Appendix A

Coverage/Acceptance Test Plan
For Original Installation

Test Plan Overview:

The purpose of this test plan is to determine if newly constructed buildings in excess of 25,000 square feet have been designed and/or constructed so that emergency personnel can send and receive communications from within all areas of those buildings; or alternately, to verify the performance of buildings equipped with emergency communications equipment (i.e., radiating cable, passive antennas, bi-directional amplifiers, distributed antenna systems) so that emergency personnel can send and receive communications from all areas within the building.

A Grid Acceptance Test (GAT) will be used to demonstrate that the required reliability of communication is provided among 95% of the total number of grid cells at a Delivered Audio Quality (DAQ) of 3.4., (i.e., speech understandable with repetition only rarely required. Some Noise/Distortion).

Terms and testing methodology described within the GAT are based on the Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88-B, "Wireless Communications System - Performance in Noise and Interference-Limited Situations - Recommended Methods for Technology - Independent Modeling, Simulation, and Verifications."

Grid Acceptance Test:

1. The Facility Owner is responsible to have a Grid Acceptance Test (GAT) prior to requesting a certificate of occupancy (C of O).

2. The GAT shall be performed by an Approved Vendor (AV).

- An approved vendor list shall be published by the Divisions of Communications and will be maintained on their website at www.Delaware.gov

3. The approved vendor shall be responsible to submit the results of the GAT directly to the Division of Communications.

4. If the facility has passed the GAT or the Division of Communications determines that the facility is worthy of a Temporary Certificate of Occupancy (TCO), the Division of Communications shall forward an approval form to the responsible Building Code Official (BCO) with the Division of Communications approval.

5. If the Division of Communications issued a TCO approval, the facility owner will be required to submit a passed GAT to the Division of Communications prior to the Building Code Official issuing a C of O.

Comment:

- In the case of a shell and core – tenant fitout construction arrangement the process shall be as follows:

- The facility owner shall commission a complete GAT test for shell and core C of O.

- The approved vendor shall submit the results of the shell and core GAT to the Division of Communications for a pass/fail designation.

- If the facility has passed the GAT, the Division of Communications shall forward an approval form to the responsible Building Code Official with the Division of Communications approval for "Shell and Core Only".

- The facility owner shall commission additional, complete GAT test for each "initial tenant fit-out" following the same processes discuss above.

- Any subsequent tenant fitout that may occur to an existing tenant fitout that was previously approved by the Division of Communications for C of O, would not be required to have a complete GAT test. The renovation impact upon the 800 MHz system will be discovered during the annual testing required by the In Building Regulations.

The test will be conducted after exterior walls, roofs, windows and doors have been constructed/installed and all interior rooms, their walls and ceilings, are in place and doors have been hung as appropriate for the C of O application being sought i.e., shell & core or complete tenant fitout.

The test will be conducted using portable radios which operate on the State of Delaware's Emergency Radio Communications System.

The test team will verify that the test radios are functioning properly and meet minimum manufacturer's performance standards prior to test execution.

All tests will be performed using a lapel microphone with the portable radio/antenna installed in a standard swivel case mounted on the hip belt with the operator remaining stationary during the test.

The building floor plan for all floors shall be overlaid with a uniform test grid. The test grid shall be established with each grid unit measuring 25 ft. by 25 ft. Each grid unit (cell) shall be uniquely identified and the results will be recorded in the Grid Acceptance Test Log (GAT Log). **The grid map must be attached to the grid acceptance test log.**

Grids in areas where electromagnetic interference (EMI's) will interfere with the efficient operation of equipment sensitive to EMI's will be excluded from the test and reliability calculations. When determining the coverage percentage, the total number of grids to be tested will be based on the total number of grids in a building minus the number of grids in EMI areas.

Stairwells, elevators and holding/jail cells are critical areas where Communication on both forward and reverse (transmit Tx & Receive Rx) paths must meet or exceed the DAQ 3.4 level to pass the requirements of this test. If an elevator or holding/jail cell falls in a grid area the grid and elevator or holding/jail cell will be tested separately. The test results for elevators and holding/jail cells are not included in the calculation for coverage determination.

