Clark County Fire Code Amendments

510 Emergency Responder Radio Coverage System

[SN] 510 Emergency Responder Radio Coverage System

[SN] 510.1 Emergency responder radio coverage in new buildings. All new buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communications systems of the jurisdiction at the exterior of the building. System design shall be in accordance with this section. This section shall not require improvement of the existing public safety communication systems outside the building.

Exceptions:

1. Where it is determined by the fire code official that the radio coverage system is not needed.

2. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the fire code official shall have the authority to accept an automatically activated emergency responder radio coverage system.

[SN] 510.1.1 Emergency responder radio coverage system in new buildings. An emergency responder radio coverage system shall be provided throughout buildings when any of the following apply:

1. High-rise buildings. Buildings with a floor used for human occupancy located more than 55 feet above the lowest level of fire department vehicle access.

2. Underground and below grade buildings. Buildings having a floor level below the finished floor of the lowest level of exit discharge of any level.

3. Other buildings. The fire code official is authorized to require a technical opinion and report, in accordance with Section 104.7.2, for buildings whose design, due to location, size, construction type, or other factors, could impede radio coverage as required by Section 510.4.1. The report shall make a recommendation regarding the need for an emergency responder radio coverage system.

[SN] 510.2 Emergency responder radio coverage in existing buildings. Existing buildings shall be provided with approved radio coverage for emergency responders as required in Chapter 11 and locally adopted ordinances. Existing buildings that do not have approved radio coverage, as determined by the Fire Chief, in accordance with Section 510.4.1 shall be equipped with such coverage in accordance with Section 510 within a time frame established by the fire code official.

Building owners shall submit to the fire code official a radio signal strength study, technical opinion and report prepared in accordance with Section 104.7.2. The report shall identify the area(s) requiring an emergency responder radio coverage system to comply with Section 510.4.1.

Exceptions:

1. Where approved by the fire code official, an existing approved wired communication system in accordance with Section 907.2.13.2 shall be permitted to be maintained in lieu of an approved radio coverage system.

2. Where it is determined by the fire code official that the radio coverage system is not needed.

[SN] 510.3 Permits required . Construction and operational permits shall be required as set forth in Section 105.6 and 105.7.

[SN] 510.3.1 Construction documents. Construction documents for emergency responder radio coverage systems shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations as determined by the fire code official.

[SN] 510.3.2 Plans. Plans shall be submitted to the fire code official for review and approval prior to installation. Coordination and compliance with SNACC and LVMPD radio system requirements is the responsibility of the owner and contractor.

[SN] 510.3.2.1 Plan Submittals. Plan submittals shall include, but not be limited to all of the following:

a. A floor plan that indicates the use of all rooms, emergency responder radio coverage system equipment locations, power panel connections, raceway routing layout, conduit and conductor types and sizes, compliance with survivability criteria and locations of building access to the equipment.

b. A roof plan showing the location of antenna(s) including a line of site plan to agency transmitting and receiving antenna(s).

c. Schematic drawings of the electrical system, backup power, antenna system, and other associated equipment.

d. Rack and equipment cabinet plans showing arrangement and configuration of emergency responder radio coverage system equipment. e. System riser diagram(s).

[SN] 510.3.2.2 Data sheets. Manufacturer's data sheets shall be provided for equipment to be installed. Manufacturers' data sheets shall indicate model numbers and listing information for equipment, devices, and materials.

[SN] 510.3.2.3 As-built documents. Any field changes that occur during construction shall be incorporated onto new as-built plans and data sheets. Plans shall be submitted to the fire code official and be approval prior to final inspections. Coordination and compliance with SNACC and LVMPD as-built document requirements is the responsibility of the owner and contractor.

[SN] 510.3.3 Licensing. All systems utilizing repeaters shall be FCC licensed under the agency's and SNACC system. A distributed antenna system (DAS) shall be FCC licensed under the agency's and SNACC system unless the DAS complies with 47 CFR Part 22.383.

[SN] 510.3.4 Equipment. Systems and components shall be listed and approved for the purpose for which they are installed.

[SN] 510.4 Technical requirements. Systems, components, and equipment required to provide emergency responder radio coverage system shall comply Sections 510.4.1 through 510.4.2.5 and NFPA 72.

[SN] 510.4.1 Radio signal strength. The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements are in 95 percent of all areas on each floor of the building and in 100 percent of critical areas, such as: the emergency command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, mechanical penthouses, elevator machine rooms, and other areas deemed critical by the fire code official, meet the signal strength requirements of Sections 510.4.1.1 and 510.4.1.2.

