mobile homes, for the purpose of acceptance of combustible sprinkler piping these occupancies are considered to be included in the category of residential buildings under light hazard occupancies.

A-3.2.5.18.(1) Fire Pumps. In order to ensure an adequate water supply, it may be necessary to install a fire pump for a building that has either a standpipe system or an automatic sprinkler system installed.

A-3.2.5.20. Radio Antenna System. Buildings of noncombustible construction or buildings that have glazing with a low emissivity rating can cause interference with radio signals that are necessary for emergency, firefighting and rescue operations. The installation of a radio antenna system should be shown on drawings submitted for building permit, and related permits. A complete design of the radio antenna system will be required on plans to be submitted for the building permit and should be design in accordance with the general specification provided by Vancouver Fire and Rescue Services. See Fire Department publication "Vancouver Fire Rescue Services Specifications for Radio Antenna System Design, Installation and Acceptance Testing" as updated from time to time. By-law users are advised to keep up-to-date. The technical specifications as of May 2019 are reproduced here for convenience.

Specifications for Radio Antenna System - Design, Installation and Acceptance Testing (May 2019)

1. SCOPE

1.1. This Specification describes the requirements for the design, installation, and acceptance testing of a radio antenna system in a building.

12. The installation of radio antenna system equipment and devices not covered by this Specification shall be in accordance with good engineering practice and the manufacturer's installation instructions.

1.3. The work in this section shall be performed under the supervision of a registered professional engineer in British Columbia

2. REQUIREMENTS OF RADIO ANTENNA SYSTEMS

2.1. GENERAL

2.1.1. Radio antenna systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.

2.1.2. Provide an in-building radio antenna system to provide coverage in the building for the public safety agencies as required by the local fire department and other agencies and authorities having jurisdiction. System users shall receive and transmit radio broadcasts from their portable radio units within the building. This shall be accomplished utilizing the following components, which if applicable shall conform to UL 2524 "Standard for In-building 2-Way Emergency Radio Communication Enhancement Systems":

a) Bi Directional Amplifiers (Signal Boosters)
b) Coaxial Cable
c) Frequency filters
d) Donor and discrete antennas
e) Other components and interconnecting circuitry as required

2.1.3. Radio antenna systems shall not rely on mobile repeaters installed on fire department apparatus.

2.1.4. The entire system shall meet with approval of the Fire Chief, Chief Building Official, and Director of Planning for the City of Vancouver (the authorities having jurisdiction, AHJ).

2.1.5. All permits necessary for the installation of the work shall be obtained from the AHJ prior to the commencement of the work. All permit costs and inspection fees shall be included as the part of the required work.

2.2. FEDERAL LICENSE

2.2.1. All active systems shall be licensed by the federal regulator, Innovation, Science & Economic Development Canada (ISED), and shall comply with the applicable Standard Radio Systems Plan (SRSP).

2.2.2. The installing contractor shall arrange to obtain the federal license to operate on behalf of the owner.

2.2.3. The installing contractor shall be responsible for any fees and costs to obtain the federal license for the first year of operation.

2.2.4. Any license required shall be renewed annually by the building owner and the cost of the licensing borne solely by the building owner.

3. PLANS AND SUPPORTING DOCUMENTS

3.1 The plans and supporting documents for the radio antenna system shall include a complete and detailed description of the following:

a) Installation instructions
b) Location of in-building antenna
c) Location of donor antenna
d) Location of riser and trunk on each floor
e) Location of amplifier, repeater, and head-end equipment
f) Connection to the fire alarm system for a common trouble zone
g) Critical locations requiring coverage
h) Method of Acceptance Testing

4. INSTALLATION OF RADIO ANTENNA EQUIPMENT

4.1 AMPLIFIERS, REPEATERS AND HEAD-END EQUIPMENT

4.1.1. Amplifiers, repeaters, and head-end equipment shall be located in a service room that is provided with not less than 1 h fire-resistance rating.

4.1.2. All amplifiers, repeaters, and head-end equipment required by the radio antenna system shall be protected by enclosures rated CSA Type 3 or higher.

4.1.3. All amplifiers, repeaters and head-end equipment shall be provided with drip shield to guard against water spray from fire sprinklers located in the room unless the enclosures are rated CSA Type 4 or higher.

4.2 DISTRIBUTED ANTENNA SYSTEM

4.2.1. One in-building antenna shall be located within 20 m of the elevator door opening at each odd-numbered storey.

4.2.2. One in-building antenna shall be located inside each exit stair shaft at the landing of each even numbered storey.

4.2.3. Additional in-building antennas shall be installed to provide 98 percent radio coverage inside each critical area as described in the Vancouver Building By-law.

