indicating:
 - a. Donor antenna, grounding and lightning protection details
 - b. Cable routing, splitters, couplers and coverage antenna locations
 - c. Active component locations, layout and configuration
 2. Test Reports
 - a. WSP: Submit accepted ATP reports confirming the requirements of this specification have been met.
 3. Field Reports: Submit sweep-testing results for all cable runs.
 4. Operation and Maintenance Data: Submit hardware manuals for all Components.
 5. Warranty Documents:
 - a. Submit for all manufactured components specified in this Section.
 - b. Submit Contractor's System Warranty.
 - c. Submit Manufacturer's Warranty

1.09 QUALITY ASSURANCE

- A. Qualifications and Requirements:
1. Contractor or Sub-contractor shall have a minimum of 4-years full-time experience executing work of similar scope and complexity.
 2. Contractor or Sub-contractor shall have deployed a minimum of 10 systems.
 3. Contractor or Sub-contractor Project Managers must be System Certified.
 4. Contractor or Sub-contractor shall provide an onsite construction foreman to oversee the installation.
 5. Contractor or Sub-contractor shall provide a project manager to oversee the deployment.
- B. Certifications:
- a. The manufacturer(s) of the active components shall maintain a formal authorized and certified value-added reseller program, which consists of routine quality audits of the participating value-added resellers. The list of authorized value-added resellers shall be published and the Contractor or Sub-contractor shall be listed in the Manufacturer's publication of value-added resellers.
 - b. Contractor or Sub-contractor(s) shall provide manufacturer certification that their personnel have been trained on the passive and active components being installed.
 - c. Contractor or Sub-contractor shall be an authorized and certified value-added reseller for the proposed manufacturer of passive and active components.

1.10 WARRANTY

- A. Manufacturer Warranty:
1. Splitters, Couplers and Coverage Antennas: 5-year limited warranty from date of system acceptance.
 2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
 3. Active Components: The earliest of 3-year limited warranty from date of system installation or 15 months from date of shipment.

1.11 MAINTENANCE

- A. The Contractor shall provide an optional annual maintenance service contract to include:
- Diagnostics & Repair
 - 24x7x365 Technician Dispatch (On-site within 24 hours)
 - Annual Preventive Maintenance
 - Equipment Warranty Management

PART 2 – PRODUCTS

1.01 MANUFACTURERS

1. Specified Manufacturers for 50 Ohm passive components:
Wilson Electronics
Specified Manufacturers for Active components: Wilson Electronics and Zinwave
2. Acceptable Manufacturers: Wilson Electronics Pro Series Equipment and Zinwave

1.02 COMPONENTS

Cellular Repeater

Single Output Amplifier

- A. Single Input Single Output (SISO) wall mount or rack mount cellular repeater shall provide up to +17 dBm downlink power and +26 dBm uplink power with maximum of 70dB gain that is compatible with all North American cell networks
- B. The cellular rep
- C. The cellular repeater shall incorporate eXtended Dynamic Range (XDR) technology to protect the amplifier from shutting down due to strong outside signal (-40dBm or higher) or changes in the outside signals.
- D. The cellular repeater shall incorporate Multi-Tower Targeting (MTT) technology to target specific frequency bands from multiple macro antennas.
- E. The cellular repeater shall incorporate cloud integration for remote monitoring and management. Connectivity to the cloud shall be via LTE connection (using built-in cellular modem) or wired ethernet connection.
- F. The cellular repeater shall auto-detect and prevent any cell tower interference.
- G. Frequencies:
- | | |
|--------------|--------------|
| a. Band 12 | 700MHz |
| b. Band 13 | 700MHz |
| c. Band 5 | 850MHz |
| d. Band 4 | 1700/2100MHz |
| e. Band 25/2 | 1900MHz |