[SN] 510.4.1.1 Minimum signal strength into the building. A minimum signal strength of -95 dBm with a DAQ of 3.4 or better, from the emergency responder site for the radio associated to that radio system shall be receivable within the building.

[SN] 510.4.1.2 Minimum signal strength out of the building. A minimum signal strength of -95 dBm with a DAQ of 3.4 or better shall be received by the emergency responder's radio system when transmitted from an approved portable radio with a maximum of 3 watts of strength within the building.

[SN] 510.4.2 System design. The emergency responder radio coverage system shall be designed in accordance with Section 510.4 and NFPA 72.

510.4.2.1 Amplification systems allowed. Buildings and structures that cannot support the required level of radio coverage shall be equipped with a distributed antenna system with Federal Communications Commission (FCC)-certified signal boosters or other system approved by the fire code official in order to achieve the required adequate radio coverage.

[SN] 510.4.2.1.1 Amplification Components. Systems shall be equipped with a radiating cable system and/or a distributed antenna system (DAS) with FCC certified signal boosters, or systems otherwise approved in order to achieve the required adequate radio coverage.

[SN] 510.4.2.1.2 Reliability Factor. The system shall be designed and capable of providing a 99% reliability factor.

[SN] 510.4.2.1.3 Isolation. Isolation shall be maintained between the donor antenna and all inside antennas and shall be a minimum of 15 db above the signal booster gain under all operating conditions.

[SN] 510.4.2.1.4 Human exposure to radio frequency and electromagnetic fields. The system design, and installation, shall in no case exceed the FCC's OET 65 Standards.

[SN] 510.4.2.2 Technical criteria. The fire code official shall maintain a document providing the specific technical information and requirements for the emergency responder radio coverage system. This document shall contain, but not be limited to, the inbound/outbound frequency pairs, the location and effective radiated power (ERP) of radio sites used by the emergency responder radio coverage system, the maximum propagation delay (in microseconds, nominally 25 microseconds or less), and other supporting technical information.

[SN] 510.4.2.2.1 System radio frequencies. The emergency responder radio coverage system shall be capable of transmitting all public safety radio frequencies (700 and 800 Megahertz public safety bands) assigned to the agency, and be capable of using any modulation technology. For LVMPD the frequency range is from 769 Megahertz to 775 Megahertz (downlink) and 799 Megahertz to 805 Megahertz (uplink). For SNACC the frequency range is from 806 MHz to 815 MHz (uplink) and 851 MHz to 860 MHZ (downlink).

[SN] 510.4.2.2.2 Degraded performance in emergencies: The system shall be designed to allow degraded performance in adverse conditions, such as abnormally high temperatures resulting from

nearby fires, extreme voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) will not be implemented as the standard mode for public safety applications. It is the purpose of this specification to assure the maximum possible level of communications to public safety personnel depending upon the signal booster even to the extent of damaging the signal booster as long as some communications benefit can be provided during the emergency.

[SN] 510.4.2.2.3 Mode of Operation. The system shall be normally powered on and shall continuously provide passing of frequencies within the public safety bands.

[SN] 510.4.2.3 Secondary power. Emergency responder radio coverage system shall be provided with an approved secondary source of power. The secondary source of power shall be either a UPS battery system or an emergency generator. The secondary power supply shall be capable of operating the emergency responder radio coverage system for a period of at least 24 hours. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the secondary power supply.

[SN] 510.4.2.3.1 Battery Systems. The active components of the installed system or systems shall be capable of operating on an independent battery system for a period of at least 24 hours without external power input. The battery system shall automatically charge in the presence of external power input.

[SN] 510.4.2.3.2 Monitoring. Monitoring shall be provided to annunciate the status of the system. A single supervisory signal shall be sent to the fire alarm control unit upon any off-normal condition. The following conditions shall be monitored:

a. Active component trouble

b. Loss of normal ac power

c. Battery system trouble

[SN] 510.4.2.4 Signal booster component requirements. If used, signal boosters shall be compatible with both analog and digital communications simultaneously at the time of installation.

1. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4type/IP65 waterproof cabinet.

2. The battery system shall be contained in a NEMA 3-type or NEMA 4-type/IP65 waterproof cabinet.

[SN] 510.4.2.5 System Components. System components shall be in accordance with this section.

[SN] 510.4.2.5.1 Component Approval and Compatibility. Components utilized in the installation of the emergency responder radio coverage system, such as repeaters, transmitters, receivers, signal boosters, cabling, fiber distributed antenna systems shall be approved and shall be compatible with the agencies public safety radio systems.

