

CITY OF SOMEWHERE

BY-LAW NO. 00000

Public Safety CREST Radio Building Amplification System By-law

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- (a) WHEREAS there is a need for certain buildings and structures to have internal radio support systems to ensure the uninterrupted operation of the City's fire services, law enforcement and other emergency-related radio communications networks essential to public safety and emergency response;
- (b) AND WHEREAS certain buildings and structures constructed of steel, reinforced concrete or reflective glass can be radio opaque thereby interrupting the operation of emergency services communications networks;
- (c) AND WHEREAS radio support and amplification systems within buildings or structures can overcome the interruption of emergency communication networks and are vital to public safety, policing and emergency services.

Under its statutory powers, including subsections 8(3), 8(7), 8(8), 63, 64 and 66(1) of the Community Charter, S.B.C. 2003, c. 26, the Council of the City of Somewhere enacts the following provisions:

**INTENT OF BY-LAW**

- (a) to require new or renovated buildings and structures of reinforced concrete or structural steel or using metal cladding or reflective glass, and having greater than 500 square metres in gross floor area or over 12 metres in height or basements of more than 1,000 square metres in area, to install and maintain Amplification Systems within buildings that allow uninterrupted communication to the CREST wide-area VHF radio system within the City;
- (b) to provide uninterrupted public safety and emergency response network communications ensuring the health, safety and protection of persons through the requirements of this By-law; and
- (c) the activities undertaken by or on behalf of the City pursuant to this By-law are not contemplated nor intended to, nor does the purpose of this By-law, extend to the protection of persons from economic loss, the assumption by the City of any responsibility of ensuring compliance by a person with this By-law, or providing a warranty with respect to any building for which a Permit or Occupancy Permit is issued.

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### **Part 1 Introductory Provisions**

#### **Title**

- 1. This By-law may be cited as the "Public Safety CREST Radio Building Amplification System By-law, 2007, No. 00000".

## **Definitions**

2. In this By-law,

"Amplification System" means the internal radio support and amplification systems described in Section 4 of this By-law;

"Building Official" means the person appointed by the City as the General Manager of Planning and Development or such person's authorized delegate;

"City" means the City of Somewhere;

"CREST" means Capital Region Emergency Service Telecommunications Incorporated and all the features and functions of the VHF trunked radio telecommunications systems, including microwave and VHF radio systems, provided by CREST to fire services, law enforcement and other emergency services;

"Fire Chief" means the person appointed by the City to be the head of its fire services or such person's authorized delegate;

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

"Permit" means authorization in writing by the Building Official to perform construction regulated by Somewhere Building By-law, No. 00000, as amended; and

"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 the building or structure in the radio signal path (line of sight) between the area and the transmitting/receiving site of CREST.

## **Part 2 Requirements to Provide a Radio Communications Support System**

### **General**

3. Except as otherwise provided, no person shall erect, construct, change the use of or provide an addition of more than 20% to any building or structure or any part thereof, or cause the same to be done, which fails to support adequate radio coverage for CREST, including but not limited to fire services and law enforcement personnel. For the purposes of this section, adequate radio coverage shall include all of the following:

- (a) System access and "Delivered Audio Quality" (DAQ) of 3.4 or better (speech understandable without repetition, some noise or distortion may be present) for communication between a portable (handheld) radio using a simple flexible whip antenna ("rubber ducky") and CREST transmitting/receiving 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; and
  - (iii) in areas that are in the Shadow 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.
- (b) 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 may also be approximately equivalent to a received signal level of -109 dBm (0.8 microvolts across a 50-ohm load), 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.
- (c) The radio frequency range to be supported is VHF 138-149. If signal amplifiers are used, they shall include filters that will protect the amplifiers from overload and the system from interference of out-of-band signals. The Amplifiers must meet IC requirements and be approved by CREST.
- (d) In no case shall the field strength required within the building be greater than that delivered by CREST to the receive antenna location of the Amplification System; nor shall the field strength required to be delivered to CREST be greater than that delivered by an emergency service portable radio operated at head height by an emergency service provider standing at the location for the transmit antenna for the Amplification System. In each case, the location for the receive and transmit antennas shall be favourable for the reception and transmission of emergency service radio signals, as determined by the Fire Chief.
- (e) In no case shall the field strength required within a Shadowed Area of the building be greater than that which would be delivered by CREST within the Shadowed Area prior to erection, construction or modification of the building or structure; nor shall the field strength required to be delivered to CREST be greater than that which would be delivered from the Shadowed Area prior to erection, construction or modification of the building or structure. If active amplification is needed to restore communication quality in the Shadowed Area of the building, coordination