Multiple Output Amplifier

- A. Single Input Multiple Output (SIMO) wall mount or rack mount cellular repeater shall provide up to +17 dBm downlink power and +26 dBm uplink power with maximum of 70dB gain from the input to each of (4) outputs and is compatible with all North American cell networks
- B. The cellular repeater shall incorporate eXtended Dynamic Range (XDR) technology to protect the amplifier from shutting down due to strong outside signal (-40dBm or higher) or changes in the outside signals.
- C. The cellular repeater shall incorporate Multi-Tower Targeting (MTT) technology to target specific frequency bands from multiple macro antennas.
- D. The cellular repeater shall incorporate cloud integration for remote monitoring and management. Connectivity to the cloud shall be via LTE connection (using built-in cellular modem) or wired ethernet connection.
- E. The cellular repeater shall display RSRP & RSRQ (network scanning) on the LCD referenced to the indoor (server) ports. This represents signal performance after it has been amplified and shall also be available through cloud integration for troubleshooting purposes.
- F. The cellular repeater shall auto-detect and prevent any cell tower interference.
- G. The solution shall have the capability of conversion to RF over fiber utilizing duplex singlemode fiber for backbone distribution and composite duplex singlemode fiber and 16/2 AWG copper for horizontal cabling to remote units.
- H. Frequencies:
 - f. Band 12 700MHz
 - g. Band 13 700MHz
 - h. Band 5 850MHz
 - i. Band 4 1700/2100MHz
 - j. Band 25/2 1900MHz

Outside Antennas

- I. Omni-Directional Outside Antennas: Omni-Directional outside antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.
- J. Electrical Band 1:
 - k. Frequency Band: 698 – 800 MHz
 - l. VSWR: < 1.8
 - m. Gain: 2 dBi
 - n. Maximum input power: 100W
 - o. Impedance: 50 Ω
 - p. Beamwidth, Horizontal: 360° omnidirectional
 - q. Beamwidth, Vertical: 60° nominal
- 1. Electrical Band 2:
 - a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b. VSWR: 1.5:1
 - c. Gain: 5 dBi
 - d. Maximum input power: 100W
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 360° omnidirectional
 - g. Beamwidth, Vertical: 60° nominal
- 2. Mechanical:
 - a. Connector: 50 Ω N Type Female
 - b. Mounting: Mast Mount

- c. Radome material: ABS, UV resistant
 - d. Pigtail cable: KSR195, plenum rated
3. Environmental:
 - a. Application: Outdoor
 - b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c. Relative Humidity: Up to 100%
 4. Regulatory Compliance/Certifications: RoHS 2002/95/EC

Outside Directional Antennas (YAGI): Outside Directional antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.

- K. Electrical Band 1:
 - a. Frequency Band: 698 – 800 MHz
 - b. VSWR: < 1.8
 - c. Gain: 2 dBi
 - d. Maximum input power: 100W
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 360° omnidirectional
 - g. Beamwidth, Vertical: 60° nominal
1. Electrical Band 2:
 - a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b. VSWR: <1.8
 - c. Gain: 4 dBi
 - d. Maximum input power: 100W
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 360° omnidirectional
 - g. Beamwidth, Vertical: 60° nominal
2. Mechanical:
 - a. Connector: 50 Ω N Type Female
 - b. Mounting: Thru-hole ceiling mount
 - c. Radome material: ABS, UV resistant
 - d. Pigtail cable: KSR195, plenum rated
3. Environmental:
 - a. Application: Indoor
 - b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c. Relative Humidity: Up to 100%
4. Regulatory Compliance/Certifications: RoHS 2002/95/EC

Inside Antennas

- L. Omni-Directional Coverage: Omni-Directional Coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.
- M. Electrical Band 1:
 - a. Frequency Band: 698 – 800 MHz
 - b. VSWR: 1.5:1
 - c. Gain: 7 dBi
 - d. Maximum input power: 50 watts
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 360° omnidirectional
 - g. Beamwidth, Vertical: 60° nominal
 - h. Return Loss: 10.9 dB

1. Electrical Band 2:
 - a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b. VSWR: 1.5:1
 - c. Gain: 7 dBi
 - d. Maximum input power: 50 watts
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 360° omnidirectional
 - g. Beamwidth, Vertical: 65° nominal
 - h. Return Loss: \leq 13.9 dB
 2. Mechanical:
 - a. Connector: 50 Ω N Type Female
 - b. Mounting: Thru-hole ceiling mount
 - c. Radome material: ABS, UV resistant
 - d. Pigtail cable: KSR195, plenum rated
 3. Environmental:
 - a. Application: Indoor
 - b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c. Relative Humidity: Up to 100%
 4. Regulatory Compliance/Certifications: RoHS 2002/95/EC
- N. Low Profile Omni-Directional Coverage: Omni-Directional Coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.
- O. Electrical Band 1:
- i. Frequency Band: 698 – 800 MHz
 - j. VSWR: 1.5:1
 - k. Gain: 7 dBi
 - l. Maximum input power: 50 watts
 - m. Impedance: 50 Ω
 - n. Beamwidth, Horizontal: 360° omnidirectional
 - o. Beamwidth, Vertical: 60° nominal
 - p. Return Loss: 10.9 dB
1. Electrical Band 2:
 - i. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - j. VSWR: 1.5:1
 - k. Gain: 7 dBi
 - l. Maximum input power: 50 watts
 - m. Impedance: 50 Ω
 - n. Beamwidth, Horizontal: 360° omnidirectional
 - o. Beamwidth, Vertical: 65° nominal
 - p. Return Loss: \leq 13.9 dB
 2. Mechanical:
 - e. Connector: 50 Ω N Type Female
 - f. Mounting: Thru-hole ceiling mount
 - g. Radome material: ABS, UV resistant
 - h. Pigtail cable: KSR195, plenum rated
 3. Environmental:
 - d. Application: Indoor
 - e. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - f. Relative Humidity: Up to 100%
 4. Regulatory Compliance/Certifications: RoHS 2002/95/EC
- P. Directional Coverage Antennas: Directional coverage antennas shall feature a

