2021 VCC Proposal 1:

Section 918 In-Building Emergency Communications Coverage

918.1 General

For localities utilizing public safety wireless communications, dedicated infrastructure to accommodate and perpetuate continuous in-building emergency communication equipment to allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

Exceptions:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.
2. Buildings of Types IV and V construction without basements, that are not considered unlimited area buildings in accordance with Section 507.
3. Above grade single story buildings of less than 20,000 square feet (1858 m2).
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof does not impede emergency communication signals.
6. ~~Buildings in localities that do not provide the additional communication equipment required for the operation of the system.~~

918.1.1 Installation

Where provided, in—building, two-way emergency responder communication coverage system shall be designed, installed and tested in accordance with section 510.4 and 510.5 of the International Fire Code. ~~The building owner shall install radiating cable, such as coaxial cable or equivalent. The radiating cable shall be installed in dedicated conduits, raceways, plenums, attics, or roofs, compatible for these specific installations as well as other applicable provisions of this code. The locality shall be responsible for the installation of any additional communication equipment required for the operation of the system.~~

~~**918.1.2 Operations**~~

~~The locality will assume all responsibilities for the operation and maintenance of the emergency communication equipment. The building owner shall provide sufficient operational space within the building to allow the locality access to and the ability to operate in-building emergency communication equipment.~~

918.1.3 Inspection

In accordance with Section 113.3, all installations shall be inspected prior to concealment.

~~**918.2 Acceptance Test**~~

~~Upon completion of installation, after providing reasonable notice to the owner or their representative, emergency public safety personnel shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies in the installation of the radiating cable or operational space shall be provided in an inspection report to the owner or the owner's representative~~.

13.1. General building information that includes: property name, address, the number of floors in the building above and below grade, use and occupancy classification (for mixed uses, identify the different types of occupancies on each floor) and the estimated building population during the day, night and weekend.

13.2. Building emergency contact information that includes: a list of the building's emergency contacts including but not limited to building manager, building engineer and their respective work phone number, cell phone number and email address.

13.3. Building construction information that includes: the type of building construction including but not limited to floors, walls, columns and roof assembly.

13.4. *Exit access stairway* and *exit stairway* information that includes: number of *exit access stairways* and *exit stairways* in building; each *exit access stairway* and *exit stairway* designation and floors served; location where each *exit access stairway* and *exit stairway* discharges, *interior exit stairways* that are pressurized; *exit stairways* provided with emergency lighting; each *exit stairway* that allows reentry; *exit stairways* providing roof access; elevator information that includes: number of elevator banks, elevator bank designation, elevator car numbers and respective floors that they serve; location of elevator machine rooms, control rooms and control spaces; location of sky lobby; and location of freight elevator banks.

13.5. Building services and system information that includes: location of mechanical rooms, location of building management system, location and capacity of all fuel oil tanks, location of emergency generator and location of natural gas service.

13.6. *Fire protection system* information that includes: location of standpipes, location of fire pump room, location of fire department connections, floors protected by automatic sprinklers and location of different types of *automatic sprinkler systems* installed including but not limited to dry, wet and pre-action.

13.7. Hazardous material information that includes: location and quantity of hazardous material.

14. Work table.
15. Generator supervision devices, manual start and transfer features.
16. Public address system, where specifically required by other sections of this code.
17. Elevator fire recall switch in accordance with **ASME A17.1/CSA B44**.
18. Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.

508.1.7 Fire command center identification. The *fire command center* shall be identified by a permanent, easily visible sign stating "FIRE COMMAND CENTER" located on the door to the *fire command center*.

SECTION 509
FIRE PROTECTION AND UTILITY EQUIPMENT IDENTIFICATION AND ACCESS

509.1 Identification. Fire protection equipment shall be identified in an *approved* manner. Rooms containing controls for air-conditioning systems~~, sprinkler risers and valves,~~ or ~~other fire detection, suppression or control elements~~ ***fire protection systems*** shall be identified for the use of the fire department. *Approved* signs required to identify *fire protection* ***system*** equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

509.1.1 Utility identification. Where required by the *fire code official*, gas shutoff valves, electric meters, service switches and other utility equipment shall be clearly and legibly marked to identify the unit or space that it serves. Identification shall be made in an *approved* manner, readily visible and shall be maintained.

509.2 Equipment access. *Approved* access shall be provided and maintained for all *fire protection* ***system*** equipment to permit immediate safe operation and maintenance of such equipment. Storage, trash and other materials or objects shall not be placed or kept in such a manner that would prevent such equipment from being readily accessible.

SECTION 510
EMERGENCY RESPONDER COMMUNICATION COVERAGE

510.1 Emergency responder ~~radio~~ communication coverage in new buildings. ~~New buildings shall have~~ *Approved* **in-building, two-way emergency responder communication** ~~radio~~ coverage for emergency responders **shall be provided in all new buildings. In-building, two-way emergency responder communication coverage** within the building **shall be** based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

Exceptions:

1. Where *approved* by the building official and the *fire code official*, a wired communication system in accordance with **Section 907.2.13.2** shall be permitted to be installed or maintained instead of an *approved* radio coverage system.
2. Where it is determined by the *fire code official* that the radio coverage system is not needed.
3. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the *fire code official* shall have the authority to accept an automatically activated emergency responder radio coverage system.

510.2 Emergency responder ~~radio~~ communication coverage in existing buildings. Existing buildings shall be provided with *approved* **in-building, two-way** ~~radio~~ **emergency responder** communication coverage for emergency responders as required in **Chapter 11**.

510.3 Permit required. A construction permit for the installation of or modification to **in-building, two-way** emergency responder ~~radio~~ **communication** coverage systems and related equipment is required as specified in **Section 105.6.4**. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

510.4 Technical requirements. Equipment required to provide in-building, two-way emergency responder communication coverage shall be *listed* in accordance with UL 2524. Systems, components and equipment required to provide the **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system shall comply with **Sections 510.4.1** through **510.4.2.8**.

510.4.1 Emergency responder communication ~~enhancement~~coverage system signal strength. The building shall be considered to have acceptable **in-building, two-way** emergency responder ~~communications enhancement~~**communication** system coverage **where** signal strength measurements in 95 percent of all areas **and 99 percent of areas designated as *critical areas* by the *fire code official*** on each floor of the building meet the signal strength requirements in **Sections 510.4.1.1** through **510.4.1.3**.

510.4.1.1 Minimum signal strength into the building. The minimum inbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the *fire code official*. The inbound signal level shall be **a minimun of -95dBm throughout the coverage area and** sufficient to provide not less than a Delivered Audio Quality (DAQ) of 3.0 or an equivalent Signal-to-Interference-Plus-Noise Ratio (SINR) applicable to the technology for either analog or digital signals.

510.4.1.2 Minimum signal strength out of the building. The minimum outbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the *fire code official*. The outbound signal level shall be sufficient to provide not less than a DAQ of 3.0 or an equivalent SINR applicable to the technology for either analog or digital signals.

510.4.1.3 System performance. Signal strength shall be sufficient to meet the requirements of the applications being utilized by public safety for emergency operations through the coverage area as specified by the *fire code official* in **Section 510.4.2.2**.

510.4.2 System design. The **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system shall be designed in accordance with **Sections 510.4.2.1** through **510.4.2.8** and **NFPA 1221**.

510.4.2.1 Amplification systems and components. Buildings and structures that cannot support the required level of **in-building, two-way emergency responder communication** ~~radio~~ coverage shall be equipped with systems and components to enhance the ~~public safety~~ **radio** signals and achieve the required

level of ~~radio~~ **in-building, two-way emergency responder communication** coverage specified in **Sections 510.4.1** through **510.4.1.3**. ~~Public safety communications enhancement~~ **In-building, two-way emergency responder communication** systems utilizing radio-frequency-emitting devices and cabling shall be *approved* by the *fire code official*. Prior to installation, all RF-emitting devices shall have the certification of the radio licensing authority and be suitable for public safety use.

510.4.2.2 Technical criteria. The *fire code official* shall maintain a document providing the specific technical information and requirements for the **in-building, two-way** emergency responder **communication** ~~communications~~ coverage system**.** This document shall contain, but not be limited to, the various frequencies required, the location of radio sites, the effective radiated power of radio sites, the maximum propagation delay in microseconds, the applications being used and other supporting technical information necessary for system design.

510.4.2.3 Standby power. In-building, two-way emergency responder **communication** radio coverage systems shall be provided with dedicated standby batteries or provided with 2-hour standby batteries and connected to the facility generator power system in accordance with **Section 1203.** The standby power supply shall be capable of operating the **in-building, two-way** emergency responder **communication** ~~radio~~ coverage system at 100-percent system capacity for a duration of not less than 12 hours.

510.4.2.4 Signal booster requirements. If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.
2. Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher-rated cabinet.
3. Equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.
4. Where a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to not less than 20dB greater than the system gain under all operating conditions.
5. ~~Bi-Directional Amplifiers (BDAs)~~**Active RF-emitting devices** used **for in-building, two-way** emergency responder **communication** ~~radio~~ coverage systems shall have ~~oscillation prevention~~**built-in oscillation detection and control** circuitry.
6. The installation of amplification systems or systems that operate on or provide the means to cause interference on any **in-building, two-way** emergency responder ~~radio~~ **communication** coverage ~~networks~~ **network** shall be coordinated and *approved* by the *fire code official*.

510.4.2.5 System monitoring. The **in-building, two-way** emergency responder **communication coverage** ~~radio enhancement~~ system shall be monitored by a *listed fire alarm control unit*, or where *approved* by the *fire code official*, shall sound an audible signal at a constantly attended on-site location. Automatic supervisory signals shall include the following:

1. Loss of normal AC power supply.
2. System battery charger(s) failure.
3. Malfunction of the donor antenna(s).
4. Failure of active RF-emitting device(s).
5. Low-battery capacity at 70-percent reduction of operating capacity.
6. Failure of critical system components.
7. The communications link between the *fire alarm system* and the **in-building, two-way** emergency responder ~~radio enhancement~~ **communication coverage** system.
8. **Oscillation of active RF-emitting device(s).**

510.4.2.6 Additional frequencies and change of frequencies. The **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or other radio licensing authority, or additional frequencies are made available by the FCC or other radio licensing authority.

510.4.2.7 Design documents. The *fire code official* shall have the authority to require "as-built" design documents and specifications for **in-building, two-way** emergency responder **communication** ~~communications~~ coverage systems. The documents shall be in a format acceptable to the *fire code official*.

510.4.2.8 Radio communication antenna density. Systems shall be engineered to minimize the near-far effect. ~~Radio enhancement~~ **In-building, two-way emergency responder communication coverage** system designs shall include sufficient antenna density to address reduced gain conditions.

Exception: Systems where all portable devices within the same band use active power control features.

~~**Exceptions:**~~

~~1. Class A narrow band signal booster devices with independent AGC/ALC circuits per channel.~~
~~2. Systems where all portable devices within the same band use active power control features.~~

510.5 Installation requirements. The installation of the ~~public safety radio~~ **in-building, two-way emergency responder communication** coverage system shall be in accordance with **NFPA 1221** and **Sections 510.5.2** through **510.5.5**.

510.5.1 Mounting of the donor antenna(s). To maintain proper alignment with the system designed donor site, donor antennas shall be permanently affixed on the building or where *approved*, mounted on a movable sled with a clearly visible sign stating "MOVEMENT OR REPOSITIONING OF THIS ANTENNA IS PROHIBITED WITHOUT APPROVAL FROM THE FIRE CODE OFFICIAL." The antenna installation shall be in accordance with the applicable requirements in the *International Building Code* for weather protection of the building envelope.

~~**510.5.1**~~**510.5.2 Approval prior to installation.** Amplification systems capable of operating on frequencies licensed to any public safety *agency* by the FCC or other radio licensing authority shall not be installed without prior coordination and approval of the *fire code official*.

~~**510.5.2**~~**510.5.3 Minimum qualifications of personnel.** The minimum qualifications of the system designer and lead installation personnel shall include both of the following:

1. A valid FCC-issued general radio operators license.
2. Certification of in-building system training issued by an *approved* organization or *approved* school, or a certificate issued by the manufacturer of the equipment being installed.

These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the *fire code official* is provided.

~~**510.5.3**~~**510.5.4 Acceptance test procedure.** Where an **in-building, two-way** emergency responder ~~radio~~**communication** coverage system is required, and upon completion of installation, the building *owner* shall have the radio system tested to verify that two-way coverage on each floor of the building is not less than 95 percent. The test procedure shall be conducted as follows:

1. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.
2. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the *agency* talking through the *agency*'s radio communications system or equipment *approved* by the *fire code official*.
3. Failure of more than one test area shall result in failure of the test.

4. In the event that two of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of not more than two nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 95-percent coverage requirement.

5. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public *agency*'s radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered to be a failure of that test area. Additional test locations shall not be permitted.
6. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building *owner* so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building *owner* shall be required to rerun the acceptance test to reestablish the gain values.
7. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at the time of installation and at subsequent annual inspections.
8. **Systems** ~~incorporating Class B signal booster devices or Class B broadband fiber remote devices~~ shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet (3048 mm) from the indoor antenna. The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna. With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in **Sections 510.4.1.1** and **510.4.1.2**.

~~**510.5.4**~~**510.5.5 FCC compliance.** The **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system installation and components shall comply with all applicable federal regulations including, but not limited to, **FCC 47 CFR Part 90.219**.

510.6 Maintenance. The **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system shall be maintained operational at all times in accordance with **Sections 510.6.1** through **510.6.4**.

510.6.1 Testing and proof of compliance. The *owner* of the building or *owner*'s authorized agent shall have the **in-building, two-way** emergency responder ~~radio~~ **communication** coverage system ~~shall be~~ inspected and tested annually or where structural changes occur, including additions or remodels that could materially change the original field performance tests. Testing shall consist of the following:

1. In-building coverage test as described in **Section 510.5.4**.
2. Signal boosters shall be tested to verify that the gain is the same as it was upon initial installation and acceptance or set to optimize the performance of the system.
3. Backup batteries and power supplies shall be tested under load of a period of 1 hour to verify that they will properly operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.
4. ~~Other~~**All** active components shall be checked to verify operation within the manufacturer's specifications.
5. ~~.~~

At the conclusion of the testing, a report, which shall verify compliance with **Section 510.5.4**, shall be submitted to the *fire code official*.

510.6.2 Additional frequencies. The building *owner* shall modify or expand the **in-building, two-way** emergency responder ~~**radio**~~ **communication** coverage system at his or her expense in the event frequency changes are required by the FCC or other radio licensing authority, or additional frequencies are made available by the FCC or other radio licensing authority. Prior approval of ~~a public safety radio~~**an in-building, two-way emergency responder communication** coverage system on previous frequencies does not exempt this section.

510.6.3 Nonpublic safety system. Where other nonpublic safety amplification systems installed in buildings reduce the performance or cause interference with the **in-building, two-way** emergency responder ~~communications~~ **communication** coverage system, the nonpublic safety amplification system shall be corrected or removed.

510.6.4 Field testing. *Agency* personnel shall have the right to enter onto the property at any reasonable time to conduct field testing to verify the required level of radio coverage.

Why Emergency Radio Communications Enhancement Systems (ERCES)?

NOTIFIER® by Honeywell

The Issue

Two-Way Radio Dead Spots for First Responders

In an emergency, we depend on First Responders to mitigate the problem and help survivors. These firefighters, EMTs and law enforcement officers rely on two-way radios for communications, especially in multi-story buildings when responders can be located on different floors while trying to save lives. For that reason, radio signals within buildings need to be strong to support two-way communications in an emergency situation.

Buildings can weaken the radio signals that First Responders rely on to orchestrate emergency responses, evacuations, and other life-saving protocols. Concrete, glass windows, metal structures, below-grade build outs, among others impacting radio propagation can cause emergency radio communications to become unreliable or drop altogether.

This is unfortunately a common problem. A 2017 International Association of Fire Chiefs Survey shows:

- 98.5% of Fire Departments reported dead spots in buildings due to poor radio frequency coverage
- 56% of First Responders have experienced a communications failure within a building during an emergency incident within the past 24 months

Codes require an approved level of radio coverage in a building which can be achieved by enhancing the in-building public radio frequency signal coverage with an ERCES (Emergency Radio Communications Enhancement Systems) which comprises of a BDA (Bi-Directional Amplifier) / Signal Booster and Distributed Antenna System (DAS). **But not all key stakeholders know about the code requirements and are putting First Responders at risk when buildings are not outfitted with proper radio frequency signal coverage.**

The Regulatory Response

ERCES and Code Review

This challenge was most famously evident during September of 2001 when the World Trade Center buildings were brought down in terrorist attacks. Because of this the National Institute of Standards and Technology (NIST) studied the disaster and developed recommendations to improve public safety.

The NIST WTC investigation was conducted under the authority of the National Construction Safety Act. The final 2011 NIST WTC report (http://wtc.nist.gov) published a summary of findings, including recommended revisions to current codes, standards, and practices to improve public safety.

In a key conclusion (Recommendation #22), NIST:

> *"…recommends the installation, inspection, and testing of emergency communications systems, radio communications, and associated operating protocols to ensure that the systems and protocols: (1) are effective for large- scale emergencies in buildings with challenging radio frequency propagation environments; and (2) can be used to identify, locate, and track emergency responders within indoor building environments and in the field."*

This resulted in a new section being added to the 2009 edition of the International Fire Code (IFC) that requires all buildings to have approved radio coverage for emergency responders within buildings. Approved is a defined term in the IFC which means acceptable to the *fire code official*. The 2010 edition of NFPA 72, National Fire Alarm and Signaling Code, further defined Two-Way Radio Communications Enhancement Systems requirements for technical coverage and signal strengths under Section 24.5.2*

*These requirements were then relocated from the 2016 Edition of NFPA 72 to NFPA 1221, Section 9.6.

The Result

ERCES and Code Updates

Enhancing in-building radio frequency signal coverage with an Emergency Radio Communication Enhancement System (ERCES) comprised of a BDA (Bi-Directional Amplifier) / Signal Booster and Distributed Antenna System (DAS) is now a key requirement for buildings. Most current adopted Fire and Building Codes require Emergency Responder Radio Signal strength and coverage to be measured in all new and some existing construction. ERCES are required by IBC (International Building Code), IFC and NFPA 1. These codes require ERCES to be installed, serviced and maintained in accordance with NFPA 1221 and NFPA 72. A snapshot of the current IFC and NFPA Codes include:

Conditions	NFPA 1221 Section 9.6 - 2016 Edition	IFC 510 - 2015 Edition (2018 Ed. Avail. Oct. 2017)
Antenna Malfunction	Applicable - System and BDA	Not specifically - AHJ may require
Signal Booster Failure	Yes	Yes
Low Battery 70%	Yes	Not specifically - AHJ may require
Loss of Normal A.C.	Yes	Yes
Failure of Battery Charger	Yes	Not specifically - AHJ may require
Backup Duration	12 Hours	24 Hours* (12 hours 2018 IFC)
Signal Coverage	>=95 dBm (DAQ3.0 2016 Edition) / 90% / 99%	>=95 dBm (DAQ3.0) / 95%
Monitoring / Maintenance	Yes	Yes
Battery Backup Cabinets	NEMA4	NEMA4 (NEMA3R 2018 IFC)

1. IFC Section 510 – Emergency Responder Radio Coverage

The 2018, 2015, 2012, 2009 editions dictate that all new and existing buildings shall have approved radio coverage for emergency responders. Approval is based upon the existing coverage levels of the public safety communication systems utilized by the jurisdiction and measured at the exterior of the building.

> *The 2018 edition (IFC 510.4.1)* ***requires 95% coverage of all areas on each floor of the building*** *and the same signal strength as outlined in NFPA.*

In addition, Bi-Directional Amplifier (BDA) components must be contained in a NEMA-4 type enclosure. Correlating battery backups must be contained in a NEMA 3R or higher-rated cabinet (per 2018 edition), or a NEMA 4-type cabinet. The system requires a battery backup of either 12 hours (2018 edition) or 24 hours. Under all system operating conditions, isolation must be maintained between the donor antenna and all inside antennae and be no less than 20dB greater than the system gain under all operating conditions (2018 edition). It also requires oscillation prevention circuitry for the BDA.

FCC certification is required for the BDA, whose status must be monitored by the fire alarm system with a supervised communications link.

IFC requires system designers and lead installation personnel to have both a valid FCC-issued General Radio Operators License (GROL) and to be certified in-building system training by either the equipment manufacturer or an approved organization/school. IFC also requires inspection and annual testing of ERCES, or whenever structural changes occur that could materially change the original field performance tests.

2. NFPA 1221 & 72 – National Fire Alarm and Signaling Code

NFPA 1221 Section 9.6 (2016 edition) and NFPA 72 Section 24.5.2 (2013, 2010 edition) dictates that **radio coverage shall be provided with 90% floor area in general building areas, and 99% floor area in critical areas**. Critical areas include command centers, fire pump rooms, exit stairs and passageways, elevator lobbies, standpipe cabinets, sprinkler sectionals, valve locations, and other areas specifically identified by an Authority Having Jurisdiction (AHJ).

For signal strength or quality of audio delivered, NFPA 1221 2016 Edition requires the system to provide a Minimum Delivered Audio Quality (DAQ 3.0) and NFPA 72 requires minimum inbound and outbound signal strength of -95 dBm. NFPA requires the system must be capable of all radio system frequencies assigned by AHJ.

NFPA includes system component requirements stating that signal boosters/BDA units must have FCC certification prior to installation and be compatible with both analog and digital communications simultaneously at time of installation. BDA components should be contained in NEMA-4 or 4X type enclosure(s). The system requires a battery backup of 12 hours. Isolation must be maintained between the donor antenna and all internal antennae to ensure non-interference and non-degradation of Public Safety Systems.

A dedicated annunciator panel must be housed within the emergency command center to annunciate status of any signal booster(s). The monitoring panel must provide visual and labeled indications of the following for each signal booster: (1) Normal AC power, (2) Signal booster trouble, (3) Loss of normal AC power, (4) Failure of battery charger, (5) Low-battery capacity and (6) Antenna failure. The BDA status must be monitored by the fire alarm system via a supervised communications link.

3. IBC

IBC Section 916 (2015 edition) and IBC Section 915 (2012 edition) dictate that radio coverage shall be provided in all new buildings in accordance with IFC Section 510.

4. NFPA

NFPA 1 Section 11.10 dictates in all new and existing buildings, minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ. Where required by the AHJ, two-way radio communication enhancement systems shall comply with NFPA 1221.

5. Other

Local Ordinances - Many cities and counties have additional ordinances requiring BDA systems. These ordinances are defined by the Authority Having Jurisdiction (AHJ). Specifications set by the AHJ are required and must be met.

FCC - FCC rules apply to all radio frequency (RF) emitters including BDAs. All BDAs must be FCC certified to be legally sold in the USA. Furthermore, all systems must be installed in accordance with applicable FCC rules and regulations. Similarly, in Canada Industry Canada (IC) certification is required.

The Newest Requirements

Performance Compliance – UL 2524

Product performance listings and standards were only recently introduced for ERCES. Prior to the new standards, AHJs, architects, engineers, and building owners could not be 100% certain that systems were code compliant and whether they would perform as claimed by manufacturers. Today, code regulates performance standards and listings provide all necessary parties the certainty that installed BDA systems will provide reliable communications for emergency responders.

UL 2524 for In-building 2-Way Emergency Radio Communication Enhancement systems was introduced as an Outline of Investigation (OOI) on December 21, 2017. An OOI is essentially a draft version of a product standard.

UL 2524 Timeline

- December 2017: UL 2524 published as an Outline of Investigation
- December 2017: Product testing begins
- Spring 2018: Standards Technical Panel (STP) formed for US/CAN
- June – July 2018: UL 2524 proposal balloted
- August 2018: STP meets to review negative ballots and public comments
- August – October 8: Recirculation of revisions to proposal
- October 2018: Published 1st edition on October 18th
- January 2019: 2nd edition published - Bi-National Standard

UL 2524 covers the products (e.g., repeater, transmitter, receiver, signal booster components, external filters, and battery charging components) used for ERCES/ BDA systems installed in a location to improve wireless communication at that location. It does not cover passive RF components which includes antennas, splitters, couplers, coaxial cable and connectors.

