

CITY OF
LANGLEY



RADIO AMPLIFICATION BYLAW

No. 3333

A bylaw to provide for in-building emergency responder communications enhancement systems.

WHEREAS the City of Langley Council deems it expedient to provide for internal radio support systems to safeguard the uninterrupted operation of the radio communications networks essential to public safety, policing, and emergency response;

NOW THEREFORE, the City of Langley enacts as follows:

1 Title

1.1 This bylaw may be cited as "Radio Amplification Bylaw No. 3333".

2 Definitions

2.1 In this bylaw:

"**Adequate Radio Coverage**" has the meaning ascribed in section 4.2;

"**Building**" means any structure used or intended to be used for supporting or sheltering any use of occupancy as defined by the BC Fire Code adopted as Regulation 263/2012 to the BC *Fire Services Act*, RSBC 1996, c. 144;

"**Building Inspector**" means the Building Inspector, Supervisor of Inspections, or other persons designated by Council to act in place of the Building Inspector;

"**City**" means the City of Langley;

"**Delivered Audio Quality**" or "**DAQ**" means a subjective performance scale developed by the Telecommunications Industry Association for determining the intelligibility of radio system audio;

"**Delivered Audio Quality of 3.4**" means speech over radio that is understandable without repetition and may have some noise or distortion present;

"**Dispatch Center**" means the dispatch service used by the Fire

Department;

“Enhancement System” means an in-building emergency responder communications enhancement system, also known as a zone enhancer, that enhances radio signal coverage inside a building for the radio frequencies used by E-Comm;

"Fire Chief" means the person designated by Council by name of office or otherwise;

“Fire Department” means the department of the City that provides municipal emergency and non-emergency fire and rescue services;

“Inadequate Radio Coverage” means radio coverage that does not meet all of the criteria stipulated in section 4.2;

“Low-E reflective glass” means glass that has been treated with a coating intended to reflect infrared and ultraviolet radiation;

“NEMA Type 4” means a waterproof enclosure as defined by the National Electrical Manufacturers Association;

"Occupancy Permit" means the permission or authorization in writing by a Building Inspector to occupy a building or structure;

“Owner” means any person, firm, or corporation controlling the property under consideration;

"Permit" means authorization in writing by a Building Inspector to perform construction regulated by "Building and Plumbing Bylaw No 2498" as amended;

“Shadowed Area” means an area that suffers attenuation or obstruction of radio signals to or from the area as a result of the interposition of all or any part of a building or structure in the radio signal path (line of sight) between the area and the transmitting/receiving site of the Dispatch;

“SINAD” means signal-to-noise and distortion ratio and is a measure of the quality of a signal from a communications device;

“Test Operator” means an individual or company with experience in testing radio communications signals and whose credentials are satisfactory to the Fire Chief.

3 Application

- 3.1 Unless specifically exempted in this Bylaw, this Bylaw applies to all Buildings within the municipal boundaries of the City.
- 3.2 No Permit or Occupancy Permit shall be issued for any building or structure until the requirements of this Bylaw have been met to the satisfaction of the Building Inspector and the Fire Chief.
- 3.3 This Part does not apply to a Building:
 - 3.3.1 that has been granted an exemption in writing by the Fire Chief or Building Inspector, where the Fire Chief or Building Inspector

considers that the Building should be exempt from this Bylaw, having consideration for the operational needs of the City, the need for or quality of radio coverage in the Building, or any other factor the Building Inspector or Fire Chief considers appropriate; or

- 3.3.2 that received its occupancy permit prior to the date this Bylaw came into force; or
- 3.3.3 that is no more than three storeys in height with a total floor space of no more than 400 square metres; or
- 3.3.4 that meets all of the following criteria:
 - (a) is constructed entirely of wood frame;
 - (b) does not have any metal cladding;
 - (c) does not have Low-E reflective glass;
 - (d) does not have any portion of the building with a floor level that is partially or wholly underground, including basements, cellars and crawlspaces;
 - (e) has less than 5,000 square metres of combined floor space; and
 - (f) is less than 12 metres in height from the lowest ground elevator to the highest point.

4 Requirement to Provide Adequate Radio Coverage

- 4.1 Subject to the exemptions listed in Part 4 of this Bylaw and except as otherwise provided, a Building must have Adequate Radio Coverage.
- 4.2 For the purposes of this Bylaw, “Adequate Radio Coverage” means coverage that meets all of the following criteria:
 - 4.2.1 all areas of the Building meet a minimum standard Delivered Audio Quality of 3.4, for communication between a portable (handheld) radio with simple flexible whip antenna and dispatch radio communication sites:
 - (a) within the Building, for a minimum of 90% of the area of each floor of the Building, including underground areas such as for parking;
 - (b) within the Building, for 100% of fire command centres, stairwells, protect-in-place areas, lobby refuge areas, equipment rooms and high-hazard areas; and
 - (c) in areas that are in the Shadowed Area of the Building, in 90% of all areas where DAQ 3.4 could be achieved before the erection, construction or modification of the Building or structure.