multi-band design, accommodating multiple frequency bands in a single small antenna.

1. Electrical Band 1:
 - a. Frequency Band: 698 – 800 MHz
 - b. VSWR: 1.5:1
 - c. Gain: ≥ 5.0 dBi @ 698 – 800 MHz
 - d. Maximum input power: 50W
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 70/60°
 - g. Polarization: Vertical
 - h. Return Loss: ≤ 10.9 dB
2. Electrical Band 2:
 - a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
 - b. VSWR: $\leq 1.5:1$
 - c. Gain: ≥ 5.0 dBi @ 800 – 960 MHz and ≥ 8.0 dBi @ 1710 – 2170 MHz
 - d. Maximum input power: 50W
 - e. Impedance: 50 Ω
 - f. Beamwidth, Horizontal: 70/60°
 - g. Return Loss: ≤ 13.9 dB
3. Mechanical:
 - a. Connector: 50 Ω N Type Female
 - b. Mounting: 4-hole wall mounting plate
 - c. Radome material: ABS, UV resistant
 - d. Pigtail cable: RG58, plenum rated
4. Environmental:
 - a. Application: Indoor
 - b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
 - c. Relative Humidity: Up to 100%
5. Regulatory Compliance/Certifications: RoHS 2002/95/EC

Q. Air Dielectric, Plenum Rated Cable:

1. Material Characteristics:
 - a. Jacket: Halogenated, Fire-Retardant
 - b. Outer Conductor Material: Corrugated Aluminum or Corrugated Copper
 - c. Inner Conductor Material: Copper-Clad Aluminum Wire
2. Electrical Characteristics:
 - a. Impedance: 50 \pm 2.0 Ω
 - b. Frequency Band: 1 - 8800 MHz
 - c. Peak Power Rating: ≥ 40.0 kW
3. Mechanical Characteristics:
 - a. Diameter Over Jacket: $\leq .627$ in
 - b. Minimum Bending Radius: ≤ 5 in
 - c. One Time Minimum Bending Radius: ≤ 3 in
4. Attenuation Characteristics:

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.848
450	≤ 1.53
800	≤ 2.105
2000	≤ 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

R. Foam Dielectric Cable:

1. Material Characteristics:
 - a. Jacket: Non-halogenated, Fire-Retardant Polyolefin
 - b. Outer Conductor Material: Corrugated Copper
 - c. Inner Conductor Material: Copper-Clad Aluminum Wire or Copper Tube
2. Electrical Characteristics:
 - a. Impedance: $50 \pm 1.0 \Omega$
 - b. Frequency Band: 1/2" Nominal: 1 - 8800 MHz, 7/8" Nominal: 1 - 5000 MHz
 - c. Peak Power Rating: $\geq 40.0 \text{ kW}$
3. Mechanical Characteristics:
 - a. Diameter Over Jacket: 1/2" Nominal: $\leq .630 \text{ in}$, 7/8" Nominal: $\leq 1.1 \text{ in}$
 - b. Minimum Bending Radius: 1/2" Nominal: $\leq 5 \text{ in}$, 7/8" Nominal: $\leq 10 \text{ in}$
 - c. One Time Minimum Bending Radius: 1/2" Nominal: $\leq 2 \text{ in}$, 7/8" Nominal: $\leq 5 \text{ in}$
4. Attenuation Characteristics: 1/2" Nominal

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.815
450	≤ 1.447
800	≤ 1.968
2000	≤ 3.251