When acceptance testing is performed in elevators, the internal and external doors shall be closed, and the test will be repeated on each floor. Tests in holding/jail cells shall be performed with the door to the cell in the closed and locked position.

The test procedure shall require the quality of communication to be judged by a stationary tester and mobile tester while the mobile tester move from grid unit (cell) to grid unit (cell), throughout the building, covering all grid units (cells) on all floors. The procedure has the following attributes:

- The test requires two testers. One tester shall be stationary and located in a known good reception area (the stationary tester). The mobile tester shall systematically roam all floors through the building.

- From each grid unit (cell), at least one (1) test calls shall be made to the stationary operator in a known good reception area.

- Tests will be conducted at the center of the grid. If the centermost point of the grid is not accessible the next closest area to the center of the grid will be used. Any grids not accessible will be excluded from the test and reliability calculations.

- The mobile tester shall verbally count from one to five and then five to one (for a total of ten numbers verbalized). The stationary receiver shall be required to acknowledge whether reception is or is not acceptable.

- The stationary tester shall verbally count from one to five and then five to one (for a total of ten numbers verbalized). The receiver (the mobile tester) shall be required to acknowledge whether reception is or is not acceptable.

- The test will consider both forward and reverse (Tx & Rx) communication paths. Communication on both forward and reverse paths shall meet or exceed the DAQ 3.4 level to meet the requirements of this test.

- The tester initiating the call from within each grid unit (cell) shall determine the success or failure of the call. Results will be recorded in the GAT log with a pass/fail rating system.

- The mobile tester must issue a “pass” decision to constitute a successful result for each tested grid unit (cell). This process will be repeated for each grid unit (cell) that is part of the grid acceptance test.

- TSB-88-B defines DAQ 3.4 as, “Speech understandable with repetition only rarely required. Some Noise/Distortion.” “Rarely” shall be quantified as no greater than 10 percent re-test. This means a maximum of 10% of all the grids will be allowed a repeated transmission within three feet of the original test location.

- In the event that a specific grid unit yields a fail decision, a quantitative measurement will be taken to be the final determination of grid acceptance. A Spectrum Analyzer shall be used to measure the received signal power from the Emergency Radio Communication System’s control channel frequency within the grid unit. If it is found that received signal power is greater than or equal to –95.0dBm, then the grid unit shall be considered a pass decision. Once all data is collected, coverage percentage, CP, will be

determined by Equation 1:

$$CP = (T_P)/(T_C) \times 100\%$$

CP = Coverage Percentage
T_C = Total Number of Grid Units (cells)
T_P = Total Number of Grid Units Passed (cells)

Note: CP is a function of the Pass/Fail results for each grid unit tested within the building, not the ratio of successful calls to unsuccessful calls within each specific grid unit.

- State, County & Municipal Emergency Services Personnel and The State of Delaware Division of Communications may at their discretion, witness coverage testing

Emergency Radio Communications System
In-Building Coverage Grid Acceptance Test Log **INITIAL TEST**

Building Name _____ **Bldng Owner of Record** _____
Building Address _____ **City** _____ **County** _____
Testing Contractor_____ **FCC#:** _____
Building Permit # _____ **Test Date** _____
Signature of Test Professional _____ **, I herby certify that this test was conducted in accordance with FCC guidelines and State of Delaware guidelines as outlined in the 800MHz in-building coverage rules and regulations.**

NOTE : Completed grid map must be attached to this log when submitting for approval.

Tester	Name	Affiliation	Comments
Stationary 1			
Mobile 1			
Mobile 2			

Grid Point	RESULT P/F	Signal Strength	Comments	Coverage %
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Division of Communications Use:

	Pass - This facility has met Division of Communications requirements and is approved for Certificate of Occupancy subject to Code Officials approval
	Fail W/TO - This facility has NOT met Division of Communications requirements but is suitable for a Temporary Certificate of Occupancy subject to Code Officials approval. TCO Valid for _____ Days.
	Fail No/TO- This facility has NOT met Division of Communications requirements and is **NOT** suitable for a Temporary Certificate of Occupancy subject to Code Officials approval

Date: _____ **DivComm Authorization:** _____

Please return form to: State of Delaware Division of Communications - 3050 Upper King Rd., Dover, DE 19904 for approval.