UL 2524 addresses the following areas:

- Safety (risk of fire and risk of shock) requirements – construction and testing
- Compliance with specific performance requirements in accordance with the IFC-2018 and NFPA 1221-2016 (2019)
- Reliability performance requirements applicable for life safety systems – construction and testing
- Product marking and installation documentation

Product assessment is done by an OSHA accredited, independent third-party organization and successful investigation results in product listing for the purpose.

NOTE: UL 2524 listed products and their certification information can be accessed with UL Product iQ™ https://iq.ulprospector.com/info/ by using the UL Category Control Number UTMH in the search filter.

The Impact

ERCES for AHJs, Architects, Engineers, Contractors, Building Owners

What does this mean for AHJs?

- An AHJ's fundamental requirement is to ensure the safety of the population within its jurisdiction. With national consensus model codes and installation standards that govern the installation, testing and maintenance of ERCES and UL 2524 listing for product performance in place, it is in the AHJ's best interest to implement these requirements at their local level. Not only will this serve their community and safety personnel at a higher level, it will also mitigate risk and cost of retrofits down the road for the building owners once the code and listing has been mandated locally.

What does this mean for Architects & Engineers?

- With inevitable changes to jurisdictional requirements forthcoming from AHJ's, Architects and Engineers are in a prime position to include forward thinking life-safety specifications in their design proposals. Addressing code compliant and UL 2524 listed ERCES during the design portion of a new build drives inclusion during contract and construction phases.
- Recommending ERCES during the design phase will save clients retrofit costs once the standard has been recorded
- With specific knowledge of new code and listing requirements, Architects and Engineers can position themselves as industry leaders and trusted potential partners

What does this mean for Fire Safety Engineers?

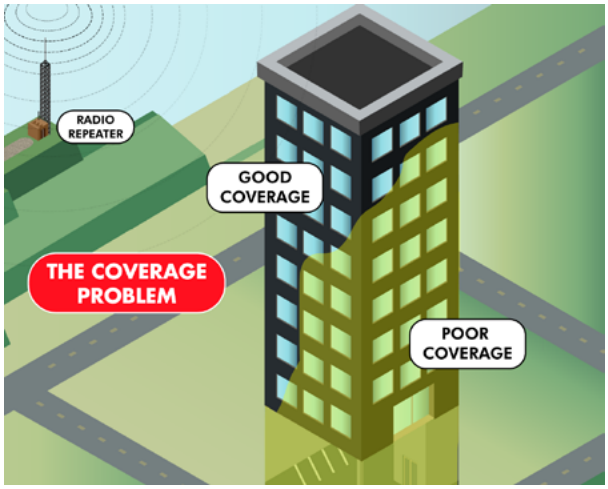
- As experts in fire safety and standards, Fire Safety Engineers are leaned upon by the design team to provide best-practice recommendations. By being aware of code changes, performance listings and their future implications, Fire Safety Engineers help mitigate risk and stay ahead of current safety standards.

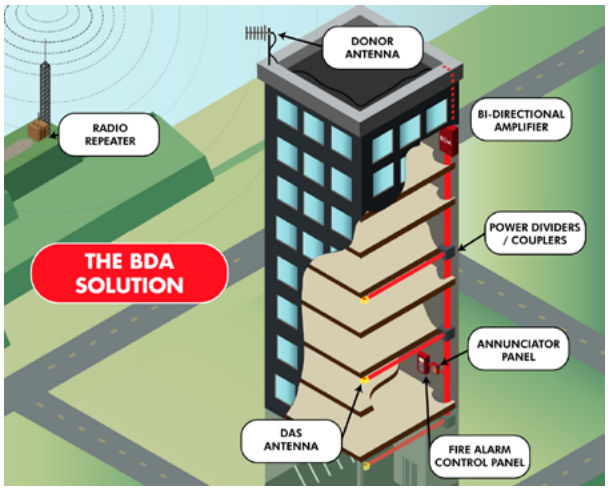
What does this mean for General and Electrical Contractors?

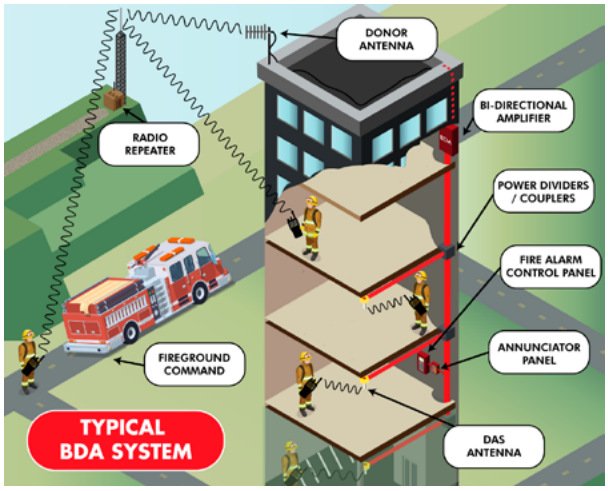
- Both General and Electrical Contractors are expected to be familiar with current code and understand how future code and product standards affect the life span of a building. Including a code compliant and UL 2524 listed ERCES system ahead of time will save construction costs, when compared to making changes in the field, or retroactively.
- By being aware of national consensus model codes and installation standards, and recent product performance listing standards and their eventual trickle down to the local level, contractors can make sure to partner with the right fire safety experts during installation.

What does this mean for Building Owners or Developers?

- Building Owners/Developers are required to build structures that are capable of meeting the mandated radio performance criteria in order to receive their certificate of occupancy (CO). By including a code-compliant and UL 2524 listed system from the earliest stages of a project, Builders/Owners can forgo unnecessary delays in tenant occupancy and fire safety upgrade costs.
- External and environmental changes can also impact the emergency radio performance throughout a building's lifetime, which would need to be amended after each year's inspection. This can be mitigated by adding a code-compliant and UL 2524 listed ERCES system during the design process.
- Safety is a significant selling point to future tenants or owners. A more sophisticated life safety system will provide not only peace-of-mind, but also minimize tenant build-out retrofit costs.







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HOUSE JOINT RESOLUTION 588

Studying the feasibility of adopting requirements within the Commonwealth of Virginia that will ensure buildings are constructed and equipped to permit effective and reliable public safety radio communications for emergency personnel operating within them.

PREFACE

During the 2003 Session of the Virginia General Assembly, the Virginia Department of Fire Programs—with assistance from the Departments of Emergency Management and Housing and Community Development—was requested in House Joint Resolution 588 (HJ 588) to study the feasibility of adopting requirements within the Commonwealth that will ensure buildings are constructed and equipped to permit effective and reliable public safety radio communications for emergency personnel operating within them.

The goals of the study included: broad stakeholder participation and input using an open process; use of a multi-agency project team; timely completion without sacrificing quality; identifying partnership opportunities for providing the Commonwealth with substantive guidance on technology/policy alternatives; and results useable for, but not constrained by, House Bill 2529 (HB 2529) directing the:

> "Board of Housing and Community Development to promulgate regulations as part of the Building Code requiring the installation in new commercial, industrial and multi-family buildings of emergency communications equipment for emergency service personnel to facilitate effective communications between emergency public safety personnel involved in emergency situations."

The *HJ 588 Task Force* created for this study includes participants from the Department of Housing and Community Development (DHCD); the State Fire Marshal's Office (within DHCD); the Virginia Department of Emergency Management; the Department of General Services; the Virginia Department of Fire Programs; the Virginia Association of Counties; telecommunications consultants and industry representatives; local fire, rescue and law enforcement personnel; local building officials; and stakeholder organizations representing builders/owners of retail and commercial office buildings, apartments, and condominiums.

Task Force staff from DHCD and the State Fire Marshal's Office includes Emory Rodgers, Charles "Ed" Altizer, and Rick Farthing. Participants from the Virginia Department of Emergency Management include Greg Britt, Tanya Brown, Parker Winborne, and Vic Buisset. Staff assigned from the Virginia Department of Fire Programs includes Adam Thiel, Aubrey W. "Buddy" Hyde, Jr., Ron Collins, Jennifer Cole, and Christy King.

The HJ 588 Task Force gratefully acknowledges the dedication and input of all study participants who volunteered their time. Many traveled great distances to participate in multiple meetings. This acknowledgement includes those organizations that volunteered staff members to participate in this endeavor. We also acknowledge the hospitality of Chesterfield Fire & EMS, the Henrico Division of Fire, and Hanover Fire & EMS for providing meeting accommodations.

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EXECUTIVE SUMMARY

During the 2003 Session of the Virginia General Assembly, the Virginia Department of Fire Programs (VDFP)—with assistance from the Department of Emergency Management and the Department of Housing and Community Development—was requested in House Joint Resolution 588 (HJ 588) to study the feasibility of adopting requirements within the Commonwealth that will ensure buildings are constructed and equipped to permit effective and reliable public safety radio communications for emergency personnel operating within them. (The full text of HJ 588 is included in this report as Appendix I.)

Resulting from this legislation, the VDFP formed the *HJ 588 Task Force* including participants from the Department of Housing and Community Development (DHCD); the State Fire Marshal's Office (within DHCD); the Virginia Department of Emergency Management; the Department of General Services; the Virginia Department of Fire Programs; the Virginia Association of Counties;[1] stakeholder organizations representing builders/owners of retail and commercial office buildings, apartments, and condominiums; telecommunications consultants and industry representatives; local fire, rescue and law enforcement personnel; and local building officials. (A complete list of participants is found in Appendix II.)

Goals for the study included: broad stakeholder participation and input using an open process; use of a multi-agency project team; timely completion without sacrificing quality; identifying partnership opportunities for providing the Commonwealth with substantive guidance on technology/policy alternatives; and results useable for, but not constrained by, House Bill 2529 (HB 2529) directing the:

> "Board of Housing and Community Development to promulgate regulations as part of the Building Code requiring the installation in new commercial, industrial and multi-family buildings of emergency communications equipment for emergency service personnel to facilitate effective communications between emergency public safety personnel involved in emergency situations." (The full text of HB 2529 is included as Appendix III of this report.)

The HJ 588 Task Force identified three principal areas affecting the feasibility of adopting requirements within the Commonwealth to ensure buildings are constructed and equipped to permit emergency public safety personnel to utilize effective and reliable radio communications while they are within buildings.

These three focus areas include: 1) policy, 2) implementation, and 3) technology.

1. **Policy** – The public policy issues associated with requiring in-building public safety radio communications solutions are complex and multi-faceted, but not insurmountable. Local governments across the United States have adopted ordinances requiring the installation of in-building public safety radio

[1] Participation was also invited from the Virginia Municipal League.

communications solutions since 1991.[2] However, Virginia would be the first state to implement such a requirement statewide.

2. **Implementation** – In Virginia, the implementation instrument for adopting such a requirement is the Uniform Statewide Building Code (USBC) development and change process. Given the relationship between the 2003 General Assembly's direction in HJ 588 and HB 2529, the Task Force spent substantial time discussing implementation issues that will be further explored in the USBC development process. In addition, DHCD and the State Fire Marshal's Office held meetings (outside the HJ 588 study) with Task Force participants to draft sample code language for emergency communications equipment in *new* buildings—this draft language is included in this report as Appendix IV.[3]

3. **Technology** – The technology behind public safety radio communications in the built environment is inherently complex and a comprehensive treatment is beyond the scope of this study. Therefore, the Task Force focused on studying the feasibility of potential technological solutions for addressing the challenge of providing effective and reliable public safety radio communications in buildings. A variety of alternatives was explored with the conclusion that no *single* technology will apply to every jurisdiction in the Commonwealth. However, a range of technology solutions is available with applicability to almost any situation in Virginia.

[2] The Jack Daniel Company (2003) http://www.rfsolutions.com/sbwp.htm

[3] It is critical to note that this *draft* language *has not* been through the prescribed USBC development/change process and is provided in this report as an exhibit only, with no warranty of Task Force, board, or agency consensus on any of its specific provisions.

SUMMARY OF KEY ISSUES	
POLICY	***New construction***—Applying in-building technology solutions to ensure effective and reliable public safety radio communications is generally less costly in new construction (or during renovations) than in existing buildings. Typically, owners and developers have more financing options for installing emergency communications equipment in new buildings or those undergoing extensive renovation. Computerized radio system models and measurement tools are available to forecast system performance with enough accuracy to effectively design in-building solutions for new construction projects.
POLICY	***Retrofitting existing buildings***—While many of the local in-building public safety radio communications ordinances adopted outside Virginia since 1991 have retrofit provisions, requiring the installation of emergency communications equipment in existing buildings could cost between 10 and 25 percent more than the cost of installing the same technology in new construction. For building owners, securing capital for retrofitting an existing building can be difficult, unless incentives are provided by public or private entities. In the event of a fire or other emergency, however, such a system could prove economically beneficial for helping reduce property damage and life loss.
POLICY	***Target hazards***—Requiring the installation/retrofit of emergency communications equipment in buildings (new and existing) with occupancies having a high potential for life loss or property damage could prove beneficial in the event of a fire or other emergency exposing the property and its occupants to harm. Retrofit provisions for specific "high-hazard" occupancy types have been previously incorporated in the USBC.
POLICY	***Funding***—The exact cost to install emergency communications equipment in buildings across Virginia is hard to define as several variables affect installation and maintenance costs. Research for this study suggests costs can range anywhere from $0.15 to $1.25 per square foot in new construction; with an additional 10 to 25 percent for retrofitting existing buildings. If required by the USBC for new construction, these costs would likely be added to initial financing arrangements and amortized over the life of the building. Securing funds to retrofit an existing building from operational cash flows could be difficult unless financial incentives are provided by public or private entities.

POLICY	***Responsibility***—The Task Force limited their scope of work, in accordance with HJ 588, by agreeing that local jurisdictions (as the federally licensed operators of public safety radio systems) are responsible for delivering adequate radio signal to the exterior of a (proposed or existing) building *before* requiring the installation of emergency communications equipment to overcome signal degradation inside the structure. The Task Force also agreed that changes to the local public safety radio system (environmental or technological) occurring after an in-building solution is accepted by authorities should not place an undue compliance burden on building owners.
POLICY	***Local government option***—The USBC can include provisions allowing local governments to "opt-in" or "opt-out" of specific code sections. An "opt-in" code section only applies to a jurisdiction if the local governing body adopts it; an "opt-out" code provision applies to a jurisdiction *unless* the local governing body chooses *not* to accept it. Given regional and local differences across Virginia, the Task Force recommended the local government option for inclusion in any USBC action on in-building public safety radio communications, but could not reach consensus for "opt-in" versus "opt-out."
IMPLEMENTATION	***Statewide code applicability***—As with any potential change to the Uniform Statewide Building Code, the principal implementation challenge facing the Board of Housing and Community Development (which promulgates the USBC) is crafting code language applicable across the entire Commonwealth.
TECHNOLOGY	***Radio spectrum availability***—A finite amount of radio spectrum is available for all uses, public and private. Public safety radio communication systems are currently restricted to certain "bands" of the spectrum as regulated by the Federal Communications Commission (FCC). While an additional band in the spectrum has recently been allocated for public safety use (700MHz), the burgeoning need for "space" on the airwaves makes fundamental change to public safety radio communications appear limited for the foreseeable future.

TECHNOLOGY	***Radio system trends***—Public safety agencies nationwide, including those in Virginia, are progressively replacing older (VHF/UHF) public safety radio systems designed in the 1970s with newer, 800MHz "trunked" systems. These systems have features allowing more efficient utilization of limited radio frequencies (assigned by the FCC) and include safety features for emergency response personnel. Most of Virginia's more populous jurisdictions have recently replaced their older (first or second generation) systems, while others are in the planning or deployment stages. While these 800MHz systems have many advantages over their predecessors, overall system performance depends on the ability of mobile and portable radios to reach fixed antenna sites over distances, through building and terrain features, and from within buildings.
TECHNOLOGY	***Radio system lifecycles***—Limited spectrum availability, coupled with the high cost and complexity of deploying a public safety radio system in a jurisdiction, markedly reduces the ability of public safety agencies to fundamentally change their basic communications technology over time. This leads to long system lifecycles as demonstrated by the fact that many of today's frontline public safety radio systems were designed and built up to 30 years ago; while newer systems (and therefore any in-building solutions designed to work with them) are projected to last many years into the future.
TECHNOLOGY	***External solutions***—A variety of devices designed for use by emergency response personnel from outside the building are currently available with promise for reducing the difficulty of providing effective and reliable public safety radio communications within buildings during emergency incidents. Since radio signals are ultimately subject only to the laws of physics, however, it seems unlikely that a completely external "solution" is on the horizon. Nonetheless, existing buildings with marginal coverage can be positively affected by externally deployed technologies and Task Force members agreed that addressing the in-building communications challenge should include the continued research, development, and testing of external radio communications adjuncts.
TECHNOLOGY	***Internal solutions***—Given the laws of physics governing radio energy, installing emergency communications equipment inside certain buildings will probably always be part of any comprehensive solution for providing effective and reliable public safety radio communications across Virginia. With the diversity of public safety radio systems around the Commonwealth, however, no *single* internal solution currently exists to guarantee effective and reliable public safety radio communications within *all* buildings. The selection, design, and installation of in-building solutions depends on a variety of factors such as construction type, architectural features, building materials, and existing public safety radio system characteristics.

TECHNOLOGY	
	The future—The continued advancement of technology will undoubtedly affect the future of public safety radio communications in buildings. Whether or not these changes improve or degrade the current situation faced by emergency response personnel in many jurisdictions remains to be seen. The basic principles governing public safety radio systems are stable enough, however, that the installation of emergency communications equipment in certain buildings to provide effective and reliable communications for emergency response personnel need not be postponed.

CHAPTER 1. INTRODUCTION

Effective and reliable radio communication is important for both public safety personnel and building occupants during emergencies. The types of incidents to which first responders are called range from domestic disputes to hostage situations; fractured limbs to cardiac arrests; and smoke alarm activations to major fires involving a hundred or more firefighters. The efficiency and effectiveness of all these operations—whether law enforcement, emergency medical, or fire department mitigated (and frequently a combination of agencies and disciplines is involved)—depend on coordinated strategy and tactics that can only be achieved with effective and reliable radio communications, both inside and outside buildings. Furthermore, when situations become extreme and threaten responders' lives, the radio serves as their lifeline to "outside" help and back-up assistance. As resolved by the Virginia General Assembly in 2003:

> "The lives of those emergency public safety personnel who respond to such emergencies, as well as the lives of those persons who may be within a building in which an emergency occurs, frequently depend solely upon the ability of those public safety personnel to communicate by radio transmissions with others who are within such buildings and others who are outside such buildings."[4]

Property owners and managers have a related interest in the efficiency and effectiveness of public safety operations conducted in their buildings. Simply stated, the sooner the suspects are apprehended, the patients are transported, and the fire is out...the sooner business returns to normal. Particularly in a fire or hazardous materials incident, the degree of property damage and life loss can depend greatly on the effectiveness of communications among emergency responders. Building owners and operators also have a vested interest in the safety of their tenants and are often willing to go the "extra mile" to provide safety features for preventing emergencies.

Emergency public safety personnel use handheld/portable radios ("walkie-talkies") as the primary form of tactical communications on incident scenes; using them for communications with both other responders and their public safety communications ("dispatch") center. First-arriving units use portable radios to describe conditions found at the scene and also to request additional assistance/back-up. As incidents increase in size and complexity, communications systems must be able to "scale-up" to handle increased message traffic. Typical, day-to-day "routine" incidents can often be managed on a single channel, but larger incidents may require several channels to allow for clear and timely exchanges of information. Separate channels may also be needed for command, tactical, and support functions.

Public safety radio systems are designed to cover a specific service area. Transmit/receive sites in a radio system are capable of putting certain amounts of radio "signal" on the ground (measured in decibels or "dBs"), where it is possible to receive and transmit signals between mobile radios, portable radios, and fixed sites. In most

[4] Source: Text – House Joint Resolution 588

modern portable radio-based public safety radio systems, the areas covered by a site for transmitting and receiving are about the same; this is known as a "balanced path" approach to system design. This essentially means that if a portable radio can "hear" the system from a given location, the system should also be able to "hear" the portable radio when it transmits; the converse of this situation is also true.

The overall amount of radio coverage provided by a system is expressed in terms of the area covered, signal strength in that area, and the reliability of the coverage.

Area covered is the geographic area where the signal strength of radio signals from a system exceeds a certain value. This value is based on two parameters – the sensitivity of the receiver in the portable radio (how well the radio can "hear"), and the amount of additional margin required in the system to overcome natural and man-made obstructions. Margins are also included which take into account how a user carries and operates a portable radio. For example, consider one radio site with an antenna on a tower, and a radio user with a portable (hand-held) radio at a location near the tower. If the user is outside the building, the system design must include enough margin to overcome any man-made or natural obstructions (e.g., terrain, foliage, buildings) that may interfere with the ability of the signal to reach the portable radio user once it has left the tower. If the portable radio user needs to operate from inside the building, the system design must also include sufficient margin to penetrate the structure.

Reliability is the statistical probability that signal strength will exceed a minimum acceptable value and is expressed in percentages. Public safety radio systems are typically designed for 95 percent signal reliability. The usual goal of a public safety radio system design is to provide signal strengths exceeding minimum acceptable values 95 percent of the time, in 95 percent of locations within the defined service area.

System designers use computer modeling to predict the radio coverage that a specific system design will provide. These sophisticated systems use digitized terrain data, digitized land use data, and radio wave propagation models.

Problem Statement

As identified in House Joint Resolution 588 (HJ 588), "reliable emergency public radio transmissions between those who are within a building and to others outside of buildings have been a significant and continuing problem for emergency public safety personnel."[5] HJ 588 also identified modern construction techniques and materials as a contributor to this life safety issue, "modern construction materials and techniques often make it more difficult for emergency public safety personnel to communicate with other persons within buildings and with other persons outside of buildings because those materials and techniques sometimes block or impede the transmission of radio signals."[6]

[5] Source: Text – House Joint Resolution 588
[6] Source: Text – House Joint Resolution 588

All radio systems have inherent limitations caused by the physics of radio waves and their propagation characteristics. These limitations are particularly salient in buildings, where modern construction materials can impede the radio signal from sender to receiver and vice versa. While a complete discussion of radio physics, signal propagation and attenuation is beyond the scope of this study, many people are familiar with wireless communications through their mobile phones, pagers, and personal digital assistants (PDAs). A "dropped call" or signal interference during a mobile telephone conversation is an inconvenience to most people. Public safety personnel can experience the same difficulties in buildings during emergency response activities—with negative impacts on their operational efficiency and effectiveness. Communications difficulties are often implicated in firefighter line-of-duty death investigations such as those listed in Appendix V of this report. (It is important to note that not all these difficulties can be attributed to radio signal attenuation in buildings; however, the recurrent theme underscores the importance of effective and reliable communications for emergency public safety personnel.) Recognizing the causal link between inadequate public safety radio communications and fatal incidents, the National Institute for Occupational Safety and Health (NIOSH) contracted for an extensive study of firefighter radio communications; the final results of which are still forthcoming.

Appendix VI provides data presented to the HJ 588 Task Force from Fairfax County highlighting several buildings with reported and tested in-building public safety radio communications problems[7]. These data suggest the difficulty of providing effective and reliable public safety radio communications in buildings is not confined to any particular construction or occupancy type.

Appendix VII and Appendix VIII provide anecdotal descriptions of in-building public safety radio communications difficulties from the Tidewater area and Fairfax County, respectively.

Study Methodology

The HJ 588 Task Force convened its first official meeting on March 26, 2003. (Many of the participants were previously involved in a Statewide Fire-Rescue Radio Communication Task Force meeting on November 7, 2002, which aimed to address fire-rescue department concerns related to the planning and deployment of new two-way radio communications systems.)

During the March 26, 2003 meeting the Task Force identified three principal areas of consideration and outlined some general goals for the study.

The three broad areas for study included: 1) policy, 2) implementation, and 3) technology. General goals included broad stakeholder participation and input using an

[7] These data are not all-inclusive and represent only a sample of these buildings within Fairfax County where problems with effective and reliable public safety radio communications have been identified.

open process; use of a multi-agency project team; timely completion without sacrificing quality; identifying partnership opportunities for providing the Commonwealth with substantive guidance on technology/policy alternatives; and results useable for, but not constrained by, House Bill 2529 (HB 2529) directing the:

> "Board of Housing and Community Development to promulgate regulations as part of the Building Code requiring the installation in new commercial, industrial and multi-family buildings of emergency communications equipment for emergency service personnel to facilitate effective communications between emergency public safety personnel involved in emergency situations."

