OCEAN CITY FIRE MARSHAL'S OFFICE

301 Baltimore Avenue, Ocean City, MD 21842
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MEMORANDUM

Subject: Two-Way Radio Communication Enhancement Systems: Requirements & Inspection/Approval Guidance	Memo #: 2021-008
	Effective: 11/1/2021 Amended: 3/4/2022
Authority: Deputy Chief Josh Bunting, Fire Marshal	Internal (FMO Staff)

This memorandum serves to outline and clarify the requirements for evaluation of adequate emergency radio signal strength, and the need for installation of Two-Way Radio Communication Systems in new construction, in accordance with the requirements from NFPA 1, 2018 edition, 11.10.

In it's simplest form, where a building does not allow for adequate emergency radio signals to transmit in/around critical areas of the building, an approved two-way radio enhancement system must be installed throughout the building in accordance with NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.*

While *all* new construction requires adequate radio signal strength, code guidance and general experience with existing radio signal strength in Ocean City established that special consideration and testing should especially occur in buildings meeting any of the following criteria:

1. Buildings 5 stories and above
2. Buildings with basement levels
3. Large area buildings (those at or above 25,000sqft per floor)
4. Buildings with extensive steel/concrete structural members/wall structure

In order for the Office of the Fire Marshal to objectively apply these requirements to ensure emergency responders can effectively communicate during an emergency inside a building, the following tasks shall be completed for new construction and significant renovation permits:

1. Building/Design Professional Notification at Permit Review
2. Testing of Radio Signal Strength at Substantial Completion
3. Ensuring Adequate Radio Signal Strength prior to Certificate of Occupancy Approval

Where the minimum radio signal strength within new construction does not meet the requirements outlined in NFPA 1221, an approved two-way radio enhancement system shall be installed throughout the building to ensure proper coverage.

Permit Review

The requirements for radio signal strength shall be outlined in ALL new construction and significant renovation permit review comments distributed by this office. The comment shall indicate the code requirement for radio signal strength, and indicate that designers/builders/owners may consider the following course of action to address the potential need:

1. Permittee may submit and plan for the installation of an approved two-way radio enhancement system.
2. Permittee may submit and install only the necessary infrastructure to more easily implement an approved two-way radio enhancement system if one is determined to be needed at substantial building completion.
3. Permittee may wait for the testing at substantial completion and install the necessary infrastructure and approved two-way radio enhancement system if required.

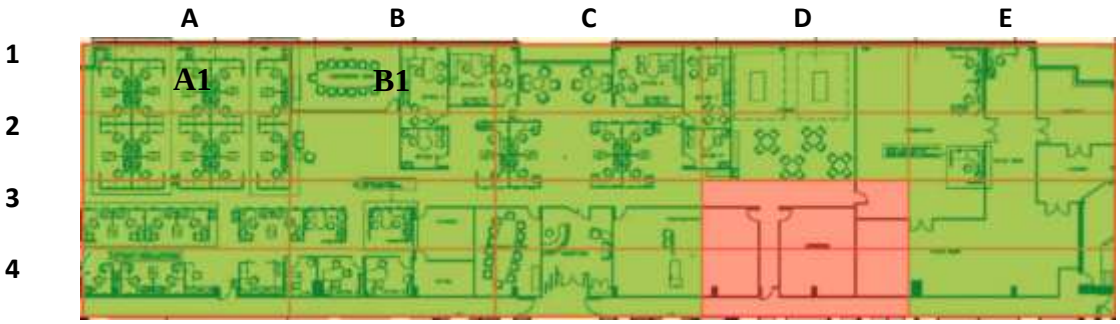
Predictive analysis software may be available via third party radio vendors in an effort to evaluate the available radio signal strength and building at design phase to estimate potential radio signal issues.

Additionally, permit review comments will require the submission to this office by the owner/design professional of the grid map developed in accordance with NFPA 1221, to be used for testing.

