



THE DISTRICT OF NORTH VANCOUVER

FIRE AND RESCUE RADIO AMPLIFICATION BYLAW

BYLAW 8514

Effective Date – July 26, 2021

CONSOLIDATED FOR CONVENIENCE ONLY

This is a consolidation of the bylaws below. The amending bylaws have been combined with the original bylaw for convenience only. This consolidation is not a legal document. Certified copies of the original bylaws should be consulted for all interpretations and applications of the bylaw on this subject.

Original Bylaw	Date of Adoption
Bylaw 8514	July 26, 2021
Amending Bylaw	Date of Adoption
N/A	N/A

The bylaw numbers in the margin of this consolidation refer to the bylaws that amended the principal bylaw (Radio Amplification Bylaw 8514, 2021). The number of any amending bylaw that has been repealed is not referred to in this consolidation.

The Corporation of the District of North Vancouver

Bylaw 8514

A Bylaw to provide for In-*Building* Emergency Responder Communications
Enhancement Systems within the District of North Vancouver

The Council for The Corporation of the District of North Vancouver enacts as follows:

PART 1 – TITLE

Citation

1. This bylaw may be cited as “Radio Amplification Bylaw 8514, 2021”.

PART 2 – DEFINITIONS

Definitions

2. In this Bylaw, unless the context otherwise requires:

Adequate Radio Coverage has the meaning ascribed in section 5;

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 person(s) appointed by the Council for the *District* to be *building* inspectors, or such person’s authorized designate;

Community Charter means the BC *Community Charter* SBC 2003, c. 26, as amended or replaced;

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

dB means decibel, a relative unit of measurement used to express the ratio of one value to another on a logarithmic scale;

dBs means *dB SINAD*, the ratio of the total power of a received signal to the power of the noise and distortion of that signal in decibels;

dBm means decibel-milliwatts, a measure of absolute power with reference to one milliwatt in decibels;

Dispatch Centre means the dispatch service used by the *Fire Department*;

District means the District of North Vancouver;

E-Comm means Emergency Communications for Southwest British Columbia Incorporated and all the features and functions of its radio communications systems, including microwave radio systems, provided to the *Fire Department*, Royal Canadian Mounted Police, British Columbia Emergency Health Services, and other emergency services;

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 appointed as the Chief of the *Fire Department* of the *District* or an authorized designate;

Fire Department means the department of the *District* 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 required in section 5;

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;

Owner has the meaning prescribed in the *Community Charter*;

Permit means authorization in writing by the *Building Inspector* to perform construction or demolition of a *building* or structure, or to permit occupancy of a *building* or structure, all as regulated by the Construction Regulation Bylaw 8271, 2017, as amended or replaced;

P25 means Project 25, which is a suite of standards for the design and manufacture of interoperable digital two-way wireless communication products. Project 25 is administered by the Telecommunications Industry Association (TIA);

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 *E-Comm*;

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*.

PART 3 – APPLICABILITY

Applies to all *Buildings*

3. Unless specifically exempted in this Bylaw, this Bylaw applies to all *Buildings* within the municipal boundaries of the *District*.

Exemptions

4. This Bylaw shall not apply to:
 - a) Any single-family detached or semi-detached residence;
 - b) Any *Building* or structure that complies with all of the following:
 - i. is constructed entirely of wood frame;
 - ii. does not have any metal cladding;
 - iii. does not have any *Low-E reflective glass*;
 - iv. does not have any portion of the *Building* or structure with a floor level that is partially or wholly underground, including basements, cellars and crawlspaces;
 - v. the area of all the floors of the *Building* or structure is less than 5000 square metres, as measured to the lesser of the outside edge of the exterior walls or sheathing; and
 - vi. is less than 12 metres in height, as measured from the lowest ground elevation of the *Building* or structure to the highest point of the *Building* or structure; or
 - c) any *Building* that has been granted an exemption in writing by the *Fire Chief* or *Building Official*, where the *Fire Chief* or *Building Official* considers that the

Building should be exempt from this Bylaw, having consideration for the operational needs of the *District*, the need for or quality of radio coverage in the *Building*, or any other factor the *Building* Official or *Fire Chief* considers appropriate.