- 4.2.2 Signaling transmitted by the portable radios (radio ID, Emergency Alert, or other signals used by the Fire Department) shall pass through the Enhancement System and be rebroadcast to all receiving radios; and
- 4.2.3 The radio frequency range to be supported shall be any frequencies used by the Dispatch Centre 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 System Requirements

- 5.1 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). Radio equipment shall only be selected from the ISED Radio Equipment List. Any License required shall be renewed annually by the Building Owner and the cost of the license borne solely by the Building Owner.
- 5.2 Where a Building must provide an Enhancement System to achieve Adequate Radio Coverage to comply with Part 5 of this Bylaw, such Enhancement System shall include any of the following that are sufficient to achieve the required criteria:
 - 5.2.1 Passive antenna systems or radiating cable systems;
 - 5.2.2 Distributed antenna systems with unidirectional or bidirectional amplifiers as required;
 - 6.1.1 Voting receiver systems; or;
 - 6.1.2 Any other system acceptable to the Fire Chief, as signified in writing on a case by case basis.
- 5.3 Enhancement Systems shall be capable of upgrade to allow for instances where the Fire Department changes or adds system frequencies, or changes or adds signaling functionality, in order to maintain system coverage as originally designed.
- 5.4 If any part of the installed Enhancement System contains an electrically powered component, the system shall be equipped to operate on an independent "Uninterruptible Power Supply" (UPS), using a battery and/or generator system, for a period of at least twelve hours without external power or maintenance. All amplifiers and electronics required by the system shall be protected by NEMA type 4 or higher enclosures. The UPS shall automatically charge the batteries in the presence of external power.

- 5.5 The UPS shall provide supervisory signals to the fire alarm to indicate:
 - 5.5.1 Failure of primary power;
 - 5.5.2 Failure of the UPS charger (primary power but no charger output); and
 - 5.5.3 70% discharge of the batteries.
- 5.6 Silencing of supervisory signals shall be the responsibility of the Owner.
- 5.7 The Owner of a Building that is equipped with emergency generators for backup power shall ensure that such generator is connected to and provides emergency power to the Enhancement System UPS.
- 5.8 Active components of the Enhancement System shall be capable of sending the following supervisory signals, which shall be connected to and monitored by the fire alarm panel:
 - 5.8.1 Donor antenna malfunction;
 - 5.8.2 Active RF-emitting device failure;
 - 5.8.3 Low battery capacity (70% depleted);
 - 5.8.4 Active system component failure;
 - 5.8.5 Loss of normal AC power; and
 - 5.8.6 Failure of battery charger.
- 5.9 The Enhancement System supervisory signals shall be summarized on a graphic annunciator located near the Fire Alarm Panel as described in this section, either:
 - 5.9.1 Using a stand-alone, hardwired annunciator designed to display the supervisory signals described in section 5.8; or
 - 5.9.2 As part of the Fire Alarm graphic annunciator using a delineated area labelled "Radio Enhancement System" containing 3 LEDs:
 - (a) normal operation shall be annunciated with a green LED labelled "Normal" that indicates there are no supervisory signals being sent by the Enhancement System;
 - (b) off normal operation shall be annunciated with a yellow LED labelled "Trouble" that indicates a supervisory signal specified in s. 5.8.5 or s. 5.8.6 or any other signal where the Enhancement System is off normal but still fully

operational for in-building radio communications; and

- (c) system failure shall be annunciated by a yellow LED labelled "Failure" that indicates a supervisory signal specified in s. 5.8.1 – s. 5.8.4 or any other supervisory signal that indicates the radio communication performance of the system is unreliable.

6 Procedures to Verify and Maintain Compliance

- 6.1 After a new Enhancement System has been installed and before that system is put into regular operation, the Owner of a Building regulated by this Bylaw shall arrange for tests by a Test Operator to verify that the Enhancement System is installed and operates in compliance with this Bylaw, at the sole expense of the Owner. The procedures used for testing shall be developed by the Owner, subject to acceptance by the Fire Chief, and in compliance with the guidelines set out in this Part.
- 6.2 If any tests described in this Part are not successful the Enhancement System will not be accepted.
- 6.3 Enhancement Systems shall be maintained in operable condition at all times. The Fire Department shall immediately be notified of any Enhancement System supervisory signal being detected, but not later than (2) hours after the initial signal occurred. Supervisory signals regarding Enhancement System failure shall be reported immediately.
- 6.4 Enhancement System acceptance shall be based upon a commissioning report that consists of the following tests and information:
 - 6.4.1 Radio Coverage testing:
 - (a) radio coverage testing shall be performed when the construction of the Building is substantially complete and all interior and exterior doors and windows have been installed. All doors and windows shall remain closed during testing;
 - (b) acceptance tests shall be performed using radio frequencies assigned to the Dispatch Center, after proper coordination with an agent of that system and with the Fire Chief;
 - (c) if queuing occurs on the radio system while testing is underway, testing shall be terminated immediately and resumed only when traffic levels on the radio system drop to the level where queuing will no longer occur;
 - (d) for all DAQ tests, a pre-defined "Harvard" sentence should be used, such that the listeners are not aware of the