The HJ 588 Task Force met five times to discuss and policy, implementation, and technology considerations affecting the feasibility of adopting requirements to ensure buildings are constructed and equipped to permit effective and reliable in-building radio communications for emergency public safety personnel. Several members of the task force additionally participated in code discussions relating to House Bill 2529.

It is essential to note that every HJ 588 Task Force meeting was an open meeting, participants were continually encouraged to bring other interested parties to the meetings, and to contribute any information they felt important for inclusion in the study.[8] Staff working on HJ 588 also conducted an extensive literature review and repeatedly asked participants to provide any essential, relevant literature.

Table 1. Study Chronology

Chronology	
August 15, 2002	The Virginia Fire Services Board Committee on Fire Prevention and Control was approached regarding the issue of 800MHz radio system difficulties in buildings. At the request of the Virginia Fire Services Board, the Virginia Department of Fire Programs began coordinating (in cooperation with the Virginia State Fire Marshal's Office) a statewide task force to address fire-rescue department concerns related to the planning and deployment of new two-way radio communications systems.
November 7, 2002	After 2 months of collecting information on coverage concerns and potential solutions from departments with radio systems (800 MHz and otherwise) deployed within the last five years, the Virginia Department of Fire Programs and the Virginia State Fire Marshal's Office host an Statewide Fire-Rescue Radio Communication Task Force.

[8] Participation was also invited from the Virginia Municipal League.

January 8, 2003	Delegate Vincent F. Callahan, Jr. introduced House Joint Resolution 588 – *Reliable radio communications for emergency public safety personnel. Requesting the Virginia Department of Fire Programs to study the feasibility of adopting requirements within the Commonwealth that will ensure that buildings are constructed and equipped in such a way that will permit emergency public safety personnel to utilize effective and reliable radio communications while they are within buildings. The Department of Fire Programs shall complete its work by December 1, 2003, and shall submit an executive summary and report of its written findings and recommendations to the Governor and the 2004 Session of the General Assembly.*
January 8, 2003	Delegate James F. Almand introduced House Bill 2529 - *Uniform Statewide Building Code; installation of communication equipment for emergency public safety personnel. Requires the Board of Housing and Community Development to promulgate regulations as part of the Building Code requiring the installation in new commercial, industrial and multi-family buildings of emergency communications equipment for emergency service personnel to facilitate effective communication between emergency public safety personnel involved in emergency situations. The bill defines emergency communications equipment and emergency public safety personnel.*
January 30, 2003	The Virginia House of Delegates passed HJ 588 (97-Y 0-N).
February 4, 2003	The Virginia House of Delegates passed HB 2529 (100-Y 0-N).
February 13, 2003	The Senate of Virginia passed HJ 588 (40-Y 0-N).
February 17, 2003	The Senate of Virginia passed HB 2529 (37-Y 0-N).
February 21, 2003	HB 2529 bill text as passed by House and Senate.
February 22, 2003	HJ 588 bill text as passed by House and Senate.
March 26, 2003	HJ 588 Task Force held its initial meeting to begin exploring issues and reliable radio communications for emergency public safety personnel and identified three general topic areas: policy, implementation, and technology.

April 21, 2003	HJ 588 Task Force met to further define issues within the three broad topic areas.
July 28, 2003	HJ 588 Task Force met to detail and discuss issues relating to any potential code change relating to in-building radio coverage in new construction and to discuss issues relating to the three broad themes of HJ 588 – policy, implementation, and technology.
September 8, 2003	HJ 588 Task Force met to discuss further issues around any proposed code change and to identify steps to move forward.
October 16, 2003	HJ 588 Task Force held its final meeting to discuss potential costs associated with implementing types of in-building solutions and to discuss the retrofit policy issue.

What Others Have Done

Since 1991, local ordinances in communities across the United States have addressed in-building public safety radio communications. Many cities and counties are supplying a remedy to reliable in-building radio coverage issues by passing ordinances requiring certain structures to have provisions to provide internal radio communications for the purpose of public safety communications. Examples include:

Table 2. What Others Have Done[9]

What Others Have Done	
Burbank, California	No person shall maintain, own, erect, or construct any building or structure or any part thereof or cause the same to be done which fails to support adequate radio coverage for City emergency service workers, including but not limited to firefighters and police officers. **NOTE**: This is the earliest known example of such a local ordinance. effective 9/21/91.
Fort Lauderdale, Florida	Requirements of a Radio Signal Booster System which will correct for a reduction in the radio signal to a level below that required amount to assure the 95% coverage reliability needed for public safety communications caused by a new building development.

[9] The Jack Daniel Company (2003) www.rfsolutions.com/sbwp

Broomfield, Colorado	To provide minimum standards to insure a reasonable degree of reliability for emergency services communication from within certain buildings and structures within the city to and from emergency communication centers. It is the responsibility of the emergency service provider to receive the signal to and from the building structure.
Sparks, Nevada	No person shall maintain, own, erect, or construct any building or structure or any part thereof or cause the same to be done which fails to support adequate radio coverage for City emergency service workers, including but not limited to firefighters and police officers.
Grapevine, Texas	No person shall maintain, own, erect, or construct any building or structure or any part thereof or cause the same to be done which fails to support adequate radio coverage for City emergency service workers, including but not limited to firefighters and police officers.
Hampshire, Illinois	Fire Protection District – Establishing requirements for fire communications enhancement systems.
Tempe, Arizona	To provide minimum standards to insure a reasonable degree of reliability for emergency services communications from within certain buildings and structures within the city to and from emergency communications centers. It is the responsibility of the emergency service provider to get the signal to and from the building site.
Scottsdale, Arizona	No person shall maintain, own, erect, or construct any building or structure or any part thereof or cause the same to be done which fails to support adequate radio coverage for City emergency service workers, including but not limited to firefighters and police officers. A certificate of occupancy may not be issued for any building or structure which fails to comply with this requirement.
Ontario, California	No existing or future wireless communications facilities shall interfere with any public safety radio communications systems including, but not limited to, the 800 MHZ radio system operated by the West End Communication Authority which provides public safety communications during emergencies and natural disasters.
Ontario, California	No person shall maintain, own, erect, or construct any building or structure or any part thereof or cause the same to be done which fails to support adequate radio coverage for City emergency service workers, including but not limited to firefighters and police officers.
Roseville, California	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 the City of Roseville Radio Communications System, including but not limited to firefighters and police officers.
Folsom, California	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 Sacramento Regional Radio Communications System, including but not limited to firefighters and police officers. **NOTE:** This goes beyond the coverage requirement by defining a performance confirmation procedure; scheduled periodic verification of performance; a forward looking technical requirement that anticipates potential interaction with cellular services.
Broward County, Florida	To ensure uninterrupted operation of Broward County's public safety, law enforcement, other emergency-related and county operational telecommunications networks by making it a violation of Broward County Code of Ordinances for a property owner, lessee, licensee, contractor, or government entity not otherwise exempt by law, to erect a building or other structure, or portion thereof, or cause a building or other structure, or portion thereof, to be erected or constructed in a manner that creates interference with Broward County's public safety, law enforcement, other emergency-related and county operational telecommunications networks.
West Hartford, Connecticut	(Code change) No person shall erect, construct, change the use of, or construct an addition of more than 50% in gross floor area to any building or structure of Type I or Type II construction which exceeds 10,000 square feet in gross floor area, including any portions thereof which may be located below grade, which fails to support adequate radio coverage.
Sarpy County, Nebraska	No person shall erect, construct, remodel, renovate, 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 the Sarpy County Communications Systems (SCRCS), including but not limited to emergency service workers, firefighters and police officers.
Schaumburg, Illinois	No person shall erect, construct, maintain or modify any building or structure or any part thereof, or cause the same to be done which fails to support adequate radio coverage for village public safety services, including but not limited to police, fire, and public works departments. A certificate of occupancy may not be issued for any building or structure which fails to comply with this requirement. The frequency range which must be supported shall be 806 to 816 MHz and 856 to 866 MHz, or as otherwise established and required in writing by the

	village as being necessary for public safety purposes.
Bayside, Milwaukee County, & Ozaukee County Wisconsin	No person or organization shall maintain, own, erect, or construct any building or structure which is used for commercial, multi-family, or institutional use or any part thereof or cause the same to be done which fails to support adequate radio coverage to public safety service workers, including, but not limited to firefighters and police officers.

CHAPTER 2. POLICY

The Task Force explored several policy issues affecting the feasibility of requiring the installation of emergency communications equipment in buildings. This chapter summarizes their findings.

New Construction

Applying in-building technology solutions to ensure effective and reliable public safety radio communications is generally less costly in new construction (or during renovations) than in existing buildings. Typically, owners and developers have more financing options for installing emergency communications equipment in new buildings or those undergoing extensive renovation. Computerized radio system models and measurement tools are available to forecast system performance with enough accuracy to effectively design in-building solutions for new construction projects.

Retrofitting Existing Buildings

Retrofitting involves the addition of new equipment, which was not available at the time of initial construction, to a building to bring it up to current code requirements. Retrofit measures to address specific requirements are typically mandated by the legislature.

Table 3 is a summary of retrofit measures previously applied in the Uniform Statewide Building Code (USBC) governing:

Table 3. USBC Retrofit Applications[10]

	Retrofit Applications
Colleges and Universities	Battery-powered or AC-powered smoke detector devices installed in college and university buildings containing dormitories for sleeping purposes.
Juvenile Care Facilities	Battery-powered or AC-powered smoke detectors shall be installed and maintained in all local and regional detention homes, group homes, and other residential care facilities for children and juveniles which are operated by or under the auspices of the Virginia Department of Juvenile Justice.

[10] Uniform Statewide Building Code 2000 Edition

Deaf and Hearing Impaired	Smoke detectors providing an effective intensity of not less than 100 candela to warn deaf or hearing impaired individual shall be provided, upon request by the occupant to the landlord or proprietor, to any deaf or hearing-impaired occupant of any of the following occupancies: dormitory buildings, multiple-family dwellings, or one-family or two-family dwelling units.
Assisted Living Facilities	A fire protective signaling system and an automatic fire detection system meeting the requirements of the USBC, Volume I, 1987 Edition, Third Amendment, shall be installed in assisted living facilities.
Assisted Living Facilities	Battery or AC-powered single and multiple station smoke detectors meeting the requirements of the USBC, Volume I, 1987 Edition, Third Amendment, shall be installed in assisted living facilities.
Dwelling Units	AC-powered smoke detectors with battery backup or an equivalent device shall be required to be installed to replace a defective or inoperative battery-powered smoke detector located in dwelling units or rooming houses offering to rent overnight sleeping accommodations.
Nursing Homes and Facilities	Fire suppression systems as required by the edition of this code in effect on October 1, 1990, shall be installed in all nursing facilities licensed by the Virginia Department of Health.
Nursing Homes and Facilities	Fire alarm or fire detector systems, or both, as required by the edition of this code in effect on October 1, 1990, shall be installed in all nursing homes and nursing facilities licensed by the Virginia Department of Health.
Hospitals	Fire suppression systems shall be installed in all hospitals licensed by the Virginia Department of Health as required by the edition of this code in effect on October 1, 1995.
Hotels and Motels	Smoke detectors shall be installed in hotels and motels as required by edition VR 394-01-22, USBC, Volume II, in effect on March 1, 1990.
Hotels and Motels	An automatic sprinkler system shall be installed in hotels and motels as required by the edition of VR 394-01-22, USBC, Volume II, in effect on March 1, 1990.
Dormitories	An automatic fire suppression system shall be provided throughout all buildings having a Group R-2 fire area which are more than 75 feet or six stories above the lowest level of exit discharge and which are used, in whole or in part, as a dormitory to house students by any public or private institution of higher education.

Care Facilities	In each kitchen there shall be installed and maintained at least one approved type ABC portable fire extinguisher with a minimum rating of 2A10BC. The facility shall provide and maintain at least one battery operated, properly installed smoke detector as a minimum (i) outside each sleeping area in the vicinity of bedrooms and bedroom hallways, and (iii) on each additional floor.
Adult day care centers	Battery-powered or AC-powered smoke detector devices shall be installed in all adult day care centers licensed by the Virginia Department of Social Services.

A great deal of discussion occurred concerning retrofit and its potential impacts such as the fiscal impact to building owners, who would absorb retrofit costs, and whether incentives could be offered to ease the way for retrofit. The estimated cost to retrofit a building with an in-building solution is 10 to 25 percent over that of new construction. Therefore if in new construction the cost to provide an in-building solution is $1.00 per square foot, the cost to retrofit the same building can be estimated to range anywhere from $1.10 - $1.25 a square foot. This estimate does not take into account historic structures and instances of unique construction (e.g., cinderblock building with a plaster roof), where the retrofit cost could range even higher than 25 percent over the cost of installing a like system in a like structure.

Retrofit financing is a major concern. It was noted that once a building is constructed, retrofit costs must be funded from operational cash flows and substantial amounts of money are often difficult to absorb. As the costs associated with retrofit were of paramount concern, the Task Force entertained a great deal of discussion regarding the potential of offering tax credits or other incentives to building owners who retrofit to help absorb costs incurred.

It was also noted that the timeframe to implement and enforce a retrofit provision for installing emergency communication equipment in buildings would need to be lengthy.

Retrofit is logistically complex as many buildings, commercial office buildings, in particular, have multiple tenants. Each of these tenants has a unique set-up and diverse needs. In order to retrofit, a building owner must gain permission and coordinate with each building occupant as well as taking into account each of their security needs. Many buildings also lease their roof space to private telecommunications firms; before adding an in-building solution radio interference concerns would need to be reconciled.

Target Hazards

Requiring the installation/retrofit of emergency communications equipment in buildings (new and existing) with occupancies having a high potential for life loss or property damage could prove beneficial in the event of a fire or other emergency exposing the property and its occupants to harm. Retrofit provisions for specific "high-hazard" occupancy types have been previously incorporated in the USBC, as listed in Table 3.

Over time, various retrofit measures have been applied to structures including assisted living facilities, nursing homes, colleges and universities, juvenile care facilities, hospitals, hotels and motels, dormitories, state-regulated care facilities, and adult day care centers. The Task Force agreed that government-owned buildings, including schools, should not be exempt from any retrofit measures. There was also discussion as to whether or not buildings such as historic structures should be included in any retrofit action.

Funding

The HJ 588 Task Force spent a great deal of time discussing funding issues around the installation of emergency communications equipment in new construction, as well as for retrofitting existing buildings.

The exact cost to install emergency communications equipment in buildings across Virginia is hard to define as several variables affect installation and maintenance costs, such as labor rates, competition among qualified firms, complexity of installation for a specific building, and existing public safety radio system characteristics. Research for this study suggests costs can range anywhere from $0.15 to $1.25 per square foot in new construction;[11] with an additional 10 to 25 percent for retrofitting existing buildings (retrofitting costs for some buildings could be even higher.[12] If required by the USBC for new construction, these costs would likely be added to initial financing arrangements and amortized over the life of the building. Securing funds to retrofit an existing building from operational cash flows could be difficult unless financial incentives are provided by public or private entities. More detail on the costs of installing in-building solutions can be found in Chapter 5 of this report.

The possibility of alternate funding strategies for system installation in new or existing structures in the form of neutral host systems may exist. This potential strategy is not specific to any particular vendor or technology, but basically runs broadband services anywhere from 400 to 2.4 GHz, which essentially covers the entire spectrum of wireless applications, including public safety. The notion is that a public safety solution could "piggy-back" on the neutral host system, offering a "win-win" situation for the building owner. Currently, the market for this strategy is limited to large stadiums, shopping malls, convention centers, and coliseum type venues.

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[11] Source: rfsolutions.com and HJ 588 Task Force Meeting on October 16, 2003
[12] Source: HJ 588 Task Force Meeting on October 16, 2003

It was noted that the cost to implement a neutral host system could add approximately 25 – 50 percent to the initial costs[13] of a public safety in-building solution.

Responsibility

When looking at the potential policy implications associated with requiring in-building solutions some questions regarding responsibility were presented.

The Task Force limited their scope of work, in accordance with HJ 588, by agreeing that local jurisdictions (as the federally licensed operators of public safety radio systems) are responsible for delivering adequate radio signal to the exterior of a (proposed or existing) building *before* requiring the installation of emergency communications equipment to overcome signal degradation inside the structure.

The Task Force also agreed that changes to the local public safety radio system (environmental or technological) occurring after an in-building solution is accepted by authorities should not place an undue compliance burden on building owners.

Local Government Option - Opt-In/Opt-Out

The USBC can include provisions allowing local governments to "opt-in" or "opt-out" of specific code sections. An "opt-in" code section only applies to a jurisdiction if the local governing body adopts it; an "opt-out" code provision applies to a jurisdiction *unless* the local governing body chooses *not* to accept it. Given regional and local differences across Virginia, the Task Force recommended the local government option for inclusion in any USBC action on in-building public safety radio communications, but could not reach consensus for "opt-in" versus "opt-out."

[13] Source: HJ 588 Task Force Meeting on October 16, 2003

CHAPTER 3. IMPLEMENTATION

The implementation instrument for adopting requirements within the Commonwealth to ensure that buildings are constructed and equipped in such a way to permit emergency public safety personnel to utilize effective reliable radio communications while they are within buildings is the Virginia Uniform Statewide Building Code (USBC).

The USBC prescribes mandatory regulations for the construction of buildings and structures and their internal equipment. Buildings constructed before the 1973 adoption of the USBC must comply with the Virginia Public Building and Safety Regulations (VPBSR). However, since the adoption of the USBC, local building inspection departments have been responsible for enforcing compliance with building code requirements during construction.

During the 2003 Virginia General Assembly, Session House Bill 2529 (HB2529) was passed, which specifically requires the:

> "Board of Housing and Community Development to promulgate regulations as part of the Building Code requiring the installation in new commercial, industrial and multi-family buildings of emergency communications equipment for emergency service personnel to facilitate effective communication between emergency public safety personnel involved in emergency situations."

While this is a separate and ongoing effort from HJ 588, given the similarity between the two tasks the Virginia Department of Fire Programs, the Department of Housing and Community Development, and the State Fire Marshal's office incorporated discussions of potential code language in the work of the Task Force. In order to facilitate this process members of the HJ 588 Task Force participated in formulating this proposed code change.

Given the extensive and required process for implementing changes to the USBC, this study was limited to discussions of "potential" (draft) code language – as described in Appendix III.[14]

The following is a brief summary of the USBC code change process.

The 2003 USBC and Statewide Fire Prevention Code (SFPC) update cycles will follow the requirements established by the Administrative Processes Act (APA), which requires the Department of Housing and Community Development to publish a baseline/proposed 2003 USBC/SFPC that is reviewed and approved by the Department of Planning and Budget, the Office of the Attorney General, the Board of Housing and Community Development (BHCD) and is published in the Virginia Register. Several

[14] It is critical to note that this *draft* language *has not* been through the prescribed USBC development/change process and is provided in this report as an exhibit only, with no warranty of Task Force, board, or agency consensus on any of its specific provisions.

comment periods will be provided to allow for submission of both administrative and technical code changes. The Codes and Standards Committee of the BHCD will review all code changes and make recommendations to the full Board as to what should be included in the 2003 regulations. Once the BHCD recommends approval the final regulations go through another set of reviews by applicable state agencies, another public hearing, and an open comment period. The BHCD then approves the final recommendations, which are subject to an appeals process of 30 days. It is estimated this process would encompass the majority of 2004 and resultant changes could possibly become effective in the Spring of 2005.

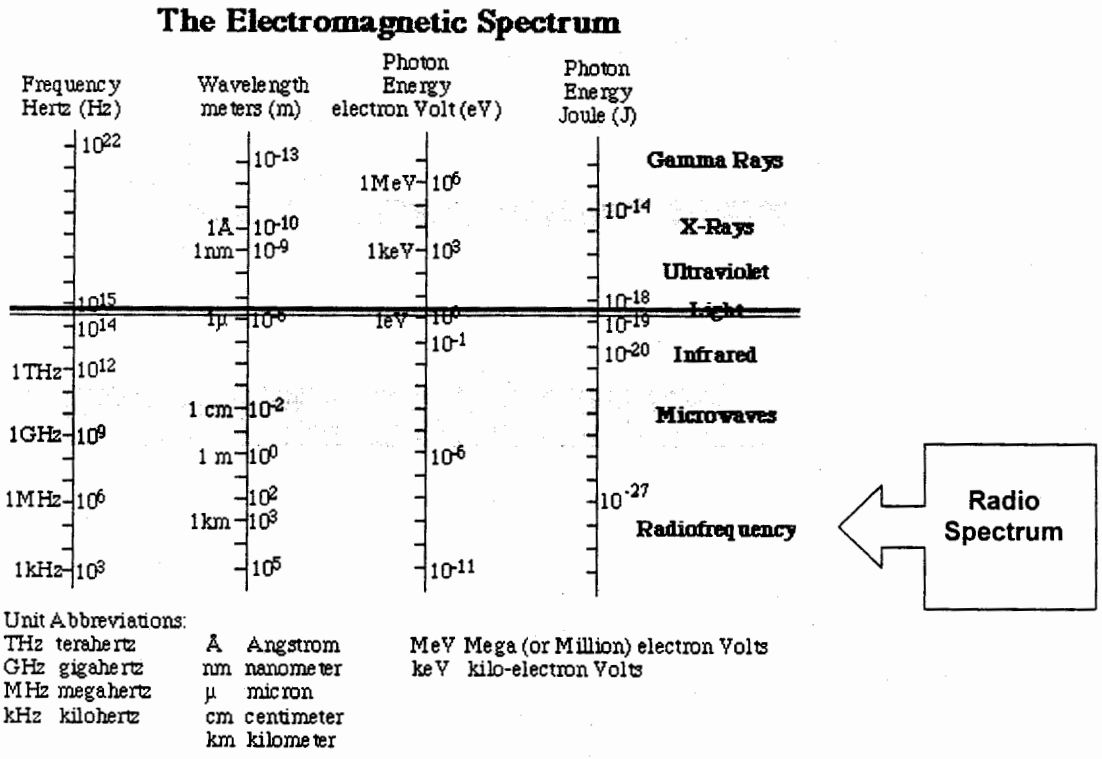
CHAPTER 4. TECHNOLOGY

A complete discussion of the underlying principles governing the design, installation, use, and benefits/limitations of public safety radio systems is beyond the scope of this report. (Several basic references are provided in the reference list at the end of the report). Therefore, this chapter relates primarily to issues identified by the HJ 588 Task Force as salient for studying the feasibility of requiring the installation of emergency communications equipment in buildings to provide effective and reliable communications for emergency public safety personnel.

Radio Spectrum Availability

A finite amount of radio spectrum (part of the overall electromagnetic spectrum that also includes visible light, infrared, x-rays, etc.) is available for all uses, public and private. Figure 1 illustrates the complete electromagnetic spectrum with the radio spectrum occupying approximately the bottom one-third of the diagram.

Figure 1. The Electromagnetic Spectrum[15]

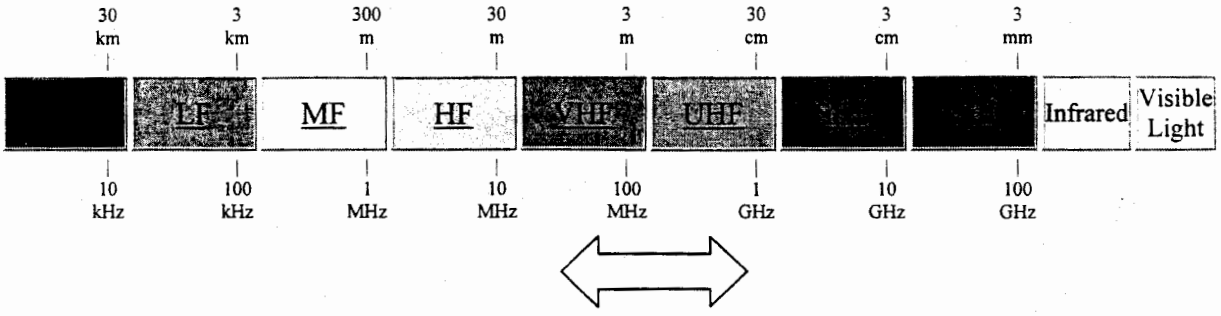


[15] National Aeronautics and Space Administration (1996) http://science.nasa.gov/newhome/help/glossfig1.htm

Within the radio spectrum, public safety radio communication systems are restricted to certain "bands" and are regulated by the Federal Communications Commission (FCC) in Title 47 of the Code of Federal Regulations (47CFR90.20). While additional spectrum has recently been allocated for public safety use (700MHz), the burgeoning need for "space" on the airwaves makes fundamental change to public safety radio communications appear limited for the foreseeable future.