PART 4 – REQUIREMENTS TO PROVIDE ADEQUATE RADIO COVERAGE

Adequate Radio Coverage

5. For the purposes of this Bylaw, “Adequate Radio Coverage” means coverage that meets all of the following criteria:

a) System access and *DAQ* of 3.4 or better (speech understandable with repetition only rarely, some noise or distortion may be present) for communication between a portable (handheld) radio with simple flexible whip antenna and *E-Comm* radio communication sites:

i. within the *Building*, for a minimum of 90% of the area of each floor of the *Building*, including underground areas such as for parking; and

ii. within the *Building*, for 100% of fire command centres, stairwells, protect-in-place areas, lobby refuge areas, equipment rooms and high-hazard areas;

As an aid to system design, *DAQ* 3.4 has been measured by NTIA (U.S. Department of Commerce, National Telecommunications and Information Administration) to be approximately equivalent to 22 *dBs* (22 *dB SINAD*) for analogue signals modulated with a 1 kHz tone at 1.5 kHz deviation, and to 2% BER (Bit Error Rate) for *P25* digital signals. It is approximately equivalent to a received signal level of -95 *dBm*, in the absence of other signals that may affect the receiver. 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*;

b) 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;

c) The radio frequency range to be supported shall be any frequencies used by the *E-Comm* 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; and

- d) In the event that active amplification is required to meet the foregoing communication quality requirements in the *Building* including the *Shadowed Area* of the *Building*, coordination with *E-Comm* 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 *E-Comm* outdoor radio communication performance and restoration of signal strength in the *Building* and *Shadowed Area*, the trade-off decision shall be made by *E-Comm* and communicated to the *Fire Chief* by the *Building Owner*.

Requirement to Provide Adequate Radio Coverage

6. Subject to the exemptions listed in section 4 of this Bylaw and except as otherwise provided, a *Building* must have *Adequate Radio Coverage* within the *Building*:
 - a) For 90% of the area of each floor of the *Building*, including underground areas; and
 - b) For any part of those areas designed or designated in the *Building* as being fire command centres, stairwells, protect-in-place areas, lobby refuge areas, equipment rooms and high-hazard areas.

Licensing Requirements

7. All active systems shall be licenced 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 Licence required shall be renewed annually by the *Building Owner* and the cost of the licence borne solely by the *Building Owner*.

System Changes

8. *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.

PART 5 – ENHANCEMENT SYSTEMS ALLOWED

Systems Allowed

9. Where a *Building* must provide an *Enhancement System* to achieve *Adequate Radio Coverage* to comply with section 6 of this Bylaw, such *Enhancement System* shall include any of the following that are sufficient to achieve the required criteria:
 - a) Passive antenna systems or radiating cable systems;

- b) Distributed antenna systems with unidirectional or bidirectional amplifiers as required;
- c) Voting receiver systems; or
- d) Any other system acceptable to the *Fire Chief*, as signified in writing on a case by case basis.

Secondary Power

10. 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.
- a) The UPS shall provide supervisory signals to the fire alarm to indicate:
 - i. Failure of primary power;
 - ii. Failure of the UPS charger (primary power but no charger output); and
 - iii. 70% discharge of the batteries.

Emergency Generators

11. 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.

System Monitoring

12. 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:
- a) Donor antenna malfunction;
 - b) Active RF-emitting device failure;
 - c) Low battery capacity (70% depleted);
 - d) Active system component failure;

- e) Loss of normal AC power; and
- f) Failure of battery charger.

Remote Annunciation

13. The *Enhancement System* supervisory signals shall be summarized on a graphic annunciator located near the Fire Alarm Panel as described in this section, either:
- a) Using a stand-alone, hardwired annunciator designed to display the supervisory signals described in section 12; or
 - b) As part of the Fire Alarm graphic annunciator using a delineated area labelled “Radio *Enhancement System*” containing 3 LEDs:
 - i. normal operation shall be annunciated with a green LED labelled “Normal” that indicates there are no supervisory signals being sent by the *Enhancement System*;
 - ii. off normal operation shall be annunciated with a yellow LED labelled “Trouble” that indicates a supervisory signal specified in section 12(e), 12(f), or any other signal where the *Enhancement System* is off normal but still fully operational for in-*building* radio communications; and
 - iii. system failure shall be annunciated by a yellow LED labelled “Failure” that indicates a supervisory signal specified in section 12, subsection (a), (b), (c), (d), or any other supervisory signal that indicates the radio communication performance of the system is unreliable