Emergency Radio Communications System
In-Building Coverage Grid Acceptance Test Log

ANNUAL TEST

Building Name _____ **Bldng Owner of Record** _____
Building Address _____ **City** _____ **County**
Testing Contractor_____ **FCC#:** _____
Building Permit # _____ **Test Date** _____
Signature of Test Professional _____, **I herby certify that this test was conducted in accordance with FCC guidelines and State of Delaware guidelines as outlined in the 800MHz in-building coverage rules and regulations.**

NOTE : Completed grid map must be attached to this log when submitting for approval.

Tester	Name	Affiliation	Comments
Stationary 1			
Mobile 1			
Mobile 2			

***10% of the subject building must receive coverage testing annually.**

Grid Point	RESULT P/F	Signal Strength	Comments	Coverage %
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Amplifier gain / Initial Install: ☐ Amplifier gain: ☐

Back-up battery load test results: ☐ PASS ☐ FAIL

Division of Communications Use:

Annual Test Results ☐ PASS ☐ FAIL

Date: _____ **DivComm Authorization:** _____

Please return form to: State of Delaware Division of Communications - 3050 Upper King Rd., Dover, DE 19904 for approval.

In-Building Coverage

System Frequencies

New Castle

WPSI864-WQDN950		TX	RX
N 1	768	853.2125	808.2125
N 2	828	853.9625	808.9625
N 3	826	853.9375	808.9375
N 4	618	851.2375	806.2375
N 5	782	853.3875	808.3875
N 6	732	852.7375	807.7375
N 7	730	852.7125	807.7125
N 8	714	852.4875	807.4875
N 9	694	852.2375	807.2375
N 10	678	852.0375	807.0375
N 11	655	851.7250	806.7250
N 12	642	851.5625	806.5625
N 13	638	851.4875	806.4875
N 14	808	853.7125	808.7125

Kent

WPIZ596-WQDN677		TX	RX
K1	823	853.9000	808.9000
K2	811	853.7500	808.7500
K3	803	853.6500	808.6500
K4	605	851.0750	806.0750
K5	727	852.6750	807.6750
K6	725	852.6500	806.6500
K7	685	852.1250	807.1250
K8	651	851.6750	806.6750
K9	649	851.6500	806.6500
K10	749	852.9500	807.9500

Wilmington

KNIA879		TX	RX
W1	461	859.7625	814.7625
W2	441	859.0875	814.0875
W3	421	858.7625	813.7625
W4	381	857.7625	812.7625
W5	361	857.2625	812.2625
W6	351	856.7625	811.7625
W7	321	856.2625	811.2625

Sussex

WPIQ290-WQDR545		TX	RX
S1	798	853.5875	808.5875
S2	779	853.3500	808.3500
S3	760	853.1125	808.1125
S4	607	851.1000	806.1000
S5	740	852.8375	807.8375
S6	721	852.6000	807.6000
S7	703	852.3500	807.3500
S8	682	852.0875	807.0875
S9	628	851.3625	806.3625
S10	758	853.0875	808.0875

*NOTE - Contact Tone 7 : 138.45 HZ
Network ID : 3A7

SAMPLE RFP

Emergency Radio Communications System
In-Building Coverage
For Informational Purposes Only

Request for Proposals/Equipment specifications

Scope of Work:

General:

The building owner and/or owner's representative shall request services to design, install, test and make operational an in-building Communications System (the "System" -- including, but not limited to, radiating cable, passive antennas, bi-directional amplifiers, and distributed antenna systems) on all levels of the building. The implementation of the System shall require work throughout all floors, including levels below grade, and shall result in a specified, minimum level of signal strength on all floors of the building, as well as the ability to successfully transmit and receive using typical hand-held audio transceivers used by the State of Delaware. The minimum acceptable signal strength and ability to successfully communicate shall be achieved 95% of the time and, with certain exceptions, among 95% of the 25' X 25' cells into which each floor is divided for testing and validation purposes. As part of the scope of work, the building owner and/or owner's representative and the contractor shall identify specific, critical areas on each floor that shall be required to have the minimum acceptable level of signal strength at all times as long as the System and external (to the building) Emergency Communications System are operational. These critical areas shall include, but shall not be limited to, all stairwells, elevators and holding/jail cells.