Testing Procedures and Documentation

Testing of radio signal strength will occur at substantial completion of all new construction, and will be conducted by FMO personnel throughout the entire building, utilizing standard-issue departmental radios w/ lapel microphones, worn in a typical configuration (radio belt-mounted at waist, antenna 3-4' from the ground in a vertical configuration). Where each floor of a building is arranged in a similar layout, FM personnel shall be permitted to test every other floor of the building, which must include both the lowest and highest floor.

Utilizing the grid overlay provided by the design professional (*example below*), FM personnel will label each individual cell with a letter (horizontal)/number (vertical) designation, identify those cells containing critical areas, and document the results of the test on both the grid and test log for each floor/section of the building.



MIN Grid Dimension (20'), MAX Grid Dimension (80'): Each floor divided to provide 20 grids per floor

NFPA 1221 Notes: 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 (6.1 m) and a maximum grid dimension of 80 ft (24.4 m) will suffice to encompass the entire floor area. Where a floor exceeds 128,000 ft^2 (11,900 m^2), which is the floor area that can be covered by the maximum grid dimension of 80 ft (24.4 m), it is recommended that the floor be subdivided into sectors each having an area less than or equal to 128,000 ft^2 (11,900 m^2), and each sector be tested individually with 20 grid cells in each sector.

During the test, one personnel will move to the center of each grid cell, and conduct a two-way (outbound and inbound) radio communication with either OC Fire Dispatch (on an available, normal, non-encrypted radio channel recommended by dispatch), or depending on dispatcher availability, with another FM personnel located outside the building at the street/public way. For each communication, personnel will score and document the communication consistent with the delivered audio quality (DAQ) scale outlined in NFPA 1221:

DAQ Score	Description of Audio Quality
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.
3.5	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

Individual cells will be considered "Passing" if they score DAQ 3 or above. If ALL individual cells obtain a passing score, or failure is within the thresholds for overall system passing outlined in NFPA 1221 (noted below), the documentation will be included in the FM Building file and the radio signal strength will not require the addition of a two-way radio enhancement system.

Installation of an approved two-way radio enhancement system WILL be required if any of the following failures occur:

1. Failure of any cell containing a critical area, including:
   Fire command center(s), fire pump/sprinkler rooms, exit stairs, exit passageways, elevator lobbies, standpipe cabinets/connection locations, sprinkler sectional valve locations, security offices, and other areas deemed critical by the AHJ.

2. Failure of two (2) adjacent cells located in non-critical areas. *

3. Failure of more than two (2) total cells throughout the building. *

*Where cells fail at the thresholds listed above, the design professional will be contacted to revise the grid to provide a more statistically accurate testing grid resolution and the test repeated, as outlined in NFPA 1221:

> In the event that three of the areas fail the test, or if two adjacent areas fail the test, in order to be more statistically accurate the testing grid resolution should be doubled. This would require decreasing the size of the grids to one-half the dimension used in the failed test to a minimum of 10 ft (3 m) and a maximum of 40 ft (12.2 m). Further, to cover the same floor area, the number of grids is quadrupled to 80 grids. No more than eight nonadjacent and/or five adjacent grid cells should then be allowed to fail the test.
>
> In the event that nine or more nonadjacent and/or six or more adjacent grid cells fail the test, consideration should be given to redesigning and reinstalling the public safety radio enhancement system to meet the minimum system design requirements. Failures should not be allowed in critical areas.

Ocean City Fire Department
Office of the Fire Marshal

In-Building Two-Way Radio System Grid Acceptance Test Log
(Attach Grid Map to Test Log for each Floor/Sector)

Building Name:		Address:	
Test Date:		Inspector(s):	
Test Floor/Area:			

Grid Cell	Contains Critical Area? (If yes, describe)	Pass/Fail (>DAQ 3)	Comments
A1			
A2			
A3			
A4			
B1			
B2			
B3			
B4			
C1			
C2			
C3			
C4			
E1			
E2			
E3			
E4			

Critical Area: Fire command center(s), fire pump rooms, exit stairs, exit passageways, elevator lobbies and control rooms, standpipe cabinets/connection locations, sprinkler sectional valve locations, and other areas deemed critical by the AHJ.

DAQ Score	Description of Audio Quality
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