Figure 2 illustrates just the radio spectrum with infrared and visible light for context at the extreme right; the arrow along the bottom approximates the range of frequencies allocated for public safety.

Figure 2. The Radio Spectrum[16]



Each band of the radio spectrum allocated for public safety use has different characteristics, as described in Table 4.

[16] Adapted from Neuhaus, John (2002) "Allocation of Radio Spectrum in the United States," http://www.jneuhaus.com/fccindex/spectrum.html#table_of_contents

Table 4. Public Safety Radio Characteristics[17]

	FREQUENCY RANGE	PROPAGATION CHARACTERISTICS	TYPICAL USAGE
VHF "Low Band"	30 MHz - 50 MHz	Low path loss, good refraction over terrain features, poor building penetration. Requires approximately 84" mobile or portable antenna for efficient transmission/reception. Compact (50") mobile antennas can be used with reduced efficiency.	Older technology that is still very effective for providing mobile coverage to large geographic areas. Vehicular repeaters operating on higher frequencies must be used if effective portable coverage is desired. Still used in Virginia by VDOT and some rural public safety agencies.
VHF "High Band"	148 MHz to 174 MHz	Somewhat higher path loss and reduced refraction over terrain features than VHF "Low Band." Requires approximately 19" mobile or portable antenna for efficient transmission/reception. Larger antennas can be used if higher gain is desired. Smaller portable antennas consist of approximately 8" of coiled spring coated with plastic to provide 19" electrical length, but are very inefficient.	Popular land mobile radio band, was used in a wide variety of public safety communications applications. Still used in many areas of the Commonwealth. Jurisdictions have left this band mostly due to congestion, lack of available frequencies, and difficulty implementing trunked radio systems here. Still used by many agencies in Virginia, including Virginia State Police.
UHF Band	450 MHz to 470 MHz	Again, higher path loss associated with higher frequencies. Poor refraction over terrain features. Requires 6" antenna for efficient transmission/reception. Larger antennas can be used if higher gain is desired.	Popular land mobile radio band, was used in a wide variety of public safety communications applications. Came into wide use in the 1970s for city and suburban county systems. Ideal for portable radio coverage in buildings. Still used in many areas of the Commonwealth. Jurisdictions have left this band mostly due to lack of new frequencies and difficulty implementing trunking systems.
UHF "T" Band	470 MHz to 512 MHz	Similar to UHF band above.	Expansion band created in major metropolitan areas. Uses spectrum shared with UHF TV channels 14-20. Usage similar to UHF band above. In Virginia, only used in metropolitan Washington, DC and Northern Virginia.
700 MHz band	764 MHz - 776 MHz 794 MHz - 806 MHz	Similar to 800 MHz band below.	New public safety spectrum taken from reallocated UHF TV channels 64-69, not available yet in most areas of the United States.
800 MHZ Band	806 MHz - 824 MHz 851 MHz - 869 MHz	Considerably higher path loss than lower frequency bands, but improved building penetration and portable radio coverage. Poor refraction over terrain features. Requires 3" mobile or portable antenna for efficient transmission/reception. Larger mobile and portable antennas are frequently used to obtain higher gain.	Very popular land mobile band in urban, suburban and suburban/rural jurisdictions. Use of trunking is mandatory, provides excellent system capacity and advanced features. Most urban, semi-urban and suburban jurisdictions use or plan to use systems in the 800 MHz band. Availability of new frequencies is limited, future use of 700 MHz will help.

Radio System Trends

Public safety agencies nationwide, including those in Virginia, are progressively replacing older (VHF/UHF) public safety radio systems designed in the 1970s with newer, 800MHz "trunked" systems. These systems have features allowing more efficient utilization of limited radio frequencies (assigned by the FCC) and include safety features for emergency response personnel. Most of Virginia's more populous jurisdictions have recently replaced their older (first or second generation) systems, while others are in the planning or deployment stages. While these 800MHz systems have many advantages over their predecessors, system performance ultimately

[17] Anderson, Jack (2003) RCC Consultants, prepared for HJ 588 Task Force.

depends on the ability of mobile and portable radios to reach fixed antenna sites over distances, through building and terrain features, and from within buildings.

Table 5 displays selected results from a statewide interoperability survey in which respondents were asked to identify the public safety radio communications frequencies currently used by systems within their jurisdiction.[18]

Table 5. Selected Public Safety Radio Bands Used in Virginia—2003

Jurisdiction	*Population*	*Low Band VHF (25 - 50 MHz)*	*High Band VHF (150 - 174 MHz)*	*UHF (406 - 512 MHz)*	*800 MHz*	*Notes*
Accomack County	38,305	EMS, Fire, Law	EMS, Fire, Law			
Albemarle County	79,236	EMS, Fire	EMS, Fire, Law	Law		800 MHz in planning stages
Amherst County	31,894				EMS, Fire, Law	
Arlington County	189,453				EMS, Fire, Law	
Botetourt County	30,496			EMS, Fire, Law		
Charlottesville, City of	45,049	Fire		Fire		800 MHz in planning stages
Chesapeake, City of	199,184				Fire	
Chesterfield County	259,903				EMS, Fire, Law	
Colonial Heights, City of	16,897				EMS, Fire	
Covington City	6,303				EMS, Fire, Law	
Danville, City of	48,411		Law			
Fairfax City	21,498				EMS, Fire, Law	
Fairfax County	969,749				EMS, Fire, Law	
Franklin County	47,286	EMS, Fire, Law				
Frederick County	59,209	EMS, Fire	EMS, Fire			
Goochland County	16,863	EMS, Fire, Law	Fire			
Hampton, City of	146,437				Law	
Hanover County	86,320				EMS, Fire, Law	
Harrisonburg, City of	40,468	Law	Law	Law		800 MHz in planning stages
Henrico County	262,300				EMS, Fire, Law	
Henry County	57,930	EMS, Fire, Law	EMS, Fire, Law	EMS, Fire, Law		
Hopewell, City of	22,354				Fire	
Madison County	12,520	EMS, Fire, Law	EMS, Fire, Law			
Norfolk, City of	234,403				Law	
Petersburg, City of	33,740		Law	Law		
Portsmouth, City of	100,565				EMS, Fire, Law	
Prince William County	280,813			Law		
Richmond County	8,809	Fire				
Roanoke, City of	94,911				Fire	
Rockbridge County	20,808			EMS, Fire, Law		
Rockingham County	67,725	EMS, Fire		EMS, Fire		800 MHz in planning stages
Smyth County	33,081	EMS, Fire, Law	EMS, Fire, Law	EMS, Fire, Law		
Spotsylvania County	90,395				EMS, Fire, Law	
Stafford County	92,446	EMS, Fire, Law	EMS, Fire, Law	EMS, Fire, Law		
Staunton, City of	23,853			EMS, Fire		
Suffolk, City of	63,677				EMS, Fire, Law	
Surry County	6,829	Law	Law			
Virginia Beach, City of	425,257				Fire	
Waynesboro City	19,520			EMS, Fire, Law		
Westmoreland County	16,718	EMS, Fire, Law		EMS, Fire, Law		
Wise County	40,123	Law	Fire, Law			
Wythe County	27,599	EMS, Fire, Law	EMS, Fire, Law			

[18] The statewide radio interoperability survey—an effort unrelated to HJ 588—from which these samples are drawn is still ongoing. To prevent duplication of effort, these preliminary and unverified results are included here to give a general impression of the current state of affairs with respect to public safety radio communications in Virginia.

Table 5 shows the trend toward combining public safety radio systems for different agencies into a single system (to promote interoperability), with 800MHz "trunked" systems the current local favorite based on frequency characteristics and availability (from the FCC). In fact, many of the above listed jurisdictions enjoy regional interoperability where portable radios from one system are programmed to operate on an adjacent system; in these cases, in-building solutions designed for one system can actually serve (without modification or additional cost) emergency public safety personnel from adjacent localities.

In jurisdictions where public safety agencies have separate systems in disparate bands, without plans to combine them, determining the system for which an in-building solution must be designed is a salient and early consideration. The Task Force agreed that, instead of requiring building owners to install emergency communications equipment to serve multiple systems at potentially 2 or 3 times the expense, any USBC action should include provisions requiring the locality to designate a single (primary) public safety radio system.

Radio System Lifecycles

Limited spectrum availability, coupled with the high cost and complexity of deploying a public safety radio system in a jurisdiction, markedly reduces the ability of public safety agencies to fundamentally change their basic communications technology over time. This leads to long system lifecycles as demonstrated by the fact that many of today's frontline public safety radio systems were designed and built up to 30 years ago; while newer systems (and therefore any in-building solutions designed to work with them) are projected to last many years into the future.

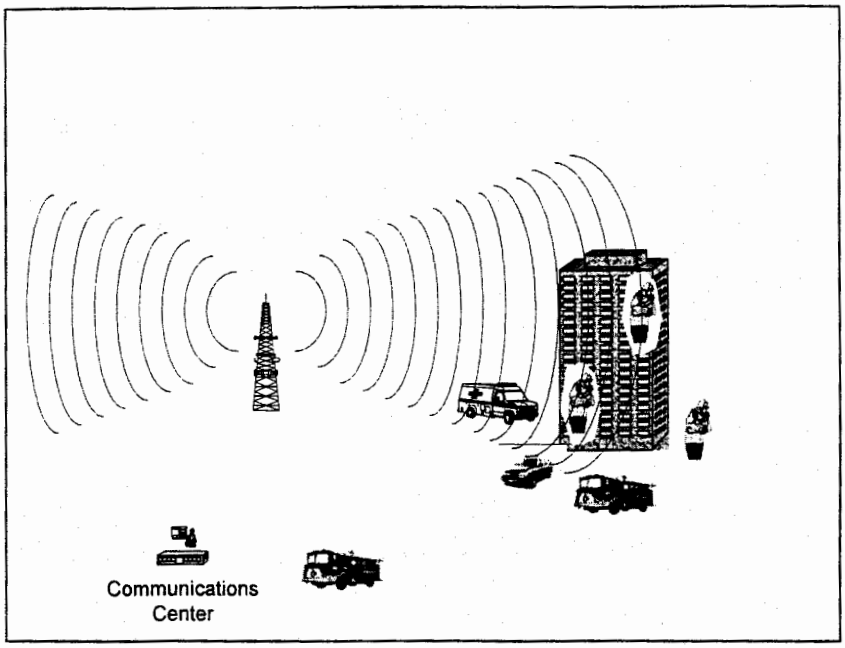
Basic Radio System Performance

Under ideal circumstances, public safety radio systems (conventional or trunked, in all bands) could penetrate all buildings using only their basic infrastructure, without assistance from internal or external adjuncts. In these cases, radio signal strength is sufficient to overcome attenuation from building materials (e.g., steel, concrete, window coatings, etc.) with enough margin to provide acceptable coverage and reliability, specifically, to allow portable radio use throughout 95 percent of the building, 95 percent of the time. (Even the most expensive radio system could not assure 100 percent coverage to all areas, at all times.) No specialized equipment or user training is required to operate within buildings, since the system functions the same inside and outside the structure.

In many buildings throughout Virginia, the local jurisdiction's basic radio system infrastructure provides adequate coverage and reliability for emergency public safety personnel to operate within while retaining the radio's safety features, the ability to communicate with other users, and the communications center ("dispatch").

The diagram in figure 3 illustrates radio system performance using only basic infrastructure.

Figure 3. Basic Radio System Performance[19]



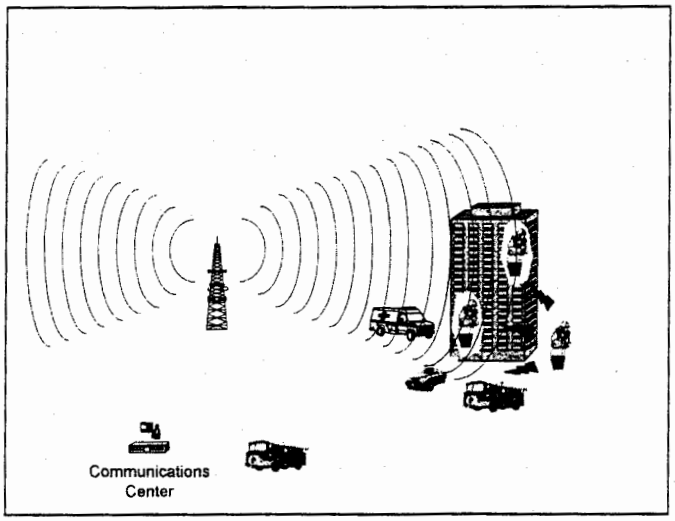
Direct/Talkaround Mode

Most public safety radio systems include a "direct" or "talkaround" mode allowing the radio user to communicate directly with other users when the basic system infrastructure cannot provide enough signal strength to "hear" the user's portable radio (and vice versa) in a given location, at a given time. (The "talkaround" term refers to talking "around" the system...which is usually designed to have all transmissions pass through an antenna/repeater site, thus ensuring message receipt by all users.) Radio functionality is markedly diminished in this mode since users lose safety features, can no longer talk with or hear their communications center, and may not be able to talk with or hear the incident commander and other units operating on the scene. Direct/talkaround mode provides only limited ability to penetrate all areas of large, dense structures and floor-to-floor communications are difficult over multiple floors.

Figure 4 illustrates the direct/talkaround mode.

[19] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

Figure 4. Radio System Performance in Direct/Talkaround Mode[20]



External Solutions

Several devices designed for use by emergency response personnel from outside the building are currently available with promise for reducing the difficulty of providing effective and reliable public safety radio communications within buildings during emergency incidents. It is important here to note the difference between inter-operability and operability. Many of the external public safety radio communications adjuncts currently being marketed are primarily for enhancing *inter*-operability between agencies; before these can work, operability inside/outside the building must still be achieved.

Since radio signals are ultimately subject only to the laws of physics, it seems unlikely that a completely external "solution" is on the horizon. Nonetheless, existing buildings with marginal coverage can be positively affected by externally deployed technologies. Task Force members agreed that addressing the in-building communications challenge should include the continued research, development, and testing of external radio communications adjuncts.

Vehicular Repeaters

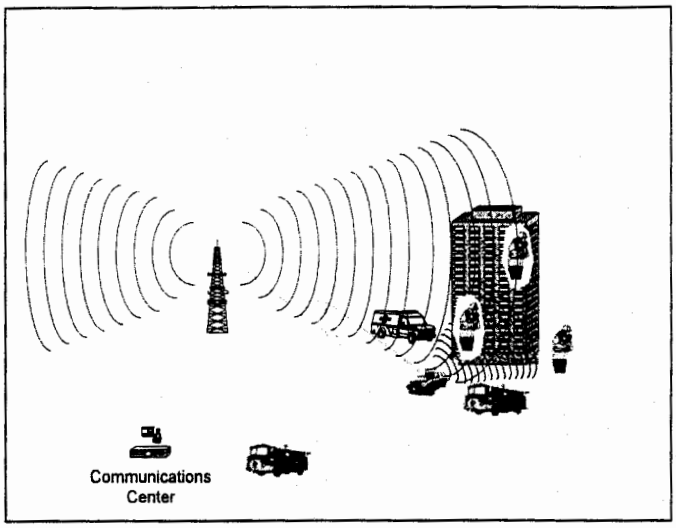
Vehicular repeaters are devices located on public safety vehicles with the ability to "boost" the signal received from either a fixed antenna site on the radio system or a portable radio located on the incident scene, thus enhancing basic system performance. The use of a vehicular repeater is more effective than direct/talkaround mode, but still provides limited ability to penetrate all areas of a structure since the active signal they produce is also subject to attenuation by

[20] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

building materials and terrain. The relative cost and complexity of these devices limits their deployment potential within a public safety vehicle fleet, meaning initial emergency response operations would need to either await the arrival of a vehicle so equipped or begin without effective and reliable communications.

Figure 5 provides an illustration of vehicular repeater performance.

Figure 5. Vehicular Repeater Performance[21]



Internal Solutions

Given the laws of physics governing radio energy, installing emergency communications equipment inside certain buildings will probably always be part of any comprehensive solution for providing effective and reliable public safety radio communications across Virginia.

With the diversity of public safety radio systems around the Commonwealth, no *single* internal solution currently exists to guarantee effective and reliable public safety radio communications within *all* buildings. A viable alternative in densely populated urban areas may not be an option for sparsely populated rural areas. Simply put, "one size does not fit all."

The selection, design, and installation of in-building solutions depends on a variety of factors such as construction type, architectural features, building materials, and existing public safety radio system characteristics. The need to proactively address these variables suggests the need for an open, interactive, and continued dialogue between local emergency response personnel, building officials, property owners and managers, architects, plan reviewers, and radio system engineers. This dialogue is critical for

[21] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

ensuring the design of any in-building solution meets the needs of the community in a cost-effective manner.

This section describes several current alternatives for providing effective and reliable public safety radio communication within buildings—without advocating for any particular vendor or system type.

Signal Boosters (BDAs)

Signal boosters, more commonly known as Bi-Directional Amplifiers (BDAs), appear the predominant in-building technology solution currently used to help remedy in-building radio coverage issues in areas served by trunked 800MHz public safety radio systems. A BDA system consists of one or more amplifiers located inside the building, an external antenna, and an internal antenna network. The external antenna, usually located on the roof of the building, receives the signal coming from the radio system antenna/tower site and brings it into the amplifier while radiating a signal back to the radio site. The internal antenna network then passes signal from the amplifier into the building, throughout all needed locations, and receives messages from portable radios being used in the building, passing them back to the amplifier, out through the external antenna, and into the public safety radio system.

Proper BDA system design is technically straightforward, but essential. Both the internal and external antenna systems are critical. Coverage requirements, interference with other equipment, interference with other radio sites, and general cost of materials needed are important design factors. It is possible for a BDA to amplify signals other than the signals desired by the application. BDAs are also capable of multi-band usage with the same antenna, but different amplifiers are needed. In the event of a fundamental change in the local public safety radio system, BDA systems would probably not require complete replacement to remain functional.

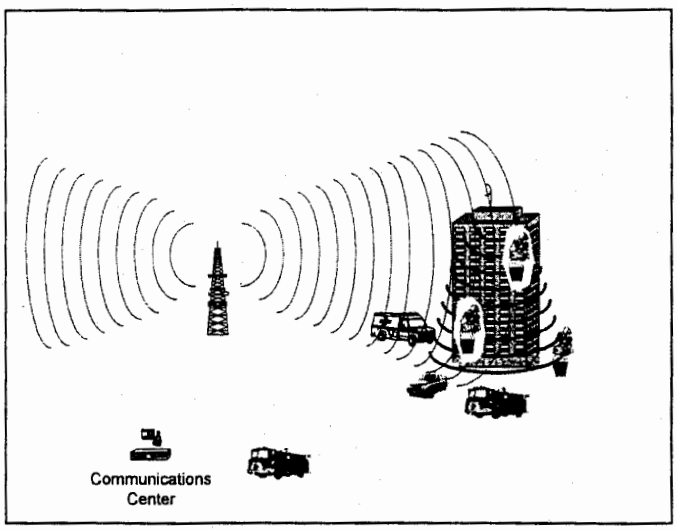
System cost factors include: design, the cost of the amplifier (usually a fixed cost), antennas, coaxial cable, fiber optic cable, splitters, labor to install the system, and annual preventive maintenance. BDA systems can be tailored to provide coverage throughout a building, or only in areas where radio coverage is marginal/non-existent.

BDAs provide a seamless link between the public safety radio system infrastructure and the distributed antenna/cable system in a building. BDAs are fully linked with system infrastructure and provide complete control over coverage reliability (signal is propagated throughout the structure by design). It is also important to note that with a BDA system if "dead spots" are discovered after installation (or caused by renovations) complete retooling is not always necessary as the addition of more cable (an possibly an additional amplifier) can usually provide remedy.

There are no additional training considerations for emergency public safety personnel with BDA systems and all system features are available to all users.

Figure 6 illustrates the performance of an in-building system using a signal booster (BDA).

Figure 6. Signal Booster (BDA) Performance[22]



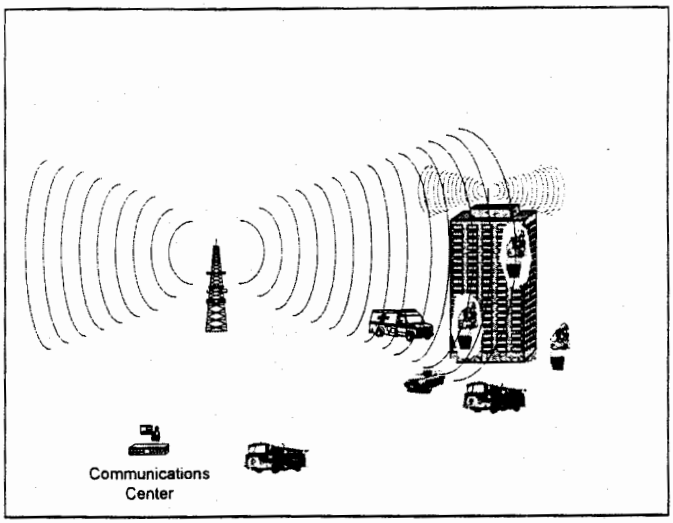
Special Repeater at Building/In-Building Portable Radios

Special repeaters at buildings, coupled with "unique" building radios passed out to emergency services personnel during an incident, can be an effective solution in rural areas with limited responses to an affected building. This requires the installation of an individual/special repeater (essentially a stand-alone radio system) with a cache of hand-held portable radios distributed on-site to emergency services personnel when they arrive at an incident. The number of portable radios required for a major incident is a limiting factor and this option also causes substantial training issues for the emergency services personnel in the locality and in surrounding localities delivering mutual-aid. Some solutions of this nature can provide a link to the public safety radio system infrastructure, but in general they provide only a limited communications capability.

Figure 7 provides an illustration of special repeater performance at a building so equipped.

[22] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

Figure 7. Special Repeater Performance[23]



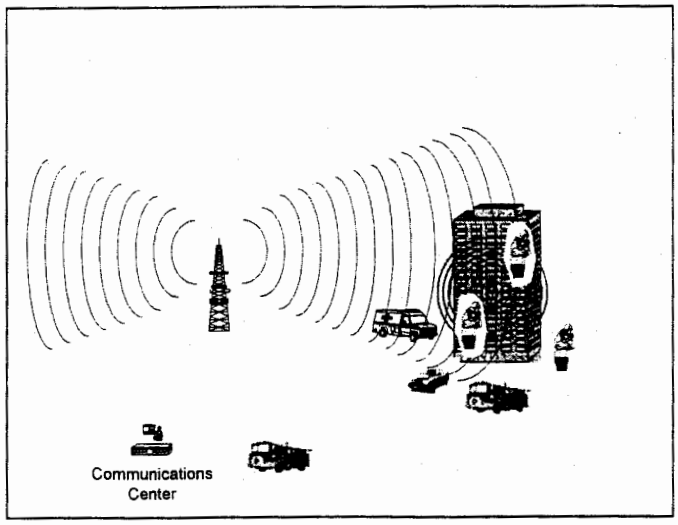
Voting Receivers Installed at Building

Voting receivers are essentially a series of repeaters feeding repeaters. Voting receivers are typically used for conventional VHF and UHF systems and require a very strong outside signal to blanket the structure; they are not a viable option for trunked radio systems in any radio band. Each individual radio channel requires a receiver and therefore multiple receivers may be necessary to cover all areas of the structure. Each individual receiver requires a dedicated leased telephone circuit back to the voting comparator. Voting receivers can enhance emergency communications, but require a great deal of maintenance.

Figure 8 depicts the performance of a voting receiver-based system.

[23] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

Figure 8. Voting Receiver Performance[24]



The Future

The continued advancement of technology will undoubtedly affect the future of public safety radio communications in buildings. Whether or not these changes improve or degrade the current situation faced by emergency response personnel in many jurisdictions remains to be seen. The basic principles governing public safety radio systems are stable enough, however, that the installation of emergency communications equipment in certain buildings to provide effective and reliable communications for emergency response personnel need not be postponed.

[24] Anderson, Jack (2003) RCC Consultants, presented to HJ 588 Task Force.