sentence in advance on each test. A different recorded sentence should be used at each location;

- (e) where the Shadowed Area, or the floor plate area of a Building, is greater than 4,500 m² it shall be divided into a uniform grid of not more than 15m on a side, or if the floor area is smaller than 4,500m² it shall be divided into a uniform grid of approximately 20 equal areas, to a minimum of 9m², and measurements shall be taken at the centre of 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 Building Inspector in areas where special construction or other obstruction may significantly affect radio signals. Tests shall also be performed in the fire command centres, stairwells, protect-

in-place areas, lobby refuge areas, equipment rooms, and high-hazard areas without the use of a grid system;

- (f) tests shall first be made using a portable (handheld) radio of the type used by emergency service providers, held at hip level and using a simple flexible whip antenna, and shall be deemed satisfactory if Adequate Radio coverage can be achieved for a five-second test transmission in each direction. If system access is not reliable, or if Adequate Radio Coverage for five seconds cannot be achieved at any location, the Test Operator may move a maximum of 1.5m in any direction from the centre of the grid and repeat the test. If system access continues to be unreliable, or if Adequate Radio Coverage still cannot be achieved, or if there is any doubt about whether it can be achieved, a failure shall be recorded for that location;
- (g) a maximum of two (2) non-adjacent grid areas on a floor or in a Shadowed Area will be allowed to fail the test. In the event that three (3) or more grid areas on a floor or in a Shadowed Area fail the test, the floor or Shadowed Area may be divided into 40 approximately equal areas and the tests repeated. In such event, a maximum of four (4) non-adjacent areas will be allowed to fail the test. If the Enhancement System fails the 40-area test, the Owner shall have the Enhancement System altered to meet the 90% coverage requirement in section 5.2.1(a); otherwise the Enhancement System will not be accepted; and
- (h) if the Enhancement System fails to provide Adequate Radio Coverage in any of the fire command centre, any portion of a stairwell, protect-in-place areas, lobby refuge areas, equipment rooms, or high-hazard areas, the Owner shall have the Enhancement System altered to meet the 100% coverage requirement for these areas, otherwise the

Enhancement System will not be accepted.

6.4.2 System Measurements:

- (a) measurements shall be taken and recorded in compliance with the Dispatch Coverage Enhancement System Commissioning Guidelines, and shall be recorded in the document specified in s. 6.4.5(a) ix.

6.4.3 Secondary Power:

- (a) backup batteries and power supplies shall be tested under full load by generating communication traffic automatically for a duration of at least one hour. If within the one-hour period the UPS shows any symptom of failure or impending failure, the test shall be continued for a duration of at least twelve hours to determine the integrity of the UPS. If the UPS fails within a twelve-hour continuous period, such UPS will not be accepted; and
- (b) if the Building contains an emergency generator, the UPS shall be tested to ensure charging takes place on emergency generator power.

6.4.4 System Monitoring:

- (a) tests shall be made using deliberate failures or simulations that activate each supervisory signal in section 5.8. Each test must also ensure that the signals are annunciated in compliance with section 5.9.

6.4.5 Documentation:

- (a) The Owner shall provide the following documentation to the Fire Department:
 - (i) complete drawings of the system as installed showing the location of all components;
 - (ii) design drawings sufficient to use as a baseline for future maintenance and testing;
 - (iii) the measured signal strength received at the donor antenna from the targeted Dispatch site;
 - (iv) other amplifier settings required for compliance with this Bylaw or the requirements of the Dispatch Centre site;
 - (v) signal strength measurements at each interior antenna;

- (vi) an acceptance test report showing signal strength and/or bit error rate and the DAQ values for each required test grid, certified in accordance with section 6.6;
- (vii) secondary power system design information and test results;
- (viii) supervisory signals and fire alarm panel interconnection details and test results; and
- (ix) an annual test procedures document sufficient to ensure future system compliance with this Bylaw.