1. The contractor shall participate in interviews with appropriate representatives of the owner to identify critical areas of the building on all levels that will be required to have an acceptable level of 800 MHz signal strength and signal propagation characteristics 100% of the time as long as the System and external (to the building) Emergency Communications System are functioning. The areas shall be identified as specific cells identified in Attachment C that are used for system testing and validation purposes and shall be referred to as "critical cells."

2. The contractor shall evaluate the building drawings, 25' X 25' cell layout, location of critical cells noted in paragraph 1, frequencies used by the State of Delaware (see Attachment A), minimum equipment specifications, rules and regulations (see Attachment B), and established specifications for signal strength and voice transmission criteria (see Attachment C) to engineer the placement of all equipment and antennas on all floors of the building.

3. The contractor shall specify all equipment and cable to be used to implement the system, installation locations, power requirements, interconnections to other systems, schematic wiring diagrams and a plan of installation. The plan of installation may be divided into multiple phases that will enable portions of the system to be installed, tested, validated and activated in sequential fashion.

4. The contractor shall present its design for the System to the owner's representative for approval prior to the start of work. The owner's representative shall not unreasonably withhold approval, but the owner's representative may request information from the contractor concerning the engineering assumptions on which the system design is based, and may require the contractor to make reasonable changes to its design before approval to proceed is granted.

5. Once the System design is approved by the owner's representative, the contractor may proceed with the

acquisition of supplies and materials, the installation of wiring, cabling, equipment and antennas, and the testing and validation of each phase of the System.

Deliverables:

1. Drawings of each floor of the building that are divided into 25' by 25' cells and note the critical cells identified through interviews with appropriate personnel identified by the owner's representative.

2. A proposed System design that shows the location of all equipment, interconnections to other systems, power sources, proposed cabling routes and the location of all distribution antennas.

3. A final, approved System design that shows the location of all equipment, interconnections to other systems, power sources, cabling routes and the location of all distribution antennas.

4. All goods, materials, equipment, supplies, services and labor required to install, implement, test and validate the operation of the System according to the approved design noted in paragraph 3.

5. Completed test and System validation reports specified in Attachment "C." A completed set of test and validation reports shall be required at the completion of each phase of system installation.

6. As-built drawings of the entire System at the completion of the project.

Warranty:

The contractor warrants that the signal strength and the ability to acceptably communicate according to the test procedures noted in Attachment "C" shall be at or above minimum acceptable levels in 95% of the 25' X 25' test cells into which each floor of the building is divided 95% of the time with the following exceptions:

- Signal strength and the ability to communicate will be at or above minimum acceptable levels in all stairwells, elevators, holding/jail cells and critical cells on all floors of the building. This requirement shall be achieved 100% of the time as long as the System is functioning and as long as the external (to the building) Emergency Communications System is operating.

The contractor shall warrant all materials, labor and workmanship for a period of at least one-year from the date the testing and validation report for the final phase of installation is accepted by the owner's representative. The contractor shall warrant all materials and components for a period of at least one-year unless the manufacturer provides a longer warrantee period. If so, the contractor warrantee shall continue until the manufacturer's warrantee has expired. The warrantee shall include all components of the in-building System installed on each floor (including components located on the roof and cabling between the roof and lower levels).

Information to be included in the Bidder's Proposal:

1. A description of the Bidder's experience and abilities as it relates to in-building RF systems.

2. A description of other similar projects completed within the last two years. Include project description, scope, outcome, cost and a contact name and phone number.

3. Business references including name, telephone number and relationship to bidder.

4. Project methodology including a description and technical overview for the proposed installation of the

System. Include diagrams, schematics, a list of proposed equipment, power requirements and proposed interconnections to the existing system.

5. Project price as proposed.

6. An implementation plan including phases of work and time required to complete the project.

7. A price for an annual service contract for the System to be effective one year after the date that the owner's representative accepts the testing and validation report for the last phase of installation. Pricing shall include an escalation factor to be used to calculate the cost of annual service agreements for a period of four additional years beyond the first year service agreement. Include a description of the service agreement and a proposed list of services and responsibilities.