PART 6 – PROCEDURES TO VERIFY AND MAINTAIN COMPLIANCE

Initial Compliance

14. 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 following guidelines:

Acceptance Tests

15. *Enhancement System* acceptance shall be based upon a commissioning report that consists of the following tests and information:

- a) Radio Coverage testing:
- i. 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;
 - ii. acceptance tests shall be performed using radio frequencies assigned to the *Dispatch Centre*, after proper coordination with an agent of that system and with the *Fire Chief*;
 - iii. 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;
 - iv. 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;
 - v. 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;
 - vi. 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;

- vii. 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(a); otherwise the *Enhancement System* will not be accepted; and
 - viii. 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.
- b) System Measurements:
- i. measurements shall be taken and recorded in compliance with the *E-Comm Coverage Enhancement System* Commissioning Guidelines, and shall be included in the document specified in section 15(e)(ix).
- c) Secondary Power
- i. 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 to determine the integrity of the UPS. If the UPS fails within a twelve-hour continuous period, such UPS will not be accepted; and
 - ii. if the *Building* contains an emergency generator, the UPS shall be tested to ensure charging takes place on emergency generator power.
- d) System Monitoring
- i. tests shall be made using deliberate failures or simulations that activate each monitoring signal in section 12. Each test must also ensure that the signals are annunciated in compliance with section 13.

e) Documentation

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 *E-Comm* site;
 - iv. other amplifier settings required for compliance with this bylaw or the requirements of *E-Comm*;
 - 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 19;
 - 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.
16. If any tests described in section 15 are not successful, the *Enhancement System* will not be accepted.

Annual Testing

17. 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, 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.

18. Additional tests or inspection of records may be conducted from time to time by the *Fire Department* at the discretion of the *Fire Chief*, after giving reasonable notice to the *Owner*. 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 section 14, unless the *Owner* can demonstrate conclusively that the degradation is solely the result of external changes not under their control.

Test Reports

19. Unless otherwise approved by the *Fire Department*, all test reports of tests described in Part 6 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.

Test Equipment

20. 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.

Maintenance

21. *Enhancement Systems* shall be maintained in operable condition at all times. The *Fire Department* shall be notified of any *Enhancement System* supervisory signal, either immediately that the signal is detected, but not later than (2) hours after the initial signal occurred. Supervisory signals regarding *Enhancement System* failure shall be reported immediately.

System Upgrade

22. 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.

PART 7 – EXISTING *ENHANCEMENT SYSTEMS*

Minimum Compliance

23. The *Owner* of a *Building* containing an existing *Enhancement System*:
- a) That has provision to supply supervisory signals shall upgrade their fire alarm interconnection if necessary to comply with sections 12 and 13 for all such signals present;
 - b) That has an emergency generator shall provide a connection from the generator to the *Enhancement System* UPS;
 - c) That provides less than 12 hours of secondary power shall upgrade the UPS to provide 12 hours of secondary power;
 - d) That does not have documented measurements as specified in section 15(b) shall have those measurements taken and recorded in the next annual test report to ensure system compliance; and
 - e) That requires repairs shall ensure replacement components comply with the current requirements of this Bylaw.

PART 8 – *PERMIT CONDITIONS*

24. A *Permit* for occupancy of a *Building* shall not be issued for any *Building* until the requirements of this Bylaw have been met to the satisfaction of the *Building Inspector* and *Fire Chief*.

PART 9 – *RIGHT OF ENTRY*

25. Every *Owner* or occupant of a *Building* shall, at all reasonable times, permit the *Building Inspector*, the *Fire Chief*, or their authorized designate 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 the Bylaw and shall be liable to the penalties hereby imposed.

PART 10 – *DEEMED NUISANCE*

26. The construction or erection of a *Building* which interferes with the *District's* fire services, law enforcement and other emergency related telecommunications networks shall constitute a nuisance because it threatens the health, safety and welfare of the residents and visitors to the *District*. In addition to any other remedies or enforcement procedures provided herein, the *District* may seek an injunction to restrain such a nuisance.