with CREST is required to ensure that simulcast performance is not degraded. If there is a trade-off to be made between maintenance of simulcast performance and restoration of signal strength in the Shadowed Area, the trade-off decision shall be made by CREST and communicated to the Fire Chief by the building owner.

### **Amplification Systems Allowed**

4. Where a building or structure is required to provide an Amplification System to achieve adequate radio communication coverage, such system shall include any of the following that are sufficient to achieve the required coverage:
  - (a) passive antenna systems or radiating cable systems;
  - (b) internal multiple antenna systems with uni-directional or bi-directional amplifiers as needed;
  - (c) voting receiver systems; or
  - (d) any other system acceptable to the Fire Chief, as signified in writing on a case by case basis.

If any part of the installed Amplification 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 four hours without external input or maintenance. The UPS shall automatically charge the batteries in the presence of external power. The UPS shall provide a monitored alarm signal to indicate failure of primary power, failure of the UPS system power output, and/or discharge of the batteries. Silencing of this alarm shall be the responsibility of the person maintaining the equipment. The Somewhere Fire Service shall be notified of any failure that extends beyond two (2) hours.

### **Procedures to Verify and Maintain Compliance**

5. Tests and measurements to verify and maintain compliance shall be made at the sole expense of the building owner. The procedures used shall be developed by the owner, subject to acceptance by the Fire Chief, and in compliance with the following guidelines:
  - (a) Acceptance Test Procedure

Acceptance tests and measurements shall be performed after completion of installation of the Amplification System. Tests shall be performed using radio frequencies assigned to CREST, after proper coordination with the manager of that system and with the Fire Chief and the OIC of Police for the City of Somewhere.

If queuing occurs on the radio system while testing is underway, testing shall be terminated immediately and resumed only when traffic levels on the system drop to the level where queuing will no longer occur.

- (i) Where the Shadowed Area, or the floor plate area of a building, is greater than 4,500 m<sup>2</sup> 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 m<sup>2</sup> it shall be divided into a uniform grid of approximately 20 equal areas, 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 inspector in areas where special construction or other obstruction may significantly affect communications. Tests shall also be performed in fire command centres, stairwells, protect-in-place areas, lobby refuge areas, equipment rooms, and high-hazard areas.
- (ii) Tests shall first be made using a portable (handheld) radio of the type used by emergency service providers, held at head level and using a simple "rubber ducky" antenna, and shall be deemed satisfactory if DAQ 3.4 or better (speech understandable without repetition, some noise or distortion may be present) can be achieved for a five-second test transmission in each direction. If system access is not reliable, or if DAQ 3.4 for five seconds cannot be achieved at any location, the test operator may move a maximum of 1.5 m in any direction from the centre of the grid and repeat the test. If system access continues to be unreliable, or if DAQ 3.4 still cannot be achieved, or if there is any doubt about whether it can be achieved, a failure shall be recorded for that location.
- (iii) A maximum of two (2) non-adjacent grid areas on a floor or in a shadow will be allowed to fail the test. In the event that three (3) or more areas on a floor or in a shadow 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 grid areas will be allowed to fail the test. If the Amplification System fails the 40-area test, the building owner shall have the system altered to meet the 90% coverage requirement, otherwise the Amplification System will not be accepted.
- (iv) If the Amplification System fails to provide acceptable communication 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 building owner shall have the system altered to meet the 100% coverage requirement for these areas, otherwise the Amplification System will not be accepted.
- (v) For the purposes of this By-law the maximum Shadowed Area of the building shall be the width of the building perpendicular to a line directed toward the serving CREST site multiplied by five times the maximum

height of the building. Prior to construction or modification of the building, tests shall be performed to determine the existing communication coverage in the shadow, and the results recorded. Tests shall be repeated following construction, at the same locations, and the results compared. The test guidelines and acceptance criteria described in (ii) and (iii) previously shall be used for the Shadowed Area of a building; however, the tests shall be performed at 20 approximately equally-spaced locations at ground level within the Shadowed Area and at 20 approximately equally-spaced locations on or in buildings within the Shadowed Area, if such exist. A failure shall be recorded for any location that could communicate prior to construction, but cannot communicate following construction.