[SN] 510.4.2.5.2 Filters. Filters shall be provided in accordance with this section. Filters shall only pass the emergency responder radio coverage system frequencies. The signal booster shall include re-tunable or replaceable filters to accommodate rapid and economic passband changes in the event of mandatory FCC changes within the 806-824 and 851-869 MHz band. The use of non-adjustable and non-replaceable RF input and output filters is prohibited.

[SN] 510.4.2.5.2.1 External Filters. Permanent external filters and attachments shall not be permitted.

[SN] 510.4.2.5 2.2 Reject filters. Notch filter sections shall be incorporated to minimize adjacent channel cellular and SMR (Nextel) degradation of the signal booster performance. The minimum downlink band adjacent band rejection shall be 35 dB or greater at 865 MHz to 870 MHz and769 Megahertz to 775 Megahertz.

[SN] 510.4.2.5.2.3 Passive filters. Passive filter equipment shall have a passband of 700-900 Mhz.

[SN] 510.4.2.5.2.4 Analog / Digital Capability. The system shall be 100% compatible with analog or digital modulations after installation without additional adjustment or modifications.

[SN] 510.4.2.5.2.5 Output Level control. An automatic output leveling circuit shall be included for both passbands with a minimum dynamic range of 60 dB, less any gain reduction setting, to maintain FCC out of band and spurious emission compliance.

[SN] 510.4.2.5.2.6 Cable.

[SN] 510.4.2.5.2.6.1 Cable shall have a passband of 700-900 MHz.

[SN] 510.4.2.5.2.6.2 .Cable shall be contained in a non-combustible raceway, metal-clad, or fully enclosed cable tray system.

[SN] 510.4.2.5.2.7 Splitters. Only fixed value splitters shall be used.

[SN] 510.4.2.5.2.8 Agency Donor Antenna. Donor antennas shall be used to transmit and receive signals from each agency donor site. Facilities served by the Las Vegas Metropolitan Police Department (LVMPD) shall be provided with a specific donor antenna directed to a LVMPD donor site. Additional donor antenna(s) shall be directed at other agency (i.e., SNACC) donor sites.

[SN] 510.4.2.5.2.9 In-building antennas. In-building antennas shall be fixed mount.

[SN] [SN] 510.5 Installation requirements . The installation of the public safety radio coverage system shall be in accordance with Sections 510.5.1 through 510.5.5.

[SN] 510.5.1 Approval prior to installation. No amplification system capable of operating on frequencies or causing interference on frequencies assigned or licensed to any public safety agency by the FCC shall be installed without prior coordination and approval of the fire code official. The building manager/owner shall suspend and correct other equipment installations that degrade the performance of the public safety radio system or emergency responder radio coverage system.

[SN] 510.5.1.1 Workmanlike installation and mechanical execution of work. Circuits, conduit, and systems shall be installed in a neat and workmanlike manner in accordance with the requirements of the National Electrical Code as adopted by the jurisdiction.

[SN] 510.5.1.2 Conduit and equipment support. Conduit and equipment supports shall be supported by the building structure in such a manner that damage will not occur by normal building use in accordance with the requirements of the National Electrical Code as adopted by the jurisdiction.

[SN] 510.5.3 Commissioning Test. It is the building owner's responsibility to ensure that a commissioning test of the radio repeater or amplification system occurs prior to final acceptance by the agency. The test shall ensure that two-way coverage on each floor of the building meets the minimum signal strength coverage requirements described in Section 510.4.1. At the conclusion of the testing, a

report that shall verify compliance with this section shall be submitted to the fire code official. A copy of this report shall be maintained onsite.

[SN] 510.5.3.1 FCC compliance during testing. All testing must be done on frequencies authorized by the FCC. A valid FCC license will be required if testing is done on frequencies different from the police, fire or emergency medical frequencies. The installer shall coordinate with the fire code official the frequencies to be utilized during testing.

[SN] 510.5.3.2 Test procedure. Emergency responder radio coverage systems shall be tested in accordance with this section.

[SN] 510.5.3.2.1 General Building Areas. General building areas shall be tested to ensure coverage is provided at a minimum of 95 percent. The test procedure shall be conducted as follows:

1. Each 100,000 square foot sector of the building floor shall be divided into a grid of 40 approximately equal areas. The maximum grid dimension shall be 50 feet, and the maximum grid size shall be 2,500 sq. ft.

2. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system and a calibrated signal level recording system. Measurements of DAQ and signal strength shall be made in each grid area.

3. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.

4. In the event that three of the areas fail the test, in order to be more statistically accurate, the grid resolution may be doubled, so that each 100,000 square foot sector of each floor may be divided into 160 equal areas, each having a maximum dimension of 25 feet and a maximum area of 625 sq. ft. A maximum of eight nonadjacent areas shall be allowed to fail the test. If the system fails the 160-area test, the system shall be altered to meet the 95percent coverage requirement.

5. A test location approximately in the center of each grid area shall be selected for the test, then the radio shall be enabled to verify two-way communications through the public agency's radio communications system. Once the test location has been selected, that location shall represent the entire area. If the test fails in the selected test location, that grid area shall fail, and prospecting for a better spot within the grid area shall not be allowed.

6. Measurements shall be made with the antenna held in a vertical position at three (3) to four (4) feet above the floor. (Portable radio worn on the belt or turnout coat pocket).

7. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual

tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.

8. When required by fire code official input signals may use a talkbox in accordance with NFPA 72 annex-D or similar input signal.

9. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to insure spurious oscillations are not being generated by the subject installation and subsequent annual inspections.

10. A sweep test to measure the level of RF radiation shall be conducted to verify that the system complies with FCC OET 65 Standards.

Exception: FCC compliant DAS systems.

[SN] 510.5.3.2.2 Critical Areas. Critical areas shall be tested to ensure 100 percent coverage. The test procedure shall be conducted as follows:

1. Each 100,000 square foot sector of the building floor shall be divided into a grid of 40 approximately equal areas. The maximum grid dimension shall be 50 feet, and the maximum grid size shall be 2,500 sq. ft.

2. All grids shall pass the test (failure is not an option).

3. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system and a calibrated signal level recording system. Measurements of DAQ and signal strength shall be made in each grid area.

4. A test location approximately in the center of each grid area shall be selected for the test, then the radio shall be enabled to verify two-way communications to and from the outside of the building through the public agency's radio communications system. Once the test location has been selected, that location shall represent the entire area. If the test fails in the selected test location, that grid area shall fail, and prospecting for a better spot within the grid area shall not be allowed.

5. Measurements shall be made with the antenna held in a vertical position at three (3) to four (4) feet above the floor. (Portable radio worn on the belt or turnout coat pocket).

6. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.

7. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to insure spurious oscillations are not being generated by the subject installation and subsequent annual inspections.

8. When required by fire code official input signals may use a talkbox in accordance with NFPA 72 annex-D or similar input signal.

9. A sweep test to measure the level of RF radiation shall be conducted to verify that the antennae system complies with FCC OET 65 Standards.

Exception: FCC compliant DAS systems.

[SN] 510.5.3.2.3 Antenna Isolation. Isolation between donor antenna and the interior antenna(s) shall be measured using a spectrum analyzer. Isolation shall be at least 15 dB without the activation of anti-oscillation or automatic circuits that eliminate interference.

[SN] 510.6 Maintenance. The emergency responder radio coverage system shall be maintained operational at all times in accordance with Sections 510.6.1 through 510.6.4.

[SN] 510.6.1 Annual Testing and proof of compliance. The emergency responder radio coverage system shall be inspected and tested 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:

Items 1 through 4 - UNCHANGED

5. At the conclusion of the testing, a report, which shall verify compliance with Section 510.5.3.2, shall be submitted to the fire code official. A copy of this report shall be maintained on-site.

6. The agency shall be notified immediately of system impairments in accordance with Appendix L.

[SN] 510.6.4 Operational Maintenance. The emergency responder radio coverage system shall be maintained operational in accordance with the criteria of 510.5.3.2 at all times.

[SN] 510.6.4.1 Maintenance contract. The owner is responsible for holding a maintenance contract with a company that is capable of providing emergency response 24 hours a day, 7 days a week.

[SN] 510.6.4.2 Maintenance records. Maintenance records shall be maintained on-site. Copies of all maintenance records shall be submitted to SNACC, LVMPD, and the fire code official when requested.

[CC-] 510.6.5 Fire Department Radios. The owner shall provide the fire department with portable radios in accordance with this section.

[CC-] 510.6.5.1 Number of radios. A minimum of two radios, and no less than one radio for every 1 million sq. ft. of building area, shall be provided to the fire department.

[CC-] 510.6.5.2 Radio model. Radios shall be approved by the fire code official.

[CC-] 510.6.5.3 Warranty and ownership transfer. Warranty and ownership of the radios shall be transferred to the fire department upon successful completion of the acceptance test.