PART 11 – ENFORCEMENT

Orders

27. If the *Fire Chief* finds that any provision of this Bylaw has been contravened or has not be complied with, or has been complied with improperly or only in part, or that conditions exist in or about a *Building* or property to which the Bylaw applies and which constitutes a hazard to life or property or both, the *Fire Chief* may make an order to ensure full and proper compliance with this bylaw and, in particular, but without limiting the generality of the foregoing, *Fire Chief* may:
- a) make recommendations to the *Owner*, occupier or lessee of the *Building* or property to correct the contravention or to ensure compliance with this Bylaw or to remove the hazards referred to in the Bylaw; or
 - b) make orders with respect to any of the matters referred to in this Bylaw; and
 - c) if the *Owner*, occupier or lessee does not comply with the requirements in subsection (a) and/or (b) above, the *Fire Chief* may take such action as the *Fire Chief* deems necessary to mitigate the hazard and may recover the costs and expenses of such action from the *Owner*, occupier or lessee, as applicable.

Standard of Work

28. The *Fire Chief* may, where work being completed is not covered by this Bylaw or applicable codes, in the interest of safety adopt the latest edition of the National Fire Protection Association codes, standards, recommended practices and manuals by reference or equivalent.

Rejection of Work

29. The *Fire Chief* may, after the examination of any work, issue a written rejection which shall have the same force and effect as an order issued under Section 27.

Form of Order

30. An order made under this Bylaw shall be in writing and may be directed to the *Owner*, occupier or lessee of the *Building* or property in respect of which the order is made, or to any or all of them.

Serving of Order

31. An order made under this Bylaw shall be served by delivering it or causing it to be delivered to the person to whom it is directed. An *Owner*, occupier or lessee of a *Building* or premises shall, after receipt of a violation report, inspection report or order, comply with it.

Appeal of Order to *Fire Chief*

32. Any person against whom an order has been made under this Bylaw may, before the expiration of seven days after the service of the order, appeal to the *Fire Chief*, who shall review and shall amend, revoke or confirm the order appealed against or substitute another order.

Cost Recovery

33. The municipal fire service may recover the costs and expenses of providing service and/or assistance response as outlined in this Bylaw, jointly and severally from any person, *Owner*, occupier or lessee in control of the *Building* or premises.

Designation of the Bylaw

34. This Bylaw is designated pursuant to section 264 of the *Community Charter* as a bylaw that may be enforced by means of a ticket in the form prescribed and the *Fire Chief*, members and authorized Local Assistants to the Fire Commissioner, are designated to enforce this Bylaw by means of a ticket pursuant to section 264 of the *Community Charter*.

Offences, Penalties and Enforcement

35. Every person who violates a provision of this Bylaw, or 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 punishable upon summary conviction and is liable to a fine of not more than \$50,000.00 or to imprisonment for not more than six months or to both. Each day that an offence continues shall constitute a separate offence.

Ticketing (Municipal Ticket Information)

36. Pursuant to sections 264(1)(c) and 265(1)(a) of the *Community Charter*, this bylaw is designated as a bylaw that may be enforced by means of a ticket in the form prescribed and *Fire Chief*, Local Assistants to the Fire Commissioner, and Bylaw Enforcement Officers are designated to enforce this bylaw and the table below sets

out the designated expressions for offences under this bylaw with the corresponding bylaw section number and fine amount:

Section number	Designated Expression (Short-Form Description)	Fine \$
6	Fail to provide <i>Adequate Radio Coverage</i>	200
14	Fail to test <i>Enhancement System</i>	200
21	Fail to maintain <i>Enhancement System</i>	200
22	Fail to upgrade <i>Enhancement System</i>	200
25	Obstruction	500
27	Fail to comply with Order	500

PART 12 – SEVERABILITY OF PROVISIONS

37. The provisions of this Bylaw are severable. If, for any reason, any provision is held to be invalid by the decision of a court of competent jurisdiction, such a decision shall not affect the validity of the remaining provisions of this Bylaw.

PART 13 – REPEAL

38. Radio Amplification Bylaw 8272, 2017 is hereby repealed and all references in other District bylaws to Radio Amplification Bylaw 8272, 2017 are hereby amended to refer to Radio Amplification Bylaw 8514, 2021.