



# Corporate Report

NO: R082

COUNCIL DATE: April 18, 2005

---

**REGULAR**

TO: Mayor & Council                      DATE: April  
08,  
2005

FROM: Fire Chief, Len Garis              FILE: 3900-  
01

**Superintendent  
RCMP, Fraser  
MacRae**

SUBJECT: **Bylaw to Support Public Safety Radio  
Communications**

---

## RECOMMENDATION

THAT Council direct staff to prepare necessary bylaws and/or amendments to bylaws to ensure that the construction or modification of large buildings in the City of Surrey does not result in degradation of public safety radio communications required by Fire, Police and Ambulance services in the City.

THAT upon preparation of the necessary bylaws and/or amendments to bylaws, Council consider implementing those bylaws at the earliest possible opportunity.

### BACKGROUND

From January 1997, until March 2004, radio communication for the City's Fire Service was provided by a City-owned 800 MHz mobile radio system. That system provided generally adequate "on-street" radio communication, but did not provide adequate "in-building" radio communication which is a necessity for safe and effective fire-fighting. The system used during that time was the first phase of what was intended to be a three-phase system. During the period 1998 – 2003 various options were considered to obtain the necessary "in-building" radio communication. In 2003, it was determined the most economical and effective means would be to migrate onto the E-Comm wide-area 800 MHz radio system. That migration was completed in March of 2004.

The RCMP and BC Ambulance service had previously migrated onto the E-Comm radio system to serve their radio communication needs. With the migration of Fire onto the system, all three emergency services in the City now make use of a single common radio system, and share a common concern that in-building radio communication be maintained.

As presently configured, the E-Comm wide-area radio system serves the City from seven base radio sites within the City and from additional base radio sites located in Richmond, Coquitlam, and Langley. Fire-fighters and police are very pleased that "in-building" communication now is achieved for about 97% of the City. A significant exception, however, is a critical one; in that rather poor coverage is provided within Surrey Memorial Hospital, and in particular within the lower levels of the

hospital and its parking garage. Several other buildings in north Surrey also experience poor coverage of below-ground parking areas. Emergency services all share a concern that the in-building coverage of SMH needs to be improved, and will be dealt with by a separate initiative.

## **DISCUSSION**

An 800 MHz radio system is very dependent upon a relatively unobstructed radio path between a transmitter and a receiver. The radio waves pass through wood structures with some, but relatively little, attenuation. However, radio waves are severely attenuated by metals, reinforced concrete and reflective glass. Thus, when a firefighter, police officer or ambulance attendant is required to enter a building, they are generally able to maintain radio communication with base stations outside the structure when they enter small buildings, generally of wood frame construction. However, when they are required to enter larger buildings made of steel and/or reinforced concrete, or buildings which use large areas of reflective glass, they quickly discover that the farther they go within the building the greater the likelihood they will lose communication. We say that buildings and structures of this sort are relatively "radio opaque".

For particularly large buildings (either tall or large in area), when the building obstructs the line of sight between the mobile/portable radio and the base radio site it can obstruct communication outside the building. The building becomes an impenetrable "wall" through which the radio signals cannot pass, and casts a radio shadow creating a zone of no communication behind it.

Fortunately, there are means available to overcome the radio signal attenuation of large buildings. These are known as "in-building radio support systems" and in general they consist of a small antenna mounted on the exterior or on the roof of the building, connected either to a number of small and unobtrusive antennas within the building or to a "leaky" cable within the building. In most cases amplifiers are needed between the exterior and interior antennas, although for small areas an amplifier may not be needed.

Where the building casts an exterior shadow, it may be necessary to mount an exterior antenna on the side or roof of the building facing the base station site, and another antenna or antennas on the other side of the building to "illuminate" the shadowed area.

The equipment for these in-building radio support systems is not terribly expensive. A significant part of the cost is for the installation. To retrofit an existing building can involve considerable labour, and we do not propose to require that in the bylaws.

However, the cost is minimal to install the necessary radio support equipment at the time of new construction or of major renovation. The necessary radio or fibre-optic cables can be installed along with other wiring such as for fire-alarm and security systems. Interior antennas can be mounted at the same time as smoke alarms, etc, are mounted. The amplifiers, if required, are no more bulky than, and as easy to install as, corridor emergency lighting modules. Maintenance required is similarly minimal, essentially consisting of an annual check of batteries and possible adjustment of amplifier gain, easily carried out by a trained electrician or communication technician.

For a small building, the cost of equipment and installation could be as little as \$5,000. For large buildings, the cost for equipment and installation would be higher, of course, but is not likely to exceed \$100,000 except in rare cases. In general, the cost should not exceed about 0.5% of the cost of the building.

Because of the problem already experienced with lack of acceptable in-building radio reception at Surrey Memorial Hospital, the imminent possibility of construction of several more large buildings in the same area, and the potential of further serious degradation of radio communication for emergency services, we believe the issue of provision of in-building radio support systems should be addressed as quickly as possible.

## **CONCLUSION**

From the foregoing we conclude that:

- a) In-building radio communication is essential for safe and effective fire-fighting, policing, and medical emergency services, is available now to members of those services over about 97% of the City, and Ought not to be allowed to be degraded;
- b) Buildings and structures of reinforced concrete or structural steel or using metal cladding or reflective glass, and greater than 5,000 square metres in total floor area or over 12 metres in height, and basements of more than 1,000 metres in area, present a hazard to emergency service personal by reason of their being relatively “radio opaque” and possibly degrading or eliminating radio communication between emergency personnel within or near those buildings and the base radio stations that serve them;
- c) The means exist, in the form of “in-building radio support systems” to overcome the loss of radio communication created by radio-opaque buildings;
- d) In-building radio support systems are relatively inexpensive if installed at the time of new construction or of major renovation, representing less than 0.5% of the building cost; and
- e) It is desirable that the City of Surrey require the owners of “radio opaque” buildings being constructed or largely renovated within the City to provide, install and maintain suitable in-building radio support systems, and that this requirement be established by bylaw.

Len Garis  
Fire Chief

Fraser MacRae  
Superintendent RCMP

4/18/05 11:21 AM