CHAPTER 5. COST / BENEFIT ANALYSIS

The exact cost to install emergency communications equipment in buildings across Virginia is hard to define as several variables affect installation and maintenance costs. Research for this study suggests installation costs can range anywhere from $0.15 to $1.25 per square foot in new construction;[25] with an additional 10 to 25 percent for retrofitting existing buildings.[26] (In some buildings, particularly those with historical value or housing other complex systems, retrofit costs could significantly exceed 25 percent.)[27]

This extremely wide range ($1.10) for new construction (and by extension, for retrofitting existing buildings) is attributable to several factors including variable labor costs, different installation complexities, variable building sizes, the competitive environment in a given region, and the use of building materials with a high degree of radio signal attenuation in certain structures. Over time, as more installations are completed in Virginia, it seems likely the cost range will narrow.

Table 6 on the following pages contains cost *estimates* for installing emergency communications equipment in new and existing buildings based on notional scenarios suggested by the HJ 588 Task Force. While these estimates are based on the signal booster/BDA solution described in the previous chapter, given the wide range between the "low" and "high" estimates derived in the table it seems likely that most other in-building solutions would fall somewhere within this range.

The notional building parameters (including the estimated square footage) and the average cost per square foot estimates are from the website of Saylor Publications, Inc.[28] Saylor has provided construction cost data and consulting services for over 40 years.

Table 6. Cost Estimates for Installing Emergency Communications Equipment

[25] The Jack Daniel Company (2003) www.rfsolutions.com/sbwp AND presentation by Tim Dennis, et al. to the HJ 588 Task Force on 10/16/03.
[26] Presentation by Tim Dennis, et al. to the HJ 588 Task Force on 10/16/03.
[27] Presentation by Tim Dennis, et al. to the HJ 588 Task Force on 10/16/03.
[28] Saylor Publications, Inc. (2003) www.saylor.com/lacosts/csfpage1.htm

Property Type Building Parameters	Estimated Square Footage	Average Building Cost Per Square Foot (New)	Total Building Cost (New)	Low-Range Cost for In-Building Solution (New)	Mid-Range Cost For In-Building Solution (New)	High-Range Cost for In-Building Solution (New)	Mid-Range In-Building Solution Cost as % of Total Building Cost (New)	Mid-Range Cost for In-Building Solution (Retrofit)
Apartment, 2-3 Story 2 Story, 10 Ft. Story Height	15,000	$60.21	$903,142.50	$2,250.00	$10,500.00	$18,750.00	1.2%	$12,390.00
Apartment, 4-7 Story 6 Story, 11 Ft. Story Height	65,000	$67.29	$4,373,863.00	$9,750.00	$45,500.00	$81,250.00	1.0%	$53,690.00
Apartment, 8-30 Story 15 Story, 11 Ft. Story Height	175,000	$76.29	$13,350,102.50	$26,250.00	$122,500.00	$218,750.00	0.9%	$144,550.00
Auditorium 1 Story, 35 Ft. Story Height	25,000	$119.35	$2,983,785.00	$3,750.00	$17,500.00	$31,250.00	0.6%	$20,650.00
Bank 1 Story, 14 Ft. Story Height	4,000	$114.80	$459,193.60	$600.00	$2,800.00	$5,000.00	0.6%	$3,304.00
Convenience Market 1 Story, 12 Ft. Story Height	5,000	$64.78	$323,891.00	$750.00	$3,500.00	$6,250.00	1.1%	$4,130.00
Courthouse 2 Story, 12 Ft. Story Height	40,000	$105.93	$4,237,116.00	$6,000.00	$28,000.00	$50,000.00	0.7%	$33,040.00
Day Care Center 1 Story, 10 Ft. Story Height	6,000	$70.52	$423,146.40	$900.00	$4,200.00	$7,500.00	1.0%	$4,956.00
Dormitory 3 Story, 10 Ft. Story Height	30,000	$68.42	$2,052,618.00	$4,500.00	$21,000.00	$37,500.00	1.0%	$24,780.00
Fire Station 2 Story, 14 Ft. Story Height	9,000	$90.29	$812,616.30	$1,350.00	$6,300.00	$11,250.00	0.8%	$7,434.00
Garage Parking, Above Ground 4 Story, 10 Ft. Story Height	185,000	$28.67	$5,303,617.00	$27,750.00	$129,500.00	$231,250.00	2.4%	$152,810.00
Garage Parking, Underground 10 Ft. Story Height	90,000	$37.05	$3,334,680.00	$13,500.00	$63,000.00	$112,500.00	1.9%	$74,340.00
Government Building 2 Story, 12 Ft. Story Height	25,000	$90.57	$2,264,332.50	$3,750.00	$17,500.00	$31,250.00	0.8%	$20,650.00
Hospital, General 4 Story, 15 Ft. Story Height	140,000	$182.56	$25,558,344.00	$21,000.00	$98,000.00	$175,000.00	0.4%	$115,640.00
Hotel 4-7 Story 5 Story, 10 Ft. Story Height	100,000	$99.19	$9,919,260.00	$15,000.00	$70,000.00	$125,000.00	0.7%	$82,600.00
Hotel 8-30 Story 15 Story, 10 Ft. Story Height	470,000	$107.06	$50,317,401.00	$70,500.00	$329,000.00	$587,500.00	0.7%	$388,220.00
Jail 2 Story, 12 Ft. Story Height	20,000	$140.99	$2,819,720.00	$3,000.00	$14,000.00	$25,000.00	0.5%	$16,520.00
Manufacturing, Heavy 1 Story, 20 Ft. Story Height	40,000	$74.15	$2,966,044.00	$6,000.00	$28,000.00	$50,000.00	0.9%	$33,040.00
Manufacturing, Light 1 Story, 12 Ft. Story Height	35,000	$51.68	$1,808,954.00	$5,250.00	$24,500.00	$43,750.00	1.4%	$28,910.00
Medical Office 2 Story, 10 Ft. Story Height	8,000	$133.23	$1,065,841.60	$1,200.00	$5,600.00	$10,000.00	0.5%	$6,608.00
Motel 3 Story, 9 Ft. Story Height	46,000	$75.14	$3,456,449.20	$6,900.00	$32,200.00	$57,500.00	0.9%	$37,996.00
Multiple Residence 2 Story, 9 Ft. Story Height	7,000	$75.17	$526,201.20	$1,050.00	$4,900.00	$8,750.00	0.9%	$5,782.00
Office 2-3 Story 3 Story, 12 Ft. Story Height	23,000	$79.38	$1,825,721.60	$3,450.00	$16,100.00	$28,750.00	0.9%	$18,998.00

Property Type Building Parameters	Estimated Square Footage	Average Building Cost Per Square Foot (New)	Total Building Cost (New)	Low-Range Cost for In-Building Solution (New)	Mid-Range Cost For In-Building Solution (New)	High-Range Cost for In-Building Solution (New)	Mid-Range In-Building Solution Cost as % of Total Building Cost (New)	Mid-Range Cost for In-Building Solution (Retrofit)
Office 4-7 Story 6 Story, 12 Ft. Story Height	64,000	$95.85	$6,134,304.00	$9,600.00	$44,800.00	$80,000.00	0.7%	$52,864.00
Office 8-30 Story 20 Story, 12 Ft. Story Height	135,000	$111.75	$15,086,601.00	$20,250.00	$94,500.00	$168,750.00	0.6%	$111,510.00
Restaurant 1 Story, 12 Ft. Story Height	5,000	$102.54	$512,683.50	$750.00	$3,500.00	$6,250.00	0.7%	$4,130.00
Restaurant, Fast Food 1 Story, 10 Ft. Story Height	3,000	$113.26	$339,779.40	$450.00	$2,100.00	$3,750.00	0.6%	$2,478.00
School, Elementary 1 Story, 14 Ft. Story Height	43,000	$111.42	$4,791,184.70	$6,450.00	$30,100.00	$53,750.00	0.6%	$35,518.00
School, Secondary 2 Story, 14 Ft. Story Height	100,000	$108.97	$10,897,370.00	$15,000.00	$70,000.00	$125,000.00	0.6%	$82,600.00
Shopping Center, Strip 1 Story, 10 Ft. Story Height	6,000	$82.17	$493,042.80	$900.00	$4,200.00	$7,500.00	0.9%	$4,956.00
Social Club 1 Story, 12Ft. Story Height	20,000	$72.83	$1,456,646.00	$3,000.00	$14,000.00	$25,000.00	1.0%	$16,520.00
Store, Department 2 Story, 16 Ft. Story Height	150,000	$75.16	$11,273,385.00	$22,500.00	$105,000.00	$187,500.00	0.9%	$123,900.00
Store, Discount 1 Story, 18 Ft. Story Height	80,000	$83.33	$6,666,704.00	$12,000.00	$56,000.00	$100,000.00	1.1%	$66,080.00
Store, Retail 1 Story, 14 Ft. Story Height	35,000	$65.00	$2,274,930.00	$5,250.00	$24,500.00	$43,750.00	1.1%	$28,910.00
Supermarket 1 Story, 12 Ft. Story Height	20,000	$62.03	$1,240,614.00	$3,000.00	$14,000.00	$25,000.00	1.1%	$16,520.00
Surgical Center 2 Story, 14 Ft. Story Height	10,000	$177.88	$1,778,810.00	$1,500.00	$7,000.00	$12,500.00	0.4%	$8,260.00
Theater, Movie 1 Story, 20 Ft. Story Height	16,000	$93.98	$1,503,683.20	$2,400.00	$11,200.00	$20,000.00	0.7%	$13,216.00
Warehouse 1 Story, 24 Ft. Story Height	45,000	$44.57	$2,005,753.50	$6,750.00	$31,500.00	$56,250.00	1.6%	$37,170.00

On the benefit side of the equation, installing emergency communications equipment in buildings has potential to meaningfully reduce life loss and property damage. The average fire dollar loss in a commercial building fire can reach hundreds of thousands of dollars. While the installation of in-building solutions alone will not *prevent* a fire, ensuring effective and reliable radio communications among emergency public safety personnel can increase the effectiveness of fire suppression and rescue efforts, thus reducing the risk exposure of building occupants and contents.

Further economic benefits could be realized if the investment in such a system helps prevent deaths and injuries to emergency public safety personnel while handling incidents in buildings so equipped.

GLOSSARY/DEFINITIONS

- First Responder: Fire, emergency medical personnel, law enforcement, and other identified entities who, by specialty or profession normally arrive first on the scene of an emergency incident to assess or take action to save lives, protect property, and/or mitigate the situation.[29]
- Interoperability vs. Operability – Simply stated, operability allows public safety personnel to reach other responders on the same radio system; while interoperability allows emergency responders on different radio systems to seamlessly communicate. (Interoperability solutions will not work without basic communications operability.)
- Emergency Communication Equipment: Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.
- Emergency Public Safety Personnel: Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.
- Trunking: Trunking a radio system helps with capacity issues. Trunking is used whenever a large number of mobile/hand-held radios need to share radio frequencies. In a trunked radio network, a large number of workgroups/talk groups can share fewer channels because the trunking equipment dynamically allocates an available channel when users key their radio.[30]
- Ultra High Frequency (UHF): A band of radio frequencies from 300 – 3000 MHz.
- Very High Frequency (VHF): Contains low and high band. A band of radio frequencies ranging from 30 -300. Low band is characterized as 39 -150 MHz and high band is characterized from 151 - 300 MHz.
- Voting receiver system: Is basically repeaters feeding repeaters with the strongest signal being the one transmitted. The advantage of a voting receiver system is that it is much more likely that at least one of the receivers will be able to receive the input signal[31].
- Vehicular repeater: A vehicular repeater is a mobile network repeater that provides extended network coverage and on-scene incident capability.[32]

[29] Source: Secure Virginia Panel – Radio Interoperability Working Group
[30] Source: http://www.zetron.com/pages/trunk/
[31] Source: http://www.ussc.com/~uarc/rptr.synfaq1.html
[32] Source: http://www.opensky.com/../network/vrepeater.asp

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APPENDIX I- House Joint Resolution 588

Requesting the Department of Fire Programs, with the assistance of the Department of Emergency Management and the Department of Housing and Community Development, to study the feasibility of adopting requirements within the Commonwealth to ensure that buildings are constructed and equipped in such a way that will permit emergency public safety personnel to utilize effective and reliable radio communications while they are within buildings. Report.

Agreed to by the House of Delegates, January 30, 2003
Agreed to by the Senate, February 13, 2003

WHEREAS, firefighters, emergency medical services personnel, law-enforcement officers, and other emergency public safety personnel routinely are called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes, and terrorist attacks; and

WHEREAS, responding to these emergencies frequently requires those emergency public safety personnel to enter offices, commercial facilities, apartments, condominiums, and other buildings under the most exigent and dangerous circumstances; and

WHEREAS, the lives of those emergency public safety personnel who respond to such emergencies, as well as the lives of those persons who may be within a building in which an emergency occurs, frequently depend solely upon the ability of those public safety personnel to communicate by radio transmissions with others who are within such buildings and others who are outside such buildings; and

WHEREAS, reliable emergency public radio transmissions between those who are within buildings and to others outside of buildings have been a significant and continuing problem for emergency public safety personnel; and

WHEREAS, modern construction materials and techniques often make it more difficult for emergency public safety personnel to communicate with other persons within buildings and with other persons outside of buildings because those materials and techniques sometimes block or impede the transmission of radio signals; and

WHEREAS, technology is available in the form of antennas and signal booster devices, which can be used to provide improved and reliable radio communications in buildings for emergency public safety personnel; and

WHEREAS, a number of jurisdictions elsewhere in the United States have enacted laws requiring developers and building owners to install and use antennas and signal booster devices to facilitate reliable radio communication by emergency public service personnel; and

WHEREAS, it is essential for the members of the public and for those emergency public service personnel who are required to enter into buildings during emergencies that the Commonwealth provide a means to ensure effective and reliable in-building radio communications; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Fire Programs, with the assistance of the Department of Emergency Management and the Department of Housing and Community Development, be requested to study the feasibility of adopting requirements within the Commonwealth to ensure that buildings are constructed and equipped in such a way that will permit emergency public safety personnel to utilize effective and reliable radio communications while they are within buildings.

In conducting this study, the Department of Fire Programs shall consult with and consider the views and comments from representatives of the Virginia Association of Counties, the Virginia Municipal League, and organizations representing builders and owners of apartments, condominiums, factories, and retail and commercial office buildings.

All agencies of the Commonwealth shall provide assistance to the Department of Fire Programs upon request.

The Department of Fire Programs shall complete its work by November 30, 2003, and shall submit an executive summary and report of its written findings and recommendations for publication as a document to the Governor and the 2004 Session of the General Assembly. The executive summary and report shall be submitted as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents and reports no later than the first day of the 2004 Regular Session of the General Assembly and shall be posted on the General Assembly's website.

APPENDIX II – HJ 588 Participants

Name	Representing
Duncan Abernathy	Virginia Society of the American Institute of Architects
Ed Altizer	Virginia State Fire Marshal
Jack Anderson	RCC Consultants
Matt Benedetti	Capital Strategies
Lt. R.W. Blystone	Prince George Police Department
Vic Buisset	Virginia Department of Emergency Management
Gregory Britt	Virginia Department of Emergency Management
Tanya Brown	Virginia Department of Emergency Management
Jeffrey Coffman	Fairfax County Fire & Rescue Department
Jennifer Cole	Virginia Department of Fire Programs
Ron Collins	Virginia Department of Fire Programs
Christy Cooper	Apartment and Office Building Association / Building Owners and Managers Association
Dave Dailey	Fairfax County Fire & Rescue Department
James Dawson	Chesterfield Fire & EMS
Glen Dean	State Fire Marshal's Office
Mike Deli	Fairfax County Fire & Rescue
Tim Dennis	CRE Partners
Rick Farthing	State Fire Marshal's Office
Rodney Gohn	Fairfax County Police Department
Cheri Hainer	Virginia Beach - VBCOA
Steve Hall	Chesterfield Fire & EMS
Aubrey W. "Buddy" Hyde, Jr.	Virginia Department of Fire Programs
Mark Ingrao	Apartment and Office Building Association
Norman Johnson	City of Richmond
Christy King	Virginia Department of Fire Programs
Patrick McCloud	Virginia Apartment Management Association / Richmond Apartment Management Association
Curtis McIver	Department of Housing and Community Development
Nelson Migdal	Apartment and Office Building Association
Jim Milby	Building Owners and Managers Association
Dennis Mitchell	Virginia Fire Services Board
Phillip Paquette	Virginia Fire Services Board
Darlene Pope	Apartment and Office Building Association/Building Owners and Managers Association
Todd Pugh	Henrico County General Services
Jack Proctor	Department of Housing and Community Development
Ed Rhodes	Virginia Fire Chiefs Association
Emory Rodgers	Department of Housing and Community Development
Bobby Schenk	Department of General Services – Division of Engineering and Buildings

Bill Shelton	Department of Housing and Community Development
Edwin Smith	Virginia Association of Counties / Henrico County Division of Fire
Jim Spradlin	SPRINT
Adam Thiel	Virginia Department of Fire Programs
Julie Cheyalier Walton	County of Prince George
Charles Werner	Charlottesville Fire Department
Chris Whyte	Virginia Association for Commercial Real Estate
Parker Winborne	Virginia Department of Emergency Management

APPENDIX III – House Bill 2529

VIRGINIA ACTS OF ASSEMBLY – CHAPTER

An Act to amend the Code of Virginia by adding a section numbered 36-99.6:2, relating to the Uniform Statewide Building Code; installation of communication equipment for emergency public safety personnel.

[H 2529]
Approved

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding a section numbered 36-99.6:2 as follows:

§ 36-99.6:2. Installation of in-building emergency communication equipment for emergency public safety personnel.

The Board of Housing and Community Development shall promulgate regulations as part of the Building Code requiring such new commercial, industrial, and multifamily buildings as determined by the Board be (i) designed and constructed so that emergency public safety personnel may send and receive emergency communications from within those structures or (ii) equipped with emergency communications equipment so that emergency public safety personnel may send and receive emergency communications from within those structures.

For the purposes of this section:

"Emergency communications equipment" includes, but is not limited to, two-way radio communications, signal boosters, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or any combination of the foregoing.

"Emergency public safety personnel" includes firefighters, emergency medical services personnel, law-enforcement officers, and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes, and terrorist attacks.

Legislative Information System
http://leg1.state.va.us/cgi-bin/legp504.exe?031+ful+HB2529ER 03/26/2003

APPENDIX IV – Draft Proposed USBC Code Change

HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM
(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us	Document No. _____ Committee Action: _____ BHCD Action: _____
Submitted by: DHCD	Representing: DHCD for VDFP/Client Work Group
Address: 501 2nd Street, Richmond, VA	Phone No.: 804-371-7140
Regulation Title:2003 USBC/SFPC	Section No(s): 2003 USBC/IBC 902, 912 & SFPC 511

Proposed Change: USBC IBC 902.0 Definitions

Add 902.1 Definitions.

Emergency Communication Equipment. Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel. Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

Add new section into the USBC IBC Section 912.0 In-building Emergency Communication Radio Coverage

912.1. General. The locality shall determine by a written policy that it is necessary to require an in-building emergency communication radio system to be designed and constructed so that emergency public safety personnel may send and receive emergency communications from within those structures or be equipped with emergency communication equipment so that emergency public safety personnel may send and receive emergency communications from within those structures within the locality or designated geographical areas of the locality. An in-building emergency communication equipment for emergency public safety personnel shall be provided in unlimited area buildings and buildings of Construction Types I, II, III, IV and V as regulated by the International Building Code.

Exceptions:

1. Local and state governments, federal space within private buildings and private buildings/spaces with top security clearance requirements where the building official has approved an alternate method to provide emergency communication equipment for emergency public safety personnel.
2. Where the owner provides documentation from a qualified individual approved by the building official where emergency communication equipment would not be required for two-way radio communication.
3. Above-grade single story buildings of 12,000s.f. or less.
4. USBC Group R-5 of the International Residential Code and Groups R-3 and R-4 of the International Building Code.
5. Construction Type IV and V buildings of combustible construction without basements.
6. Where the building official approves alternate technology to provide in-building emergency

communications for emergency public safety personnel.
912.1.1. Applicability. The provisions of this section shall apply to building applications filed on and after the set forth effective date of this code.
912.2. General. Where required, in-building radio coverage shall be designed, installed, inspected and tested in accordance with provisions of this section.
912.2.1. A minimum signal strength of –95dBm, as measured at the antenna terminal of the public safety portable transceiver, shall be available to receive and transmit in 95% of the area on each floor of the building from or to the designated public safety radio system. A minimum received signal strength of –95dBm, as measured at the designated radio system fixed end receiver terminal, shall result for portable radio transmissions made in 95% of the area on each floor of the building. The building official shall be permitted to accept lower minimum signal strength specifications where required for the radio system technology used in a jurisdiction.
912.2.1.1. Where bi-directional amplifier systems are installed, the proof of performance signal strength measurement for the downlink path shall be based on a control channel or traffic channel signal from the designated public safety radio system. Signal strength measurements for the uplink path shall be based on one input signal generated using a portable radio operated at the worst-case extremity of the distributed antenna system. Bi-directional amplifiers shall be maintained an out of band noise, intermodulation, and spurious emissions to desired carrier ratio of at least 35 dBc when measured against public safety system carrier signal levels.
912.2.2. The in-building emergency communication radio system shall be designed for a 95% reliability factor.
912.2.3. Where the installed in-building emergency communication radio system contains electrically powered components there shall be an independent power source to provide power for a period of twelve ours without external power input. Where a battery system is installed there shall be automatic charging in the presence of an external power input.
912.2.4. The in-building emergency communication radio system shall have the capability for self-monitoring of the emergency communication equipment. Where there is a requirement for a supervised fire alarm system the emergency communications equipment self-monitoring can be tied into the building fire alarm system. Where there is no required supervised fire alarm system, there shall be a visual/audible alarm for self-monitoring in the vicinity of the emergency communication equipment.
912.3. Acceptance test procedures. Upon completion of the installation, the performance of the in-building emergency communication radio system shall be tested to ensure that the 95% area and 95% reliability requirements are satisfied.
912.3.1. The text shall be conducted using a public safety portable radio with speaker microphone or equivalent portable radios approved by the building official.
912.3.2. Where bi-directional amplifier systems are installed, the gain value and output levels of all uplink and
downlink amplifiers shall be measured and documented, and the acceptance test results shall be kept on file with the building owner for verification each year during the annual inspection and tests.
912.3.3. A copy of the acceptance test records shall be kept on the premises and a copy shall be submitted to the fire official.
912.3.4. The acceptance tests shall be conducted and certified by a qualified individual approved by the building official.

Add new section to the SFPC 511.0. Maintenance of in-building emergency communication radio systems
511.1 General. In-building emergency communication radio systems shall be maintained in accordance with the USBC and the provisions of this section.
511.2. Annual inspection. The annual inspection shall test all components of the system, including but not limited to, amplifiers, independent power sources, antennas and wiring a minimum of once every twelve months.

511.2.1. The annual and five-year inspection tests shall be performed by the locality or by qualified individuals or agencies approved by the fire official.
.511.2.2. Amplifiers shall be tested to ensure that the gain and output levels are the same as designated on the approved acceptance test. The independent power source shall be tested under load for a period of one hour.
511.2.3. All components shall function in accordance with the manufacturer's specifications and intended purpose.
511.3. Five-year tests. No less than every five years, a radio coverage test shall be performed to ensure that the in-building emergency communication radio system meets the requirement of the original acceptance coverage test in accordance with the USBC under which the building was built. Note: The USBC requires on each floor 95% coverage and minimum signal strength of 95dBm for receiving and transmission.
511.4. Field tests. After providing reasonable notice to the owner or their representative the fire official, fire or police chief or their agents shall have the right during normal business hours to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner or the owner's representative.
511.5. A copy of the annual and five-year inspection tests shall be kept on the premises and the fire official shall retain a copy.