- (vi) Backup batteries and power supplies shall be tested under full load for a duration of at least one hour. If within the one-hour period the battery shows any 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.

The gain values of all amplifiers shall be measured, using a service monitor that has been calibrated by a certified laboratory within the past 12 months, and the results shall be kept on file by the building owner for future verification and monitoring of performance. In the event that the gain records become lost, the building owner shall re-run the acceptance tests at his sole expense at the request of the Fire Chief.

(b) Annual Tests

At least annually, the building owner shall test all active components of the Amplification 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 City. Amplifier gain shall be adjusted 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 (1) hour to verify that they will function properly during a power outage.

Additional tests or inspection of records may be conducted from time to time by the Fire Service at the discretion of the Fire Chief, after giving reasonable notice to the building owner. If communications within the building or within the Shadowed Area appear to have degraded, or if the tests show unacceptable communications performance, the owner of the building or structure is required to remedy the problem and restore the Amplification System in a manner consistent with the original acceptance criteria, unless the owner can demonstrate conclusively that the degradation is solely the result of external changes not under his or her control.

(c) Qualifications of Testing Personnel and Test (Measurement) Equipment

Tests shall be performed by or under the direct supervision of a professional engineer registered in the Province of British Columbia and qualified in radio communications. Test reports shall bear the seal of the engineer.

Portable radios used shall be a Motorola type XTS 1500/3000/5000 or XTL 5000, or such replacement radio as may be in use by Somewhere Fire at the time, provided by CREST and programmed to operate on an analogue test channel and on a digital test channel. SINAD and signal strength measurements shall be made using appropriate instrumentation acceptable to the Fire Chief. Radios and measurement equipment shall have been tested for conformance to design specifications within twelve months prior to the conduct of Amplification System acceptance tests or re-tests.

### **Exemptions**

6. This By-law shall not apply to:
- (a) any single-family detached or semi-detached residence;
  - (b) any building or structure constructed of wood frame and not metal-clad;
  - (c) any building or structure less than 500 square metres; or
  - (d) any building or structure less than 12 metres in height.

### **Permit and Occupancy Conditions**

7. No Permit or Occupancy Permit shall be issued for any building or structure until the requirements of this By-law have been met to the satisfaction of the Building Official and the Fire Chief.

### **Right of Entry**

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

## **Deemed Nuisance**

9. The construction or erection of a building or structure which interferes with the City'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 City of Somewhere. In addition to any other remedies or enforcement procedures provided herein, the City may seek an injunction to restrain such a nuisance.

## **Part 3 Offences and Penalties**

### **Offences**

10. Every person who violates any of the provisions of this By-law or who suffers or permits any act or thing to be done in contravention of this By-law or who neglects to do or refrains from doing any act or thing which violates any of the provisions of this By-law shall be liable to the penalties hereby imposed and each day that such violation is permitted to exist shall constitute a separate offence.

### **Penalties**

11. Any person who violates any of the provisions of this By-law shall upon summary conviction, be liable to a penalty of not less than \$200 and not more than \$5,000 plus the cost of the prosecution, or a term of imprisonment not exceeding thirty (30) days, or both.

## **Part 4 General Provisions**

### **Commencement**

12. This By-law shall come into force on the date of final adoption hereof.

PASSED THREE READINGS on the xxth day of xxxx, 2007.

RECONSIDERED AND FINALLY ADOPTED, signed by the Mayor and Clerk, and sealed with the Corporate Seal on the xxth day of xxxx, 2007.

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MAYOR