6.5 At least once per calendar year, at the sole cost of the Owner, the Owner shall retain a Test Operator to test all active components of the Enhancement System, including but not limited to all amplifiers, power supplies and back-up batteries, to ensure the Enhancement System is operating in compliance with the requirements of this Bylaw, and shall keep a record of such tests for inspection by the Fire Chief or other inspector designated by the District. The Test Operator may adjust the amplifier gain if necessary to re-establish the gain recorded upon acceptance testing, and batteries and power supplies shall be tested under load for a period of at least one hour to verify that they will function properly during a power outage.

6.6 Unless otherwise approved by the Fire Department, all test reports of tests described in this Part must be certified by a professional engineer registered in the Province of British Columbia and qualified in radio communications. Test reports will not be deemed conclusive or acceptable for the purposes of this Bylaw unless they bear the seal of a professional engineer.

6.7 Portable radios used for DAQ testing must be of the same type used by the Fire Department. SINAD (ratio of signal-plus-noise-plus-distortion-to-noise-plus-distortion) Bit Error Rate (BER) and signal strength measurements shall be made using appropriate instrumentation acceptable to the Fire Chief. The Test Operator shall ensure that the Test Operator's radios and measurement equipment have been tested for conformance to design specification within twelve months prior to the conduct of Enhancement System acceptance tests or re-tests.

6.8 Additional tests or inspection of records may be conducted from time to time at the discretion of the Fire Chief, after giving reasonable notice to the building Owner.

6.9 If the radio signal within the Building or within the Shadowed Area appears to have degraded, or if the tests show Inadequate Radio Coverage, the Owner of the Building is required to remedy the problem and restore the

Enhancement System in a manner consistent with the original acceptance criteria in this Part, unless the Owner can demonstrate conclusively that the degradation is solely the result of external changes not under his or her control.

- 6.10 If the Enhancement System fails to provide Adequate Coverage because of any technological change to the municipal fire services radio system, the Enhancement System shall be upgraded at the sole expense of the Owner, in order to maintain Enhancement System coverage as originally designed.

7 Existing Enhancement Systems

- 7.1 The Owner of a Building containing an existing Enhancement System:
- 7.1.1 That has provision to supply supervisory signals shall upgrade their fire alarm interconnection if necessary to comply with section 7.1.2
 - 7.1.2 5.8 and 5.9 for all such signals present;
 - 7.1.3 That has an emergency generator shall provide a connection from the generator to the Enhancement System UPS;
 - 7.1.4 That provides less than 12 hours of secondary power shall upgrade the UPS to provide 12 hours of secondary power;
 - 7.1.5 That does not have documented measurements as specified in s. 6.4.2(a) shall have those measurements taken and recorded in the next annual test report to ensure system compliance; and
 - 7.1.6 That requires repairs shall ensure replacement components comply with the current requirements of this Bylaw.

8 Right of Entry

- 8.1 Every Owner or occupant of a building shall, at all reasonable times, permit the Building Inspector or the Fire Chief to enter into and inspect any building or structure to ascertain whether the regulations and provisions of this Bylaw are being obeyed and any person who refuses entry shall be in violation of this Bylaw and shall be liable to the penalties hereby imposed.

9 Enforcement

- 9.1 The Fire Chief may issue an Order to Comply to any person in contravention of this Bylaw.
- 9.2 An order made under this Bylaw shall be in writing and shall be served by delivering it or causing it to be delivered to the person to whom it is directed. The recipient of an Order to Comply shall comply with it.

- 9.3 Any person against whom an Order to Comply has been made under this Bylaw may, before the expiration of seven days after the service, appeal to the Fire Chief, who shall review and shall amend, revoke or confirm the Order to Comply.
- 9.4 Subject to the exercise of an appeal as provided in section 9.3, if the obligations stipulated in an Order to Comply are not performed by the date
- 9.5 therein set out, the City by its employees and others may enter the parcel and perform the obligations at the expense of the person defaulting.

10 Offence and Penalty

- 10.1 Every person who violates a provision of this bylaw, or who consents, allows or permits an act or thing to be done in violation of a provision of this bylaw, or who neglects to or refrains from doing anything required to be done by a provision of this bylaw, is guilty of an offence and is liable to the penalties imposed under this bylaw, and is guilty of a separate offence each day that a violation continues to exist.
- 10.2 Every person who commits an offence is liable on summary conviction to a fine or to imprisonment, or to both a fine and imprisonment, of not less than \$5000 and not more than \$50,000.

11 Severability

- 11.1 If a portion of this bylaw is held invalid by a Court of competent jurisdiction, then the invalid portion must be severed, and the remainder of this bylaw is deemed to have been adopted without the severed section, subsection, paragraph, subparagraph, clause or phrase.

READ A FIRST, SECOND, AND THIRD TIME this day of , .

FINALLY ADOPTED this day of , .