Supporting Statement:
IBC 902 add definitions from the Code of Virginia
IBC 912 add new section
IBC 912.1 Scope Requires localities to have systems installed in Construction Types I, II, III, IV and V unless they fall into the 6 exceptions. Offers the opportunity for the locality to opt in. Another option that will be considered concurrently is to seek legislative action amending 36-99.6.2 to allow local optional enforcement. The exceptions provide for alternate means and new technology; allows the owner to provide data to contest the requirement; and, allows for most all smaller commercial and residential buildings to be exempted. Some commenters believe the 12,000 s.f. is too low and should be raised, but a substitute number has not been proposed. The VSAIA recommends that the Scope to be limited to Construction Types I which are the larger multi-story buildings. or very large one story unlimited area buildings such as retail box stores Multi-family mid-rise buildings of 3 to 5 story buildings of Construction Types IV and V without basements would be exempted and most of the ones with basements would probably not be designated for wiring/conduits. Some want Groups E and I exempted as they are generally not considered "commercial buildings" as referenced in the law.
IBC 912.1.1 Only applicable to buildings built after the effective date of this code.
IBC 912.2 Set forth the technical, inspection and testing requirements. These are industry standards used by multiple vendors and different type systems. Localities can use lower signal strengths per 912.2.1.
912.2.3 Provides separate power source to ensure operation with loss of building power.
912.2.4 Provides self-monitoring so maintenance personnel or public safety personnel can tell system is operable.
912.3 Provides the acceptance test criteria for new installations.
SFPC 511.0 to 511.5. Provides for an annual inspection and five-year tests of the entire system to be based on the standards and USBC built under.

This code change will increase the cost of construction for those building designated to have these systems installed. Cost estimates run from a few thousand dollars to several hundreds of thousands of dollars. Based on meeting discussions not every new building designated within 912.1 would need to be wired or provide amplification equipment. To date there isn't a consensus on this code change proposal.

APPENDIX V – Line-of-Duty Death Investigations

Incident	Citation and Communications Key Issue
Wood Truss Roof Collapse Claims Two Firefighters Memphis, Tennessee Incident Date: Dec. 26, 1992	*Source: United States Fire Administration, Technical Report Series, Report 069.* *Investigated by J. Gordon Routley.* **Communications Issue:** Incident Commander was unable to communicate with companies over tactical radio.
Four Firefighters Killed, Trapped by Floor Collapse Brackenridge, Pennsylvania Incident Date: Dec. 20, 1991	*Source: United States Fire Administration, Technical Report Series, Report 061.* *Investigated by J. Gordon Routley.* **Communications Issue:** Radio system was inadequate for current needs.
Indianapolis Athletic Club Fire Indianapolis, Indiana Incident Date: Feb. 5, 1992	*Source: United States Fire Administration, Technical Report Series, Report 063.* *Investigated by Mark Chubb.* **Communications Issues:** Communications Equipment – One firefighter was seriously burned attempting to activate the emergency notification button on his portable radio. Communications Systems – Problems in communication between the Incident Commander and the Communications Center may be related to the activation of a new radio system shortly before the incident. Additional training should have been conducted.
The East Bay Hills Fire Oakland-Berkeley, California Incident Date: Oct. 19-22, 1991	*Source: United States Fire Administration, Technical Report Series, Report 060.* *Investigated by J. Gordon Routley.*

	Communications Issue: Radio channels and Communications Center overwhelmed by situation.
Floor Collapse Claims Two Firefighters Pittston, Pennsylvania Incident Date: March 15, 1993	*Source: United States Fire Administration, Technical Report Series, Report 073.* *Investigated by J. Gordon Routley.* **Communications Issue:** Radio System is inadequate for the needs of the fire department. Entry crews did not have portable radios to communicate with Incident Commander.
Structural Collapse at Residential Fire Claims Lives of Two Volunteer Fire Chiefs and Once Career Fire Fighter New Jersey Incident Date: July 4, 2002 Report Date: Aug. 19, 2003	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200232.html* **Communications Recommendation:** Establish and maintain regional mutual-aid radio channels to coordinate and communicate activities involving units from multiple jurisdictions.
Volunteer Fire Fighter Killed and Career Chief Injured During Residential House Fire Tennessee Incident Date: March 1, 2002 Report Date: Sept. 3, 2002	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200232.html* **Communications Recommendation:** Ensure that fire fighters are equipped with a radio that does not bleed over, cause interference, or lose communication under field conditions.
Career Fire Fighter Dies After Becoming Trapped by Fire In Apartment Building New Jersey Incident Date: May 9, 2002 Report Date: March 21, 2002	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200118.html* **Communications Recommendation:** Establish and maintain multiple operating frequencies for emergency services, allowing portable radios at incidents to be equipped with two frequencies, one channel for tactical messages and one channel for command.

Career Fire Fighter Dies After Falling Through the Floor Fighting a Structure Fire at a Local Residence Ohio Incident Date: March 8, 2001 Report Date: Feb. 28, 2002	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200116.html* **Communications Recommendation:** Ensure that personnel equipped with a radio, position the radio to receive and respond to radio transmissions.
Residential Fire Claims the Lives of Two Volunteer Fire Fighters and Seriously Injures an Assistant Chief Missouri Incident Date: March 18, 2001 Report Date: Nov. 20, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200115.html* **Communications Recommendation:** Provide adequate on-scene communications including fireground tactical channels.
Volunteer Fire Fighter (Lieutenant) Killed and One Fire Fighter Injured During Mobile Home Fire Pennsylvania Incident Date: Jan. 11, 2001 Report Date: Aug. 8, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200104.html* **Communications Recommendation:** Ensure that personnel equipped with a radio, position the radio to receive and respond to radio transmissions.
Roof Collapse Injures Four Career Fire Fighters at a Church Fire Arkansas Incident Date: Dec. 28, 2000 Report Date: Oct. 30, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200103.html* **Communications Recommendation:** Ensure that fire fighters are equipped with a radio that does not bleed over, cause interference, or lose communication under field conditions.
Residential House Fire Claims the Life of One Career Fire Fighter Florida Incident Date: Nov. 25, 2003	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200044.html* **Communications Recommendation:**

Report Date: Aug. 2, 2001	Consider providing all fire fighters with portable radios or integrated into their face pieces.
A Volunteer Assistant Chief Was Seriously Injured and Two Volunteer Fire Fighters Were Injured While Fighting a Townhouse Fire Delaware Incident Date: Oct. 29, 2000 Report Date: March 7, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200043.html* **Communications Recommendation:** Ensure that the assignment of a tactical channel is established by Central Dispatch prior to personnel entering a hazardous environment.
Residential Structure Fire Claims the Life of One Career Fire Fighter Alabama Incident Date: April 20, 2000 Report Date: Aug. 3, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200026.html* **Communications Recommendation:** Ensure that fireground communication is present through both the use of portable radio and face-to-face communications.
Structure Fire Claims the Lives of Three Career Fire Fighters and Three Children Iowa Incident Date: Dec. 22, 1999 Report Date: April 11, 2001	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face200004.html* **Communications Recommendation:** Ensure that fireground communication is present through both the use of portable radios and face-to-face communications.
Warehouse Fire Claims the Life of a Battalion Chief Missouri Incident Date: Dec. 18, 1999 Report Date: Nov. 6, 2002	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9948.html* **Communications Recommendation:** Ensure that fire fighters are equipped with a radio that does not bleedover, cause interference, or lose communication under field conditions.
Six Career Fire Fighters Killed in Cold-Storage and Warehouse Building Fire	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9947.html*

Massachusetts Incident Date: Dec. 3, 1999 Report Date: Sept. 27, 2000	**Communications Recommendation:** Ensure that standard operating procedures (SOPs) and equipment are adequate and sufficient to support the volume of radio traffic at multiple-alarm fires.
Two Firefighters Dies and Two are Injured in Townhouse Fire District of Columbia Incident Date: May 30, 1999 Report Date: Nov. 23, 1999	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9921.html* **Communications Recommendation:** Ensure that personnel equipped with a radio position the radio to receive and respond to radio transmissions.
Eight-Alarm Fire in a 27-Story High-Rise Apartment Building for the Elderly Nearly Claims the Life of One Fire Fighter Missouri Incident Date: Oct. 12, 1998 Report Date: Feb. 23, 199	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9826.html* **Communications Recommendation:** Ensure that procedures are established to record fireground radio communications.
Sudden Floor Collapse Claims the Lives of Two Fire Fighters and Four Are Hospitalized with Serious Burns in a Five-Alarm Fire New York Incident Date: June 5, 1998 Report Date: Nov. 30, 1998	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9817.html* **Communications Recommendation:** Ensure that communication equipment used on the fireground, e.g., handie-talkies, will remain operational in the event that one until malfunctions.
Commercial Structure Claims the Life of One Fire Fighter California Incident Date: March 8, 1998 Report Date: July 24, 1998	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9807.html* **Communications Recommendation:** Ensure sufficient personnel are available and properly functioning communications equipment are available to use to adequately support the volume of

	radio traffic at multiple-responder fire scenes.
Single-Family Dwelling Fire Claims the Lives of Two Volunteer Fire Fighters Ohio Incident Date: Feb. 5, 1998 Report Date: June 16, 1998	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9806.html* **Communications Recommendation:** Provide adequate on-scene communications including fireground tactical channels.
Floor Collapse in a Single Family Dwelling Fire Claims the Life of One Fire Fighter and Injures Another Kentucky Incident Date: Feb. 17, 1997 Report Date: April 27, 1998	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9704.html* **Communications Recommendation:** Ensure that fire fighters who enter hazardous areas, e.g., burning or suspected unsafe structures, be equipped with two-way communications with incident command.
Sudden Roof Collapse of a Burning Auto Parts Store Claims the Lives of Two Fire Fighters Virginia Incident Date: March 18, 1996 Report Date: April 27, 1998	*Source: The National Institute for Occupational Safety and Health (NIOSH)* *http://www.cdc.gov/niosh/face9617.html* **Communications Recommendation:** Fire departments should ensure that standard operating procedures and equipment are adequate and sufficient to support the volume of radio traffic at multiple-responder fire scenes.

APPENDIX VI – Fairfax County Data Sample

"Margin needed to cover 95%" indicates the amount of building penetration design margin needed to provide usable signal to 95% of the indoor test points, when ordered from lowest penetration loss to highest penetration loss.

Positive numbers in the "Min Loss" column indicate that indoor signal strength at one or more indoor test points exceed the outside average. These locations can be considered as having 0 dB penetration loss.

-34	average
-55	max
-14	min
-32	median
9	stdev

								Averages		
								91	71	48
Building / Location	**Description**	**Margin needed to cover 95%**	**Mean loss**	**Median loss**	**Min loss**	**Max loss**	**# of samples**	**Est. % covered w/ head portable**	**Est. % covered w/ SMA portable**	**Est. % covered w/ hip portable**
Tysons I Mall, Tysons	2 - 3 story large shopping mall	-39	-19	-18	9	-41	2434	86	69	48
Giant, Vienna	1 story grocery store on end of strip mall	-26	-19	-19	4	-31	404	88	29	3
Famous Dave's BBQ, Oakton	1 story restaurant on end of strip mall	-14	-6	-7	7	-21	92	100	100	91
Books A Million, Oakton	1 story strip mall storefront in middle of strip mall	-28	-19	-19	1	-34	143	97	71	20
Giant, Oakton	1 story grocery store on end of strip mall	-28	-19	-20	1	-35	621	98	69	20
Hallmark, Oakton	1 story strip mall storefront in middle of strip mall	-26	-18	-19	-4	-28	111	100	75	23
Toy Corner, Oakton	1 story strip mall storefront in middle of strip mall	-24	-14	-13	2	-27	95	100	87	53
Teacher's Store, Oakton	1 story strip mall storefront in middle of strip mall	-24	-16	-16	-4	-27	116	100	90	37
Oakmarr Rec Center, Oakton	2 story county recreation center, partial below grade	-33	-14	-12	13	-41	480	98	91	76
Oakton High School, Oakton	2 story large high school	-43	-24	-23	-1	-52	1289	98	90	76
Costco, Fair Oaks	1 story warehouse store	-26	-15	-15	8	-34	1507	100	100	100
County Radio Shop, Fairfax	1 story block/Butler service shop with offices	-36	-20	-21	5	-43	478	100	89	59
South Run Recreation Center, Pohick	2 story county recreation center, partial below grade	-32	-16	-13	3	-34	392	82	64	44
Fairfax PSCC, Annandale	First floor of 2-story 911 center, former elem. school	-33	-18	-17	3	-37	520	91	71	39
3701 S George Mason, Bailey's Crossroads	First floor of 26 story high rise apartment	-30	-23	-23	-7	-32	105	94	35	3
3701 S George Mason, Bailey's Crossroads	23rd floor of 26 story high rise apartment	*	*	*	*	*	143	100	100	99
Herndon Police HQ, Herndon	1 story brick police station and offices	-26	-15	-16	6	-35	510	100	92	49
Worldgate Garage, Herndon	Basement parking garage, at and below grade	-40	-36	-38	-5	-40	396	30	10	3
Herndon Museum, Herndon	1 story wood frame old train station	-20	-9	-8	5	-29	125	100	100	98
Herndon Municipal Center, Herndon	2 story brick and concrete office building	-23	-11	-11	4	-32	134	100	96	81
WalMart, Hybla Valley	1 story department store	-31	-21	-21	-4	-40	724	100	100	97
Mt. Vernon Hospital, Hybla Valley	First floor of six story hospital	-48	-26	-26	3	-55	516	98	91	71
Mt. Vernon Hospital, Hybla Valley	Below grade tunnel in six story hospital	-55	-45	-50	-9	-57	93	59	33	17
Mt. Vernon Hospital, Hybla Valley	Below grade tunnel and first floor, six story hospital	-53	-29	-29	3	-57	620	92	82	63
Fairfax Hospital, Merrifield	Emergency department treatment and waiting areas	-49	-38	-40	-12	-51	296	79	43	19
Fairfax Hospital, Merrifield	Radiology	-49	-37	-37	-18	-51	227	87	53	12
Fairfax Hospital, Merrifield	Women's center, neonatal 2nd floor	-46	-33	-34	-2	-51	370	95	58	27
Fairfax Hospital, Merrifield	Labor and delivery, 3rd floor	-43	-29	-29	6	-47	171	98	80	46
Fairfax Hospital, Merrifield	Original building, 2nd floor	-37	-23	-22	-8	-39	75	100	93	71
Fairfax Hospital, Merrifield	Original building, ground floor and cafeteria	-40	-23	-23	1	-47	192	99	85	67
Fairfax Hospital, Merrifield	Conference center	-25	-16	-16	1	-35	76	100	100	96
Fairfax Hospital, Merrifield	Warehouse	-45	-23	-23	7	-51	227	95	80	67
Fairfax Hospital, Merrifield	Cafeteria kitchen	-51	-44	-44	-30	-51	145	60	8	0
Fairfax Hospital, Merrifield	Linens	-51	-49	-51	-42	-51	87	8	0	0
Fairfax Hospital, Merrifield	Blood bank, oncology lower level	-51	-48	-49	-15	-51	226	27	3	1
Fairfax Hospital, Merrifield	Morgue	-37	-24	-24	-2	-51	96	99	92	65
Fairfax Hospital, Merrifield	Fire control room	-31	-20	-19	-13	-35	43	100	100	91
Fairfax Hospital, Merrifield	Critical Care Trauma	-49	-42	-43	-23	-51	180	75	15	6
Fairfax Hospital, Merrifield	CCU3	-44	-35	-35	-18	-48	62	97	56	23
Fairfax Hospital, Merrifield	Pharmacy, surgery	-46	-33	-35	-12	-51	191	93	55	34
Fairfax Hospital, Merrifield	Tower building, first floor	-37	-21	-23	2	-39	73	100	92	68

								Averages		
								91	71	48
Building / Location	Description	Margin needed to cover 95%	Mean loss	Median loss	Min loss	Max loss	# of samples	Est. % covered w/ head portable	Est. % covered w/ SMA portable	Est. % covered w/ hip portable
Fairfax Hospital, Merrifield	Pulmonary	-39	-28	-27	-5	-44	148	100	89	55
Fairfax Hospital, Merrifield	Entire visit	-51	-33	-35	7	-51	2886	83	55	34
8000 Towers Crescent Dr., Tysons	1st floor of 18 story large office building	-32	-13	-13	9	-36	235	100	93	77
Herndon Target, Herndon	1 story large department store	-33	-23	-23	3	-45	553	100	100	99
Belle Haven Marina, Belle Haven	Concrete block Natnl. Park Service Bathroom at Marina	-18	-9	-8	1	-20	43	100	72	28
Vienna PD 1st Floor, Vienna	1 story block/brick police station	-22	-14	-14	4	-24	137	100	65	20
Vienna PD Basement, Vienna	1 story block/brick police station, lower level	>=-31	-28	-31	-5	-31	120	21	8	3
Vienna PD Entire Building, Vienna	1story block/brick police station, entire visit	>=-31	-20	-19	4	-31	257	63	39	12
PJ Skidoos, Fairfax	Main floor bar/restaurant	-35	-23	-23	-3	-40	203	100	80	40
PJ Skidoos, Fairfax	Main floor bar/restaurant	>=-44	-38	-39	-3	-44	198	41	9	3
Fire Station 414, Burke	1 story block fire station w/ metal roof	-35	-25	-25	-5	-38	780	89	41	10
Centreville High School	3 story block high school - main office area	-37	-29	-31	-5	-41	122	97	38	14
Centreville High School	3 story block high school - main front corridor	-29	-20	-20	-5	-33	74	100	92	54
Centreville High School	3 story block high school - 1st fl. corridor 1A	-27	-15	-14	1	-34	39	100	97	82
Centreville High School	3 story block high school - 1st fl. corridor 1B	-30	-16	-17	1	-36	99	100	94	71
Centreville High School	3 story block high school - 1st fl. corridor 1C	-32	-17	-16	3	-38	64	98	89	66
Centreville High School	3 story block high school - 1st fl. corridor 1D	-21	-11	-10	2	-28	68	100	100	94
Centreville High School	3 story block high school - 1st fl. dining area	-23	-11	-10	4	-30	141	100	99	91
Centreville High School	3 story block high school - 1st fl. athletics area	-34	-21	-20	-1	-39	341	99	80	51
Centreville High School	3 story block high school - 1st fl. theatre/music area	-33	-22	-24	-6	-39	118	99	79	41
Centreville High School	3 story block high school - entire visit	-34	-19	-18	5	-41	1067	99	82	58
McNair Farms Elementary School	2 story new block elementary school 1st floor	-30	-16	-16	3	-34	753	97	69	42
McNair Farms Elementary School	2 story new block elementary school 2nd floor	-27	-13	-14	5	-31	229	100	84	48
McNair Farms Elementary School	2 story new block elementary school entire visit	-29	-15	-15	5	-34	982	97	73	43
Inova Urgent Care, Centreville	1 story medical facility	>=-28	-23	-24	-15	-28	189	55	2	0
Robinson High School	3 level, "super school", entire visit	-37	-24	-25	-1	-41	1727	92	57	25
Robinson High School	3 level, "super school", main hall and assoc. areas	-37	-25	-26	-1	-41	842	93	52	22
Robinson High School	3 level, "super school", north side, upper level	-32	-21	-21	-2	-37	430	100	76	38
Robinson High School	3 level, "super school", north side, lower level	-39	-28	-29	-8	-41	356	80	39	13
Robinson High School	3 level, "super school", gym and areas on south side	-32	-22	-21	-11	-34	99	100	77	32
Carson Middle School, Chantilly	2 level middle school, second floor	-19	-7	-7	13	-28	351	100	100	97
Carson Middle School, Chantilly	2 level middle school, first floor	-30	-16	-17	10	-36	670	100	96	76
Carson Middle School, Chantilly	2 level middle school, entire visit	-28	-13	-13	13	-36	1021	100	97	84
Westfields High School, Chantilly	2 level high school, first floor	-33	-22	-23	9	-35	1169	78	40	13
Westfields High School, Chantilly	2 level high school, second floor	-29	-20	-21	-1	-33	485	98	48	18
Westfields High School, Chantilly	2 level high school, entire visit	-33	-21	-22	9	-35	1654	84	42	14
Paul Springs Retirement Home, Ft. Hunt Rd.	1 - 3 story retirement home	-24	-17	-18	1	-27	428	93	23	2
5840 Cameron Run Terrace	5th floor of high rise apartment building	*	*	*	*	*	*	100	96	70
5840 Cameron Run Terrace	1st floor of high rise apartment building	-30	-24	-24	-8	-35	176	98	40	7
Chantilly Public Library	1 story public library, library (public) section	-31	-13	-12	14	-37	201	100	93	84
Chantilly Public Library	1 story public library, operations (private) section	-36	-27	-28	1	-40	275	99	61	18
Chantilly Public Library	Entire visit	-35	-21	-23	14	-40	476	99	75	46
Hayfield Secondary School	1st floor of large 2 story middle/high school complex	-43	-24	-25	12	-47	2287	94	71	53
Hayfield Secondary School	Basement of large 2 story middle/high school complex	-35	-23	-24	3	-44	250	100	89	59
Hayfield Secondary School	Entire visit of large 2 story middle/high school complex	-43	-24	-25	12	-47	2537	95	73	53
5366 Summit Drive (Pat's House)	3 level single family home, includes walkout basement	-17	-7	-7	6	-31	138	100	99	97

Building / Location	Description	Margin needed to cover 95%	Mean loss	Median loss	Min loss	Max loss	# of samples	Est. % covered w/ fixed portable	Est. % covered w/ SMA portable	Est. % covered w/ hip portable
							Averages	91	71	44
South County Government Center	5 story County office building, brand new construction	-38	-25	-25	-5	-47	820	99	88	55
CMU Field House	Concrete block/steel athletic house, main area	-35	-18	-18	-6	-29	253	100	79	17
CMU Field House	Concrete block/steel athletic house, weight room	-32	-15	-14	-5	-27	68	100	94	46
CMU Field House	Concrete block/steel athletic house, stairwell, rooms	-38	-28	-28	-4	-33	558	98	57	20
CMU Johnson Center	Concrete student union building, first floor	-35	-13	-13	4	-32	253	100	100	91
CMU Johnson Center	Concrete student union building, lower level	-42	-34	-38	-1	-43	287	61	23	13
JDR Courtroom C	1st floor of two story brick courthouse/jail	-31	-24	-24	-14	-35	56	100	88	30
JDR Courtroom D	1st floor of two story brick courthouse/jail	-32	-23	-22	-13	-34	62	100	85	39
JDR Security Corridor	1st floor of two story brick courthouse/jail	-35	-19	-18	-5	-32	103	100	95	70
JDR vending machine area	Basement level of 2 story brick courthouse/jail	-39	-35	-37	-1	-49	137	77	15	7
JDR Courtroom B/C lobby	1st floor of two story brick courthouse/jail	-37	-18	-18	-5	-30	44	100	98	77
JDR Security Corridor	1st floor of two story brick courthouse/jail	-35	-16	-15	-7	-30	64	100	98	86
JDR entire visit	Entire visit	-38	-24	-22	-1	-49	465	93	70	45
JDR first floor only	1st floor of 2 story brick courthouse/jail	-34	-20	-19	-5	-35	328	100	93	61
FCWA Admin Building	Lower level of office building, below grade areas	-45	-30	-31	-4	-53	119	99	88	59
FCWA Admin Building	Main floor of office building, at grade	-31	-20	-22	-7	-35	35	100	100	100
FCWA Engineering Building	Lower level of office building, below grade areas	-38	-18	-18	-2	-36	140	100	100	95
FCWA Engineering Building	Main floor of office building, at grade	-17	-9	-7	-1	-22	74	100	100	100

APPENDIX VII – Operational Anecdotes From Tidewater, Virginia Area

Fire departments in the Tidewater area were polled for information regarding in-building radio communication problems experienced with emergency/non-emergency communications.

The following are the responses received.

James City County, Virginia

Has your department experienced radio communications failures in buildings in your city over the past 12 months? **Yes**

What type of construction was present when the problem was identified?

Type I, Fire – Resistive Construction **Yes**
Type II, Non-Combustible Construction **Yes**
Type III, Ordinary Construction **No**
Type IV, Heavy Timber Construction **Yes**
Type V, Woodframe **No**

What is the size of the building and number of floors? **1,000 square feet, 1 floor**

What type of occupancy is located in the building where the problem was encountered? **M – I Industrial**

Did you know that the Virginia Department of Fire Programs was conducting a feasibility study related to "Reliable In-Building Radio Communications for Public Safety" prior to receiving this survey questionnaire? **Yes**

Virginia Beach, Virginia

Has your department experienced radio communications failures in buildings in your city over the past 12 months? **Yes**

What type of construction was present when the problem was identified?