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Attenuation Characteristics: 7/8" Nominal:

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.417
450	$\leq .744$
800	≤ 1.014
2000	≤ 1.683

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

S. Splitters, Taps, Couplers, and Coax Jumpers:

1. Approved Manufacturer: Wilson Electronics

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The contractor and/or Sub-contractor shall design, install, commission and test the Cellular amplification system in accordance with the manufacturer's instructions and recommendations.
- B. The contractor and/or Sub-contractor shall install the Cellular amplification system in accordance with the accepted SOW.
- C. The contractor and/or Sub-contractor shall adhere to all work and safety requirements while working at the job site.
- D. The contractor and/or Sub-contractor shall have Cellular amplification system project foreman on site overseeing the installation.
- E. The contractor and/or Sub-contractor shall have at a minimum one Project Manager on staff overseeing the project. The Project Manager will be responsible for the following:
 - 1. Developing and maintaining a project plan consistent with the overall milestones of the project.
 - 2. Overseeing and coordinating the activities of the Cellular amplification system project, including: initiating and holding weekly project conference calls, as well as maintaining and distributing meeting minutes.
 - 3. Act as the point-of-contact interface for all Cellular amplification system project activities.
 - 4. Provide weekly status updates regarding work performed, worked scheduled, open items, problems/issues and resolutions.
- F. The contractor and Sub-contractor shall be prepared to deploy the Cellular amplification system in a phased approach as dictated by the building construction and/or work of other trades.
- G. The contractor and Sub-contractor shall be WilsonPro Certified
- H. All singlemode fiber connections shall be SC/ APC. No mechanical terminations. Fusion splicing only.
- I. No more than 5dB optical loss and 35dB back reflection per optical link.
- J. The contractor and Sub-contractor shall facilitate WSP registration and connection to their respective macro networks.
- K. The contractor and Sub-contractor shall be prepared to connect to the WSP's network(s) in a phased approach as dictated by the construction schedules.
- L. Install cabling designed for the environment the cable will be installed in.
- M. Terminate and test all coaxial cabling with a sweep analyzer.
- N. Test all fiber cabling utilizing level 3 tester or above
- O. Label all cabling per the contract drawings to indicate the segment number from each amplifier.
- P. Provide exterior cell measurements according to the manufacturers recommendations.

3.02 ACCEPTANCE TESTING

- A. Acceptance testing will be performed confirming the requirements of Section 1.07 have been met.
- B. The contractor shall complete the acceptance testing per the requirements and as prescribed in the approved Acceptance Test Plan (ATP) submittal.
- C. Acceptance Testing

1. Acceptance Testing shall comply with the following:
 - a. The Acceptance Test shall ensure that two-way coverage on each floor of the building meets the minimum coverage requirements detailed in Section 1.07.
 - b. Tests shall be made using the frequencies listed in Section 1.02.A.
 - c. Testing shall be coordinated with the Customer and AHJ to ensure no undue interference to any building operations.
 - d. All testing shall be done on frequencies authorized by the FCC.

2. Test Procedures

The test plan shall ensure testing throughout the building. Testing shall be performed on a grid system. A spot located approximately in the center of a grid area will be selected for the test. Once the spot has been selected, prospecting for a better spot within the grid area will not be permitted. A grid is overlaid onto a floor area to provide 20 grid cells. Grid cells are provided with definite minimum and maximum dimensions. For most buildings, using a minimum grid dimension of 20 ft and a maximum grid dimension of 80 ft will suffice to encompass the entire floor area. A maximum of one area will be allowed to fail the test (95% coverage). Where a floor exceeds the sq ft, which is the floor area that can be covered by the system, the floor be subdivided into 40 equal sectors, with each sector being tested individually. A maximum of two non-adjacent areas will be allowed to fail the test (95% coverage). In addition to the above requirement, all critical areas, which include; the emergency command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ, shall be provided with 99 percent floor area radio coverage. Signal strength measurements shall be performed using standardized parameters as specified below.

3. Measurement Parameters

Signal levels shall be measured to ensure the system meets the criteria specified in the Technical Proposal. Downlink measurements shall be made with the following standardized parameters:

 1. Measurements shall be recorded using a calibrated automatic signal-level measurement system measuring RSRP in each band with a dipole antenna positioned approximately 4' above the surface.
 2. Measurements will be recorded for the test pattern as described above.
 3. System acceptance is achieved when 95% of the averaged data points meet or exceed the requirements specified here and in Section 1.07.

END OF SECTION