4.2.4. Sufficient antenna isolation shall be maintained between the donor antenna and all in-building antenna (D.A.S.) under all operating conditions

4.3 WIRING

4.3.1. Cables and wires shall be FT-4 rated, and where installed inside plenums, cables and wires shall be FT-6 rated.

4.3.2. Except within service rooms containing the amplifiers, repeaters and head-end equipment, cables and wires installed in the risers shall be mechanically protected per the Electrical Code.

4.4 INTERCONNECTION TO THE FIRE ALARM SYSTEM

4.4.1. The radio antenna system shall be monitored by the building fire alarm system for common trouble

4.5 PROVISION FOR RADIO ANTENNA SYSTEM EXPANSION

4.5.1. Raceways shall be installed to allow installation of future in-building antenna in the floor area of each storey not already provided with wiring or horizontal distribution.

5. ACCEPTANCE TESTING

5.1 Adequate Radio Coverage

5.1.1. The intent is to achieve -95 dBm on the current public safety bands. Good design should provide a margin of not less than 10 dB to allow for uncontrolled variables. Based on the foregoing, the design target for indoor coverage should be -85 dBm.

5.1.2. The radio frequency range to be supported shall be any frequencies used by the public safety communications service provider's network. If signal amplifiers are used, they shall include filters that will protect the amplifiers from overload and the system from interference by out-of-band signals.

5.1.3. In the event that active amplification is required to meet the foregoing communication quality requirements in the building, coordination with the public safety communications service provider is required to ensure that its outdoor radio communication performance is not degraded. If there is a trade-off to be made between maintaining the public safety communications service provider's outdoor radio communication performance and restoration of signal strength in the building, the trade-off decision shall be made by the public safety communications service provider and communicated to the Fire Chief by the building owner.

5.2 System Verification Procedures

5.2.1. Tests shall be performed by RF technicians under supervision of a professional engineer registered in the Province of British Columbia. Test reports shall bear the seal of the engineer.

5.2.2. If required by the engineer, during the engineer's acceptance test, portable handheld radios used for speech and coverage acceptance shall be the same type used by Vancouver Fire and Rescue Services.

5.2.3. Acceptance tests and measurements shall be performed after completion of installation of the Radio Antenna System. Tests shall be performed using radio frequencies assigned by the public safety communications service provider, after proper coordination with an authorized representative of that system and with the Fire Chief.

5.2.4. Where the floor area of a critical location is greater than 4,500 m² the area shall be divided into a uniform grid of not more than 15 m on a side, or if the floor area is smaller than 4,500 m² it shall be divided into a uniform grid of approximately 20 equal areas, to a minimum of 9 m², and measurements shall be taken in each grid area. The size of the grids shall also be reduced, or the number of grids increased, upon recommendation of the Fire Chief or inspector in areas where special construction or other obstruction may significantly affect communications.

5.2.5. If the Radio Antenna System fails to provide acceptable communication in any of the critical locations as stipulated in the Building By-law, the building owner shall have the system rectified to meet the 98% coverage requirement for these areas; otherwise the Radio Antenna System will not be accepted.

5.3 Tests for Optimization

5.3.1. The radio antenna system shall be optimized to provide maximum coverage of the remainder of the floor areas while providing 98 % coverage in the critical locations.

5.4 Tests of Power Supply

5.4.1. Backup batteries and power supplies shall be tested under full load using a minimum of a 90% duty cycle for a period of at least one hour. If within the one-hour period, the battery shows no symptom of failure or impending failure, the test shall be continued for additional one-hour periods to determine the integrity of the battery. The battery shall not fail within a four-hour continuous test period.

5.4.2. Alternatively, the power supply may be connected to the building emergency generator with the backup batteries to supply a four-hour continuous power supply.

6. DOCUMENTATION

6.1 DOCUMENTATION REQUIRED

6.1.1. The documentation required by this section shall be maintained on site in a box located in a location acceptable to the Fire Chief.

6.1.2. Documentation for the radio antenna system shall include the following description of the radio antenna system:

a) Instructions for resetting the system
b) Equipment operating instructions or manuals
c) Equipment maintenance instructions
d) Equipment testing instructions
e) Optimization tests
f) Signal strength tests at critical locations
g) Results of battery test
h) Results of testing of connection to the fire alarm system

6.1.3. The designer of the radio antenna system shall prepare the Health SC6 report which certifies the system meets Safety Code 6.

6.1.4. After installation of the radio antenna system is completed, the designer shall provide confirmation that the radio antenna system meets Safety Code 6.

6.1.5. A copy of the annual operating licence issued by Federal communications agency shall be included in the fire safety plan for the building.

A-3.2.6. Smoke Control for High Buildings. Experience with high buildings has shown that the time required for complete evacuation can exceed that which is considered necessary for the safe egress of all occupants. Studies of the "chimney effect" and observations of smoke movement in actual fires have shown that fire compartmentation to contain a fire on any one storey will not usually prevent the movement of smoke through elevator, stair and other vertical shafts to the upper floors of a high building.