Type I, Fire – Resistive Construction **Yes**
Type II, Non-Combustible Construction **Yes**
Type III, Ordinary Construction **No**
Type IV, Heavy Timber Construction **No**
Type V, Woodframe **No**

What is the size of the building and number of floors? **24 story office and warehouse**

What type of occupancy is located in the building where the problem was encountered? **Mixed use office**

Did you know that the Virginia Department of Fire Programs was conducting a feasibility study related to "Reliable In-Building Radio Communications for Public Safety" prior to receiving this survey questionnaire? **Yes**

Newport News, Virginia

Has your department experienced radio communications failures in buildings in your city over the past 12 months? **Yes**

What type of construction was present when the problem was identified?

Type I, Fire – Resistive Construction **Yes**
Type II, Non-Combustible Construction **Yes**
Type III, Ordinary Construction **No**
Type IV, Heavy Timber Construction **No**
Type V, Woodframe **No**

What is the size of the building and number of floors? **Large commercial with multiple floors**

What type of occupancy is located in the building where the problem was encountered? **Hospital, research facilities, warehouse, and office complex**

Did you know that the Virginia Department of Fire Programs was conducting a feasibility study related to "Reliable In-Building Radio Communications for Public Safety" prior to receiving this survey questionnaire? **No**

NOTE: Additional problems exist in bridge tunnels and on large ships

Portsmouth, Virginia

Has your department experienced radio communications failures in buildings in your city over the past 12 months? **Yes**

What type of construction was present when the problem was identified?

Type I, Fire – Resistive Construction **Yes**
Type II, Non-Combustible Construction **Yes**
Type III, Ordinary Construction **Yes**
Type IV, Heavy Timber Construction **No**
Type V, Woodframe **No**

What is the size of the building and number of floors? **Large buildings and multiple floor buildings**

What type of occupancy is located in the building where the problem was encountered? **Shopping centers, tunnels, and apartment buildings**

Did you know that the Virginia Department of Fire Programs was conducting a feasibility study related to "Reliable In-Building Radio Communications for Public Safety" prior to receiving this survey questionnaire? **Yes**

<u>Hampton, Virginia</u>

Has your department experienced radio communications failures in buildings in your city over the past 12 months? **Yes – the City of Hampton and the Hampton Division of Fire & Rescue operate a GE/Ericsson 800 MHz Trunked radio system. This system operates via two transmitter/repeater sites. Once is located on Buckroe Avenue and the other on Pine Chapel Road. Most of our radio difficulties are concentrated in the northwest section of Hampton. It has been determined that these difficulties are not necessarily due to distance from the transmitter, but a combination of distance from the transmitter, building construction, and location within the building.**

What type of construction was present when the problem was identified?

Type I, Fire – Resistive Construction **Yes**
Type II, Non-Combustible Construction **No**
Type III, Ordinary Construction **No**
Type IV, Heavy Timber Construction **No**
Type V, Woodframe **No**

What is the size of the building and number of floors? **All occupancies are over 50,000 square feet**

What type of occupancy is located in the building where the problem was encountered?

- **Verizon Building, 5200 West Mercury Boulevard, two floors**
- **New Market Mall, 5200 West Mercury Boulevard, two floors**
- **AMC 24 - Theater Complex, Towne Centre Way, three floors**
- **Farm Fresh, Town Centre Way, one floor**
- **West Telemarketing, 247 Foxhill Road, one floor**
- **Farm Fresh, 247 Foxhill Road, one floor**
- **Food Lion, 3855 Kecoughtan Road, one floor**
- **Old Sentara Hampton General Building, 3120 Victoria Boulevard, six floors (anywhere below the ground floor)**
- **Hampton General District Court, 36 South King Street, three floors**

Did you know that the Virginia Department of Fire Programs was conducting a feasibility study related to "Reliable In-Building Radio Communications for Public Safety" prior to receiving this survey questionnaire? **Yes**

APPENDIX VIII – Operational Anecdotes From Fairfax County, Virginia

The following are anecdotes collected from firefighters in the Fairfax County area. These are displayed by individual and are unedited.

*****

One was a fire in 8's area at Ravenworth Towers. I was OIC of T410 when the IC called me to give me an assignment. I was in the stairwell making my way to the floor above the fire and could not get out to acknowledge his call. I made my way to the next floor and down the hall about 20 to 30 feet at which point I was able to acknowledge his transmission and get the assignment.

I had a similar situation at a 79 box on four mile run with the same basic situation. The radio would receive in the stairwell but not able to transmit.

I believe you were there when we were working on the preplan for Skyline Mall and parking garage. The radios would not receive or transmit. The truck left to go to Giant to get dinner. While we were in the store we (engine and truck) got a call for a fire in 8's area. Since I knew the radios didn't work in the garage and I knew the engine crew was still there working on the preplan, we paused at S. Jefferson/Leesburg Pike and made as much noise as possible so they would hear us and check their CAD.

*****

We learned quickly in the FM's office that we could not transmit from basements such as Commonwealth Care. During fire alarms testing, we would look to the contractor using a Nextel direct connect to communicate with a FM at the main fire alarm panel. Our 800 radio would hum at us when we tried to transmit from the basement.

In another case, we used the direct channel on our 800 radios to test the fire alarm at Daniel's Run Elementary School. This channel gave us instant connection on a limited basis. If one of us went to the end of a hallway or changed floors, we lost direct contact. If we are to depend on channel 0 to communicate with a fire fighter during an emergency, we better have several people staged around a building to listen for trouble.

Now, we use the Nextel direct connect during all of our fire alarm tests. This has limited our radio use, and our problems encountered, in city buildings

As our troops continue to test the regular 4-Adam and channel 0 in our city buildings, they will learn where the problem areas are.

*****

There are several buildings where I had to use 4-0 to get out on incidents. None of the incidents were noteworthy fire wise. The buildings are:

10701 Main Street, Floor 1
4315 Chain Bridge Road, Basement
10570 Main Street, Floor 1, 2 & 3
10306 Eaton Place, Basement 3300 Willow Crescent Drive, Terrace Level
3300 Willow Crescent Drive, Terrace Level

*****

No particular "war stories", but our Retesting teams (4 2-person teams) have purchased two-way radios from Costco to communicate in high-rise buildings. The radios had such a "hit or miss" problem with reception, that the $50.00 Cobra walkie talkies are outstanding. They have been using them for months now, and are very pleased. They still carry our radio in hopes they hear an inadvertent dispatch of an engine company for a fire alarm test, but use the 2-ways for communication inside buildings.

*****

One "story" that comes to mind is when we were doing a walk-through at Huntington Metro. There is an 800' service tunnel at the end of the station. Walk more than 15-20 feet into it, and you have no radio capability at all. Needless to say, if we had to operate in there, communications would become a major issue.

*****

Although I do not have the particular dates or incident numbers, I can relate two stories of this very nature. E409 was assisting our Medic unit with an ALS event at the Oak Meadows Nursing Home. As you know, we were on channel B. While we were involved in this ALS incident, unknowing to us, a house fire was dispatched in company 11's area. The fire was on Memorial Street and was a mutual box using the L/M channel for communications. As we went AOR-09/11 the house fire was sent to our CAD and we responded. The L/M patch was extremely poor, if not non-existent. Somewhere between switching from B to A then to L and then to M at the top of the hill, we did not receive the radio transmission that E411 had a working fire. We also did not know that E411 was having trouble finding the fire in the thick smoke and had requested exterior ventilation. We were able to tell the lay-out by seeing the hose lying unattended in the street next to a hydrant. Apparently, several transmissions had been broadcast but missed by incoming units. Fortunately, nobody was injured and the blaze extinguished.

Again months later while at the Paul Springs retirement home, we missed another incident. Our radios default to the no signal tone throughout much of this building. Another ALS event had been dispatched near our location without our knowledge. Having packaged the patient and returning to quarters, we noticed flashing lights and a siren coming towards us. E424 soon passed us headed to an ALS event only blocks away. It was not serious but could have been.

I think you are familiar with Wakefield Towers in company 11's area. These are older non-sprinkled high-rise buildings with little or no radio communication abilities. When you go inside you must switch to -0- and operate in the walkie-talkie mode. That whole notion of switching to a command channel, a separate channel for the RIT team, press the red button for emergencies. For-get-about-it, you got 1 one channel and that's -0-Oscar.

*****

I use to like the fact that when I was assigned to work at Fire Station 23 and we would use the Jewish Community Center next door, that we would lose the ability to talk to PSCC. Considering that, we were less than a mile from PSCC and in a fairly small building. We still lost communications with PSCC.

Also, another quickie would have to be our training evolutions at Huntington Towers. We were doing an evolution and I was assigned to the fire floor ac the fire attack officer. As I was entering the building, still in visual touch with the IC, I would lose radio contact with him. I realize that we were going through the repeater but the fact of the matter is that I had only just crossed the threshold into the structure and had not gone more than 10 feet and was out of radio communication. This is more than a little disconcerting and even though we are attempting to address the situation, I just don't get that warm and comfy feeling anytime I have to enter a large building.

We ran a FVEHF in the parking garage at 5573 Seminary Road (Savory Park Condos) recently. It was a US Postal Service minivan about 300' inside the garage with the occupant compartment well involved. Once I was less than 50' inside the garage (which, as you know, is not truly below grade) I lost all ability to communicate on the operations channel with my driver, PSCC, and incoming units. I had to walk over near side A of the garage and get near an exterior wall before the radio came back in range. As a result, I had to resort to yelling to relay instructions and ultimately using the "0" channel, which of course was only of value once the BC got on the scene. In the interim, I was trying to transmit on the operations channel to have PSCC reduce the response of anything other than the truck and the second-due engine to priority 2. No one heard those transmissions, as I ultimately learned.

*****

On July 28, 2003, we were at a fire alarm sounding in a 16 story high-rise office building. When we reached the 12th floor we found smoke in the hallways. We could not contact PSCC via the radio. We tried several different channels with no success. Access to the surrounding offices was hampered because they were all high security defense department units, so we couldn't readily reach a window. We had to call the driver outside on the talk around channel and they had to relay all the information to incoming units and PSCC. There also have been many instances where personal cell phones have been used to either contact personnel outside or to contact PSCC directly.

*****

This past winter, assisted on a call for excessive amounts of CO on the 8th floor and above in a high-rise. Had units on multiple floors. I'm in the lobby talking with Hazmat. Units and my talk-group could not hear me unless I physically held the radio above my head. Being 6'5", you would think that would be good enough. Good thing I wasn't on a fire floor with heavy heat conditions.

*****

Two stories from the greater 2nd battalion:

Box alarm in a parking garage at Tyson's Corner Mall for a fully involved vehicle, extending to adjoining cars. I was transmitting my reports and requests to the battalion chief, sitting in his buggy that I could see less than 200' away, but he said he was unable to copy any of my radio traffic.

Second, event was reported fire in a high-rise. After gaining access to the reported apartment and determining it was only food on the stove, I attempted to contact Command with my report from the 13th floor apartment. Command said I was breaking up. I went to the balcony to retransmit my report and Command indicated they still had trouble understanding what units I wanted to hold.

*****

Parliament House a 9 story high-rise. As soon as you get 10 feet inside the front door all radio communication stops except for Channel "0" until one gets upper floors close to a window in an apartment. So, if you are in an elevator and get trapped and no one is listening to Channel 0, you are out of luck because no one will hear you. Ravenworth Towers is the same way. Rear of the K-Mart on John Marr is the same way.

Sleep Hollow Nursing Home..."Nursing Home". We had a fire in the laundry room. We entered the building on side C at ground level, by the time we made it back to the laundry room; we were under ground, which means the fire was in the center of the building underneath the majority of the patients. We were unable to talk to the outside units on the repeated channels. I had to position myself halfway down the hallway and carry 2 radios one on "0" and the other on the Fire Ground Channel.

While carrying a portable radio inside Station 8..."Inside Station 8" the radios will start to fade out, the voices sound like Charlie Brown's teacher...if the station radios are down and we are working off of a portable we might not hear the call if we are in the middle of the building.

*****

We make frequent runs to Greenspring Village, 2-3 times a day. This complex is still under construction. As a routine, I have to leave the engine driver outside communicating with him/her on: 4-Ocean" if I need to request anything from PSCC. For those calls involving the entire crew, I have to depend upon using the occupant's telephone.

*****

Dispatched to an ALS emergency for a severe asthma patient in the Bailey Cross Road area of the county. After accessing the patient, we were riding the elevator down from the 6th floor when the elevator car stalled. The radio would not transmit out, leaving us stuck in the elevator with a potentially critical patient. We were rescued when the engine crew that walked down came looking for the missing engine medic, most probably because they wanted to get back before dinner got cold.

*****

For what it's worth, I concur regarding the "0" radios. We ran a vehicle fire deep in the garage under 5573 Seminary our last day, and 30 feet into the garage I lost all ability to talk on the repeated channel. I had to walk to within 20 feet or so of one of the exterior walls to get back in range. We had to shout back and forth and ultimately resorted to the 0 channel so that I could talk to my engine driver. Of course, this took me off the repeated channel.

*****

On July 28, 2003 at 2257 hours Engine 10 and Truck 10 were dispatched to a fire alarm located at 5203 Leesburg Pike. As we were approaching the scene a supplemental MCT message indicated that a called had now seen fire from the 11th floor and that he could hear the fire alarm sounding as well. I called PSCC and asked them about the supplement; they seemed unaware of it.

PSCC then called T-10 and told them that the supplement was in fact accurate and they then asked the truck if they wanted the box filled out. It was at this time that I interjected on the radio and informed PSCC to fill out the assignment and that I would get back to them when I had determined what was going on.

After several minutes of investigation, I confirmed that an alarm was sounding, and I was still trying to determine the status of any fire. I again called PSCC; I asked them if they had filled out the box, if they had checked back with the caller for more information and what channel the incident had been moved to. They informed me that, no they had not completed the assignment, that they were still checking with the caller and that the incident had not been moved to another channel.

I again asked for the assignment to be completed and was informed that they had checked back with the caller and he no longer saw anything, and that the fire officer

"recommended" not filling out the assignment. It was, at this point due in part, to my heightened level of frustration that I told them to do whatever they felt like doing. While this exchange was taking place E-10 Alpha was ascending, as ordered, to the #12 floor. Upon their arrival they encountered a moderate smoke condition with an unknown source. They repeatedly attempted to call both PSCC and myself on both the dispatch and fire ground frequencies, but their attempt went unheard. Eventually, one of their calls was heard and at 2311 hours PSCC finally realized that the assignment should be upgraded. They assigned us to fire ground channel 4-C for the remainder of the event.

Emory Rodgers

From: Emory Rodgers
Sent: Friday, May 21, 2004 8:03 AM
To: Duncan Abernathy
Subject: RE: Code change for in-building emergency communications

Great comments and will be sending out confirmation of meetings and this extensive list of comments/options and recommendations. Will send to Fairfax and Cheri Hainer. Will be next week as I am on the road with the fire officials and will discuss with them next week these real world and federal problems.

From: Duncan Abernathy [mailto:daber@aiava.org]
Sent: Thu 5/13/2004 12:35 PM
To: Emory Rodgers
Subject: FW: Code change for in-building emergency communications

Emory,

Here are several comments from AIA members on the in-building communication proposal. Please add them all to the mix that will be studied this summer. Thanks.

Duncan

-----Original Message-----
From: David Jones [mailto:drj@SFCS.com]
Sent: Wednesday, May 12, 2004 6:37 PM
To: Duncan Abernathy; Payne, Kenney; Charles Callaghan (E-mail); Charles Henry (E-mail); Jim Snowa (E-mail); John McGrann (E-mail); Leslie Louden (E-mail); Luigi Grande (E-mail); Mark Orling (E-mail); Megan Shope (E-mail); Mike Jones (E-mail)
Subject: RE: Code change for in-building emergency communications

Duncan,
Wanted to combine a couple emails together and say a few comments. Your proposal below would work though you still have to address who is providing the equipment and the connection. For that matter, it could even be an automatic dial-up system like many building alarms activated by emergency services when needed. Actually that would be a good way to prevent interference at other times.

But this begs another question. What are we being asked to provide? At one time I thought the goal was a system that allowed people to talk direct between handhelds exclusively within the building. Now it sounds like a system that allows people within the building to talk to the dispatcher outside the site. These are different radio functions with the latter most like more expensive that the in-building only.

Chuck's comment about WI-Fi really is a different apple but closer to Duncan's thoughts. The computers are not connected direct to each other but to a central (or local) server and that connection is typically hardwired. And those systems are low power Part 15 devices that are FCC Type Accepted.

Buildings block radio signals. The higher in frequency the radio is, the worse the signal attenuates. This is why the older low band radios still used by some public service agencies work in buildings. This is why Fairfax County (I believe I have the county right, but it was one of our northern counties) found they could communicate fine within the buildings they were testing with their $50 cobra radios from Walmart when they could not get their $1,000 fire radios to work. This fact is in their report! This isn't new. This is as old as radio itself. The manufacturers know it. The buyer knows it. No company will sell a system with 100% coverage and it is hard to get 95% outside of the building – much less inside.

And buildings do not cause interference. If they do, they are in violation of federal law. States CAN NOT regulate interference under federal law, ONLY the FCC. They do block signals. One of my local counties has addressed this problem with a zoning overlay to prevent buildings from being built that block the signal from the dispatch center to the repeater towers on the mountain. Personally I do not like zoning restrictions on personal property just so the county does not have to pay for a hardwired connection... And guess what, airplanes still fly thru the signal occasionally shutting down the entire system. But this brings up something else. Different types of trees block signals as bad as buildings. Especially where the pine needle or leaf size is close to the frequency wavelength. Are we going to regulate them next? Just like buildings, the higher the frequency, the greater the blockage.

I still do not see any of my earlier concerns on standards for the equipment addressed. Beginning with the fact it is illegal to use non-FCC approved amplifiers in this country. The usage rate or duty cycle for 12 hours is not defined. I do not believe the issue of who does testing and who keeps records has been cleared up, especially between the fire code and the building code. Who pays to change the system in two years. Why isn't this in the electric code where it belongs instead of the building code.

Every commercial manufacturer in the US has announced they have a new system to cure this problem. Some work thru the older systems, most require new. Most are digital. When localities upgrade – and they will – who pays.

Who decides which service gets coverage in a building. Not everyone is on the same radios or bands. Or are some building owners going to have to put in multiple systems?

And, since radio transmitters typically require licenses – and this is a transmitter – who is going to license the system? The FCC does not license individuals to use radios in the public service bands. Has anyone at the STATE even asked the FCC if this concept is legal? Which gets to liability. When the first emergency responder dies in a building equipped with this system, the system owner will be sued – whether the system failed or not. Especially when 100% coverage is not even required by the standards for this system. You should see the number of lawsuits presently in New York over the radio systems – and they were publicly owned.

And since when can the state require what the federal government puts into their buildings? Don't believe that is the way it works.

Kenny brought up some good points also. There is terrain modeling software used to determine location of towers to generate most cost effective system. To my knowledge, none account for building materials and I have never seen one run on a scale that even included buildings. Something about available computing power. Bottom line, a locality gets what it is willing to pay for. More money, more coverage, more towers, signals inside buildings. The community leaders decided how much coverage they wanted and what risks they were willing to take when they purchased the communications systems they put in.

And finally, and I will quit, the issue of where police and fire radios will operate is before the FCC at this time and the whole issue of who will move and who will pay to readjust the commercial radios has just gotten more complicated. (Note, the company NEXTEL is offering to only fix the public service radios, not private owned systems). I have attached an article below from MRT newsletter I got this week. It is all politics and money.

My recommendation – put the entire issue on hold until the FCC makes its decision on where the services asking for an in-building communications system will be allowed to operate. At the most, require a building owner provide a space in the building for the public service agency to install their own licensed equipment (which has its own maintenance program). And no, it does not have to be wired throughout the building. A repeater system of its own could serve the entire building from one location. Its just money.

Forgot to mention, one of our local police forces have their own solution to the communications problem and have been using it for at least 10 years. They have set up the high power fixed radios in their vehicles to act as repeaters for their low power handhelds. When officers get out of the vehicle and go somewhere with poor coverage, they can turn it on as needed. No additional work required to the buildings. I can even do the same with the ham radio gear in my car – a feature we have used to provide emergency communications out of hospital buildings during disaster drills.

David R. Jones, Jr. AIA

New proposals offer 800 MHz hope, not a quick decision
By Donny Jackson
May 7, 2004

After almost two years of studying a single rebanding plan designed to address interference at 800 MHz, the Federal Communications Commission recently received two new proposals in consecutive business days.

Both submittals include components that indicate all interested parties are coming closer to an agreement. While it's good the FCC now has more options before it, giving regulators choices means deliberation, so don't expect an order for weeks.

On the surface, that has to be discouraging to public-safety officials, who have been hearing for months that the FCC was on the verge of making a decision. But public safety should be encouraged that the latest proposals offer a chance -- albeit a slim one -- that the FCC might be able to come up with something that could result in rebanding being completed quicker than it would have if the Consensus Plan had been adopted a couple of months ago.

Remember, an order that lands in court does little for public safety, which likely would get no relief from 800 MHz interference during the couple of years the judicial system would spend deciding whether the FCC can award spectrum without an auction, as is called for in the Consensus Plan. If a court ruled against the FCC on the matter -- and it's very possible -- we're back to square one.

Keeping this out of court is crucial, and it didn't seem possible as long as Verizon Wireless and CTIA continued to maintain they would litigate any spectrum award to Nextel. But both groups backed off that stance last week, acknowledging they would not take an award of 2.1 GHz spectrum to court (they also all but abandoned their previous position that technical remedies could solve the problem).

Of course, Nextel doesn't want 2.1 GHz airwaves, because they would be too costly to use -- so much so, that the carrier turned around the next business day and announced its willingness to shell out an additional $500 million to relocate broadcasters from the 1.9 GHz spectrum it covets. That would free up an additional 10 MHz of spectrum in that band the FCC could then auction.

True, there's still no clear agreement -- Verizon implies it may litigate an award of 1.9 GHz spectrum, and Nextel cites its shareholders' interests as the reason for opposing 2.1 GHz airwaves. But this is progress, because the parties finally are acknowledging publicly that the debate is not about finding the best way to help public safety--everyone agrees on the need for that--or maintaining the sanctity of spectrum auction laws.

It's about money. Public safety doesn't want to pay any; Congress would like to get some from a spectrum auction to help the budget; Nextel wants to spend as little as possible to enter the high-speed wireless data market; and Verizon/CTIA want to make sure Nextel doesn't get to enter that high-stakes game with a penny ante.

The FCC is left with the responsibility of trying to "thread the needle," as one analyst put it, by issuing an order that will appease all parties.

It won't be easy. Should the FCC award 2.1 GHz spectrum to Nextel, it would limit the legal challenges to an order. However, because there's no equipment ready made for 2.1 GHz, there's no question that the spectrum is less valuable than 1.9 GHz airwaves. Would it be valuable enough for Nextel to cover the entire cost of rebanding? That's questionable.

Should the FCC choose to award Nextel spectrum at 1.9 GHz, there should be plenty of money to reband 800 MHz and relocate broadcasters from 1.9 GHz (an aside -- wouldn't it be nice if the

same could said for 700 MHz?), opening a new auction opportunity. But that opens the door to litigation from Verizon, the one cellular competitor in a position to take such action.

For Nextel, it comes down to a difficult choice: Pay big money ($3 billion to $5 billion) for 1.9 MHz spectrum, knowing that affordable equipment is readily available but that litigation would delay -- perhaps negate -- the buildout of the high-speed network it covets; or, accept the award of 2.1 GHz spectrum that calls for less upfront cost and little legal risk, knowing that equipment choices for a high-speed data network would be limited, delayed and ultimately much more expensive.

Nobody knows how this will turn out, but it promises to be interesting. Let's just hope no first responders or civilians are killed or seriously injured while policymakers try to figure it out.

End article

-----Original Message-----
From: Duncan Abernathy [mailto:daber@aiava.org]
Sent: Tuesday, May 11, 2004 1:38 PM
To: 'Payne, Kenney'; Charles Callaghan (E-mail); Charles Henry (E-mail); David Jones; Jim Snowa (E-mail); John McGrann (E-mail); Leslie Louden (E-mail); Luigi Grande (E-mail); Mark Orling (E-mail); Megan Shope (E-mail); Mike Jones (E-mail)
Subject: RE: Code change for in-building emergency communications

I'd like to add a few thoughts here as well and ask that Mike Jones jump in here, too. I know that HSMM is a large proponent of wireless technology and Mike would be one of the people who might be able to respond to my thoughts.

I have spent a good bit of time deciding to continue the hard-wire system within the Branch House rather than moving to wireless. I did this in hopes that the wireless technology would evolve quickly to something that I felt comfortable recommending for data and voice communications. I have the impression that it will not be too long before wireless technology can circumvent buildings and penetrate almost any material.

But I agree with Kenney that the advancements to date do not allow the industry to overcome physical obstacles. That being the case, new buildings will impede the quality of the wireless signal when placed within the sight path of the existing signal source and receiver.

One solution that I have not heard proposed is to hard-wire new buildings to the nearest first-responder signal source and then wire the building for wireless communication from within. When compared to the uncertainty of future building, this seems to be a simplistic but viable solution. Any other thoughts?

Duncan

-----Original Message-----
From: Payne, Kenney [mailto:kpayne@moseleyarchitects.com]
Sent: Tuesday, May 11, 2004 11:44 AM
To: Duncan Abernathy; Charles Callaghan (E-mail); Charles Henry (E-mail); David Jones (E-mail); Jim Snowa (E-mail); John McGrann (E-mail); Leslie Louden (E-mail); Luigi Grande (E-mail); Mark Orling (E-mail); Megan Shope (E-mail); Mike Jones (E-mail)
Subject: RE: Code change for in-building emergency communications

Duncan, et. al:

Besides not being a strong proponent of this code change, I would be concerned with the language as currently proposed for 912.5 about newly constructed buildings interfering with existing communications. An owner will probably look to the A/E to advise them of the possibility of any

interference...then, it will become our responsibility to review ALL existing buildings that MIGHT be affected. This could be a HUGE undertaking, not only for the A/E, but also the owner (imagine building a new building in a downtown location...and having to decide if this new building affects the communications of all of the surrounding buildings). Perhaps this is easily done...but, the consequences of being wrong...or missing one building...and the potential liability could possibly fall back to the A/E as the owner could "blame" the A/E.

Of course, we could exclude this from our basic services, but if we do not do this...who would perform the evaluations? The local building official? The Fire Marshal? Can we rely on their results and findings?

Also, it still doesn't get into the maintenance issue too well. It talks about testing, but not about maintaining the system. I assume that would fall under the owner's requirement? What are the costs for that? How often? It talks about updating if the locality changes frequencies...but not if the equipment becomes obsolete (unless the locality will pay for that). Would an owner or locality be required to install a completely new system? What would be the estimated costs for that?

Their justification compares this to a fire alarm or sprinkler system; however, a sprinkler system...once in...does not require updating every time a frequency changes...nor does it require an owner or A/E to evaluate surrounding buildings to see if the new sprinkler system would affect other buildings (as long as flow and pressure is achieved). Usually, once these systems are in, they do not require costs for updating as the communication system appears it might.

They also speak to the building structure itself affecting the communication system. As we construct buildings in Types I, II, or III...the materials could conflict with the effectiveness of these systems...requiring more or better amplifiers...thus more cost the better the building is constructed? Sounds counter-productive to me.

Just some of my early thoughts.

Kenney

-----Original Message-----
From: Duncan Abernathy [mailto:daber@aiava.org]
Sent: Tuesday, May 11, 2004 10:51 AM
To: Charles Callaghan (E-mail); Charles Henry (E-mail); David Jones (E-mail); Jim Snowa (E-mail); John McGrann (E-mail); Payne, Kenney; Leslie Louden (E-mail); Luigi Grande (E-mail); Mark Orling (E-mail); Megan Shope (E-mail); Mike Jones (E-mail)
Subject: FW: Code change for in-building emergency communications

FYI.

Duncan

-----Original Message-----
From: Emory Rodgers [mailto:Emory.Rodgers@dhcd.virginia.gov]
Sent: Tuesday, May 11, 2004 10:59 AM
To: Jack Proctor; Vernon Hodge; Ed Altizer; Rick.fathing@dhcd.virginia.gov; Curtis McIver; norm.crumpton@dhcd.virginia.gov; Cheri Hainer; mingrao@aoba-metro.org; Hall, Steve; Duncan Abernathy; adam.thiel@vdfp.virginia.gov; cwhyte@vectrecorp.com; wsmith@vbgov.com
Subject: Code change for in-building emergency communications

Here is the Va. Beach code change for in-building emergency communications.
It provides for local option.
Not sure why HB2529 is in Exceptions #2
Additional applicable sections: Does 912.1 automatically cover these Groups?

Need a SFPC maintenance section?
Meeting scheduled for July 14th and August 11th.

March 16th ad-hoc committee

From: Duncan Abernathy <daber@aiava.org>
To: "Emory Rodgers (E-mail)" <erodgers@dhcd.state.va.us>, "Mark Ingrao (E-mail)" <mingrao@aoba-metro.org>, "Charles Callaghan (E-mail)" <cjc4m@virginia.edu>, "Charles Henry (E-mail)" <archsolu@aol.com>, "David Jones (E-mail)" <drj@sfcs.com>, "Jim Snowa (E-mail)" <jsnowa@ws-arch.com>, "John McGrann (E-mail)" <jmcgrann@Baskervill.com>, "Kenney Payne (E-mail)" <kpayne@moseleyarchitects.com>, "Leslie Louden (E-mail)" <LLouden@littleonline.com>, "Luigi Grande (E-mail)" <lgrande@ch2m.com>, "Mark Orling (E-mail)" <morling@ronarchitects.com>, "Marvin Cantor (E-mail)" <marvelle@aol.com>, "Mike Jones (E-mail)" <mjones@hsmm.com>, "Robyn Thomas (E-mail)" <rconley@btrarch.com>
Date: 12/24/2003 12:07:18 PM
Subject: FW: Emergency Comm

Another tidbit on the liability issue of in-building radio communication.

Duncan

-----Original Message-----
From: David Jones [mailto:drj@SFCS.com]
Sent: Wednesday, December 24, 2003 12:04 PM
To: Duncan Abernathy
Subject: Emergency Comm

Duncan,

From Mobile Radio Technology Bulletin that came out today,

"This week, the families of 12 firefighters killed in the World Trade Center attack sued New York City, alleging the mobile radios issued to their loved ones did not work properly during the crisis."

And now we want private building owners to install private systems to interface with public service emergency communications systems? This goes back to my original question, who is liable for a failure of either the private system or even the police/fire handheld if it does not work right in a building with a private system? And should that responsibility be placed on the private owner when he has no control over the equipment using his system or even it's proper usage?

David

****

From: Duncan Abernathy <daber@aiava.org>
To: "Emory Rodgers (E-mail)" <erodgers@dhcd.state.va.us>, "Christy King (E-mail)" <cking@vdfp.state.va.us>, "Mark Ingrao (E-mail)" <mingrao@aoba-metro.org>, "Ed Altizer (E-mail)" <ealtizer@dhcd.state.va.us>, "Charles Callaghan (E-mail)" <cjc4m@virginia.edu>, "Charles Henry (E-mail)" <archsolu@aol.com>, "David Jones (E-mail)" <drj@sfcs.com>, "Jim Snowa (E-mail)" <jsnowa@ws-arch.com>, "John McGrann (E-mail)" <jmcgrann@Baskervill.com>, "Kenney Payne (E-mail)" <kpayne@moseleyarchitects.com>, "Leslie Louden (E-mail)" <LLouden@littleonline.com>, "Luigi Grande (E-mail)" <lgrande@ch2m.com>, "Mark Orling (E-mail)" <morling@ronarchitects.com>, "Marvin Cantor (E-mail)" <marvelle@aol.com>, "Mike Jones (E-mail)" <mjones@hsmm.com>, "Robyn Thomas (E-mail)" <rconley@btrarch.com>
Date: 12/23/2003 11:39:29 AM
Subject: FW: Emergency comm systems

All,

I forward information from David Jones that will be important in your deliberations on the in-building communication system discussion.

Duncan

-----Original Message-----
From: David Jones [mailto:drj@SFCS.com]
Sent: Tuesday, December 23, 2003 10:36 AM
To: Duncan Abernathy
Subject: Emergency comm systems

Duncan,
Here are a few more comments for your review and consideration on the emergency communications proposal. There are a few issues I will not go into here - but if you follow the organizations behind proposals, where and why problems have happened, etc.... Our public safety people in the front lines need to be commended and should be provided with the best equipment available. However, the proposed system for Virginia does not appear to be the solution and may even contribute to make the problem worse. Please feel free to share the below comments. There is a wealth of available information on the internet for someone with the time to research the issue. I saw nothing to support an in-building system, but a lot for public service provided repeaters on major buildings. AS, see my recommendation at the bottom.

David R. Jones, Jr. AIA

****

There is a known problem with the new 800mhz systems not transmitting well in buildings even acknowledged by Motorola (NYTimes 8/6/2002) yet they still continue to advertise the system as improved performance in buildings - a myth perpetuated in the House Joint Resolution 588 package.

It is reported that firefighters in the World Trade Center disaster did not either receive or hear calls to leave the building on their radios. However, the police department who had their OWN repeaters installed on high rises in NY say their radios "performed without problems" (NYTimes

8/6/2002).

The Association of Public Safety Communications Officials (APCO) Project 39 Study on 800mhz band interference program put together by Motorola lists Bi-Directional Amplifiers AS A SOURCE OF INTERFERENCE to public safety radio - is this not the same system House Joint Resolution 588 wants to install? Conflict???

If a private system fails and a police or firefighter dies through failure of his public service radio to work without the private system - WHO IS LIABLE FOR THE DEATH? Ask the building owners.....

The consultant report cited throughout the House Joint Resolution 588 is by the same company that designed the Fairfax radio system that appears to be having all the problems. Does the Fairfax system, as installed, even meet the required minimum standards of covering only 95 % of their county with coverage only 95 % of the time - with all the gaps Fairfax listed? Or did Fairfax get what they were willing to pay for?

There are still issues of frequency changes by public service users and who pays for new equipment in buildings when that happens. Who gets served in localities that have public service radios on different bands or does the owner have to put in multiple systems instead of just one? Is a bi-directional amplifier system designed to radiate beyond the building to connect to the regular police/fire even legal under Federal Communications Commission regulations - It is afterall a transmitter on licensed frequencies not open to private individuals or businesses.

In a story on why new radios don't work well in big buildings, (LA Times 11/14/2000) "The biggest complaint is that the radios don't always work in many big structures and throughout entire patrol districts. Experts point out that radio waves on higher frequencies cannot travel as far as those on the low frequencies previously used. To compensate, public safety agencies must add radio towers, which are often cost prohibitive.

Several of the listed ordinances in place have already been demonstrated as illegal or void under Federal law. Many were written to try and deal with interference to public service radio by cell phones in adjacent bands - which happens to be the exclusive domain of the FCC. Appendix V - Line-of-Duty Death Investigations attached to House Joint Resolution 588 has no business even being in the report. Not a single case in the appendix is attributed to radio failure from being in a building. Most indicate improper use of equipment, failure to establish procedures or lack of radios period.

In Appendix VIII to Joint House Resolution 588, Fairfax County Firefighters identify how their fire radios did not work in several buildings, however their Nextel Direct Connects and their Costco purchased walkie-talkies gave "outstanding" performance and have been used for months when testing buildings with their fire radios. This goes to demonstrate THE PROBLEM IS NOT BUILDINGS, THE PROBLEM IS THE RADIO SYSTEM.

I note that conflicts between the proposed building code and fire code proposals still have not been resolved including who approves inspectors, who approves alternative technology, who gets reports, who

is providing radios for the test, etc, etc.... There were two pages of these conflicts that I noted previously. A 12 hour battery backup? Under what load duty cycle?

So, in conclusion, the largest public service radio manufacturer says the proposed bi-directional amplifiers are a source of interference. Experts identify the solution as more antennas sites in the public radio system. Public service owned radio repeaters on buildings work. $50 walkie-talkies from the store down the street provide outstanding performance in the very same buildings the firefighter radios fail to function in. The technical standards for the proposed system are not fully developed. The cost is still unknown but a solution outside of the building has been identified and demonstrated.

My bottom line concerns; are we trying to force building owners to shoulder the burden of cost for faulty or poorly designed public service radio systems where system operability was marginalized in the first place to reduce costs. Who should really and legally be responsible for the systems? Can a building owner legally even install and maintain such a system under FCC regulations or will the local public safety service be required by federal law to be responsible for license of these additional transmitters?

So, let me offer a counter proposal. New buildings provide a fire resistant room on top of the listed buildings with power and/or emergency power backup available for the public service agencies to install equipment as they determine is needed. Solves major cost issues, solves licensing issues, provides space for public services to not only service the building but surrounding areas as needed, and establishes the responsibility and liability for the equipment and its function with the people using it.

Please note, all the above is my personal opinion and that of the sources cited and does not reflect that of my employers or company.

From: Duncan Abernathy <daber@aiava.org>
To: "Emory Rodgers (E-mail)" <erodgers@dhcd.state.va.us>, "Christy King (E-mail)" <cking@vdfp.state.va.us>, "Ed Altizer (E-mail)" <ealtizer@dhcd.state.va.us>
Date: 3/22/2004 9:22:46 AM
Subject: FW: MRT Bulletin: FCC's Abernathy hopes for April decision on 800MHz

Emory, Christy and Ed,

I am forwarding this message to you because it concerns the communications difficulties we were discussing between the legislative sessions. Please forward it to anyone you believe would be interested. Also note that to my knowledge, Kathleen Abernathy and I are not related.

Duncan Abernathy AIA

-----Original Message-----
From: David Jones [mailto:drj@SFCS.com]
Sent: Saturday, March 20, 2004 8:26 AM
To: Duncan Abernathy
Subject: FW: MRT Bulletin: FCC's Abernathy hopes for April decision on 800 MHz

Duncan,

Here is the latest on whether or not police and fire radios on 800 mhz (the big trunked systems mainly that have problems) will have to move frequencies and a little bit on who will have to pay to change or tune all their equipment to the new bands. Please note, this would not pay for private systems in buildings – nor would it notify owners they needed to change!

David R. Jones, Jr. AIA

-----Original Message-----
From: MRT Bulletin [mailto:mrt_bulletin@newsletters.primediabusiness.com]
Sent: Friday, March 19, 2004 3:22 PM
To: David Jones
Subject: MRT Bulletin: FCC's Abernathy hopes for April decision on 800 MHz

<http://www.mrtmag.com>

March 19, 2004

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Volume 2, Number 11

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fccs_abernathy_expressesFCC's Abernathy hopes for April decision on 800 MHz
By Donny Jackson
March 19, 2004

FCC Commissioner Kathleen Abernathy said the commission intends to issue a decision about rebanding 800 MHz users in April to resolve public-safety interference issues in the band, which would bring a conclusion to the controversial two-year proceeding.

During a press briefing yesterday, Abernathy also said she is worried about the litigation risks associated with granting 1.9 GHz spectrum to Nextel as part of the deal. Indeed, critics of the Consensus Plan proposal repeatedly have noted that the Communications Act mandates that such airwaves must be auctioned.

Scott Cleland, CEO of The Precursor Group, said such concern is warranted, because "even a five-year-old can tell" the FCC is on shaky legal footing if it gives spectrum to Nextel outside the auction process. For public safety, the concern is that legal maneuverings could threaten the ability to reband in a timely manner, he said.

"[The FCC has] got to thread the needle here, because that decision will be challenged in court," Cleland said. "They don't want rebanding to be caught up [in litigation]."

But FCC Chairman Michael Powell, in a letter to 23 members of Congress, this week said the commission has the legal right to award spectrum, noting that Section 316 of the Communications Act "authorizes the commission to modify licenses if such action will promote the public interest."

In the same letter, Powell said he does not believe Nextel will benefit from the rebanding because its iDEN technology platform is designed specifically to work with non-contiguous spectrum.

According to reports, the FCC staff last week circulated a draft order that included the key components of the Consensus Plan -- rebanding 800 MHz to provide contiguous spectrum to public safety and Nextel, which also would get spectrum at 1.9 GHz -- but did not include a final payment amount from the wireless carrier.

Nextel has agreed to pay $850 million to offset public safety's costs of rebanding, but observers believe the wireless carrier will have to pay more. Guzman & Co. telecom analyst Patrick Comack has projected Nextel will have to pay an additional $1.5 billion, which would force Nextel to commit to a total payment of $2.35 billion.

Rep. Vito Fossella (R-N.Y.) this week said Nextel should be required to pay more, because he is concerned Nextel's $850 million pledge will not be enough to cover rebanding costs.

"The Consensus Plan fails to provide sufficient funding to upgrade public-safety communications, with some estimating a shortfall of $1 billion," Fossella said in a prepared statement. "Indeed, because no provisions have been made for additional funding to cover public safety's costs, the taxpayers will likely be forced to foot the bill. The Consensus Plan has the potential to become known as the '$1 Billion Tax Increase Plan on the American People.'"

However, Powell said requiring Nextel to pay the costs of 800 MHz incumbents is a sensitive issue -- and another aspect that could be subject to future litigation.

"For example, were the costs of imposing such an obligation so nominal as not to affect the value of the license, a court would likely uphold it," Powell stated in his letter. "Were the cost so high that the commercial entity's license would be substantially devalued, a court could view the action as an unreasonable modification of the license."

E-mail me at djackson@primediabusiness.com <mailto:djackson@primediabusiness.com>

More news
report_att_wireless_delay <http://www.mcb3.com/click.asp?x=131ac.2d8b.933504> Report: AT&T Wireless to delay shutdown of CDPD network

efjohnson_adds_700_mhz_capability <http://www.mcb3.com/click.asp?x=131ab.2d8b.933504> EFJohnson adds 700 MHz capability to radios

motorola_releases_project25 <http://www.mcb3.com/click.asp?x=131af.2d8b.933504> Motorola releases Project-25 version of Astro

nortel_unveils_cdma_450_products <http://www.mcb3.com/click.asp?x=131a7.2d8b.933504> Nortel unveils CDMA 450 products

report_chicago_fire_department <http://www.mcb3.com/click.asp?x=131a9.2d8b.933504> Report: Chicago Fire Department to upgrade radio system in response to racial slurs

wireless_vendors_schedule <http://www.mcb3.com/click.asp?x=131a8.2d8b.933504> Wireless vendors schedule P2T-over-cellular interoperability tests

pryme_introduces_mics_surveillance <http://www.mcb3.com/click.asp?x=131ad.2d8b.933504> Pryme introduces mics, surveillance kit

From: Duncan Abernathy <daber@aiava.org>
To: "Emory Rodgers (E-mail)" <erodgers@dhcd.state.va.us>, "Ed Altizer (E-mail)" <ealtizer@dhcd.state.va.us>, "Christy King (E-mail)" <cking@vdfp.state.va.us>
Date: 10/15/2003 10:02:03 AM
Subject: in-building communications

Emory, Ed and Christy:

I sent a note to the engineering societies about the in-building communications. Along with it, I sent Kenney Payne's comments, which all of you -- except mayby Christy -- have seen. Attached is the engineer's comments and I am also attaching Kenney's for Christy's benefit.

The first comments are from J.B. Obenchain P.E. of Whitescarver Hurd & Obenchain, a consulting engineering firm here in Richmond specializing in mechanical, electrical and plumbing. He is responding or reacting to Kenney's comments about the proposed code change being discussed by Emory's task force. His comments come at the request of Nancy Israel, the executive director of the American Council of Engineering Companies in Virginia. Kenney is an architect with Moseley Architects and the chief operating officer for its Virginia Beach office. Since October 2000, he has been the VSAIA's eyes, ears and voice on the transition from the BOCA to the IBC model building code.

Duncan

I agree, this would be applicable to "high-rise" buildings, or other very
large buildings, but certainly requiring an IBCS for most structures over
12000 sf is overkill, and costly.

Also, how is our already stressed state government going to fund another department or group to "test" or verify testing reports for these systems
every year and five years?

JB

Duncan,

As written, I think the VSAIA should consider not supporting this code change unless there is empirical data indicating that this change will in
fact: (1) work in an emergency situation, such as a large fire, explosion,
building collapse, etc.; (2) clarify what is a "qualified person"; (3) submit data that supports that this could be funded by any state agency and/or locality...as a "two-way' communication only works if someone else is
on the other end and knows how to work the system and respond to any

duress;
(4) how many lives have been lost due to the lack of this type of system (I
have heard they are claiming the WTC deaths occurred because of lack of communication; however, I believe we all know that simply is not true).

I could go on, but do we know which side electrical engineers fall on this
subject? I have to believe that they would not be in favor of doing this on
every single project out there!

Also, even by their own admittance, it could cost upwards to a couple of hundred thousand dollars!? With state budgets as they are with little relief in sight, I'm sure school districts would not have the funding to support such a requirement...and private companies would balk at such a requirement.

If this ends up moving forward, I would suggest we propose a limit to its
scope to Type 1 construction or high rise buildings only! Those are the building types that rely almost entirely on fire proofing and little-to-no
fire walls. I believe that fire walls offer greater security to the health,
safety, and welfare of the public in situations that I believe this whole
issue is trying to solve...that is, avoid a communication blackout when a
building such as the World Trade Center gets hit hard.

I also have previous emails on this subject that were not in favor, and people who could speak more to the technical aspects of why this is not a
good idea.

Kenney

> Virginia Society AIA
T. Duncan Abernathy AIA
Director of Government and Industry Affairs
The Virginia Center for Architecture
15 South Fifth St.
Richmond, VA 23219
P (804) 644-3041
F (804) 643-4607
E daber@aiava.org
W www.aiava.org

CC: "Harry Kincaid (E-mail)" <hkincaid@acecva.org>, "Kenney Payne (E-mail)"

From: Duncan Abernathy <daber@aiava.org>
To: "Emory Rodgers (E-mail)" <erodgers@dhcd.state.va.us>
Date: 10/7/2003 5:12:18 PM
Subject: in-building communications

Emory,

Architects are uncertain about the wisdom of the in-building communications systems. I recommended months ago in Adam Thiel's study group that the proponents provide data that proves the need for this equipment, but have not seen anything yet. Until we do, the VSAIA cannot support the code change or legislation attempting to require such devices. Kenney Payne has made some cogent comments about the idea as well, which I have added to this quick note.

I wanted to send this to Ed Altizer as well, but do not have his e-mail address. I will try to remember to ask tomorrow, but on the off chance that my brain is functioning normally, I may very well forget. If you think of it, I would appreciate your slipping him a copy of this as well. Thank you.

Duncan

As written, it would be difficult to support this code change unless there is empirical data indicating that this change will in fact: (1) work in an emergency situation, such as a large fire, explosion, building collapse, etc.; (2) clarify what is a "qualified person"; (3) submit data that supports that this could be funded by any state agency and/or locality...as a "two-way' communication only works if someone else is on the other end and knows how to work the system and respond to any duress; and (4) how many lives have been lost due to the lack of this type of system (I have heard they are considering the WTC deaths; however, I do not think there is any substantial data that would support that belief).

Do we know which side electrical engineers fall on this subject?

Also, based on the attachment and code change, they have acknowledged this could cost upwards to a couple of hundred thousand dollars! With state budgets as they are, and with little relief in sight, I'm sure school districts would not have the funding to support such a requirement...and private companies would also balk at such a requirement.

If this ends up moving forward, I would suggest the VSAIA propose a limit to its scope/application to Type 1 construction or high rise buildings only! Those are the building types that rely almost entirely on fire proofing and little-to-no fire walls. I believe that fire walls offer greater security to the health, safety, and welfare of the public in situations where a communication blackout occurs.

There are other, more technical reasons why this may not work as intended (offered by other people whom I have received comments from, and can make available)...and if proven to be correct, then many people have expended a lot of money for a system that may not operate.

Thank you for your consideration.

July 26th

From: Emory Rodgers
To: Duncan Abernathy
Subject: Re: FW: Revised draft USBC/SFPC code change in-building emergency communication radio system

Thanks andnext meeting is July 26the as I hope you got the email from the fire folks. I will ask Adam Thiel to pass this along to the folks meeting on this one and especially Fairfax who have lead the research. your comments herein do raise some additional thoughts such as FCC reactions and new technology. i will ask Jack Anderson, the Fairfax Consultant to comment and have a response when Duncan or a VAIA representative attends the July 26th meeting where the location is yet to be determined.

>>> Duncan Abernathy <daber@aiava.org> 6/11/2003 12:52:29 PM >>>
Emory,

Here are comments from one of our more knowledgeable members about the in-building communications discussions. I do not have Adam Thiel, Ed Altizer or Christy King's (?) e-mail addresses, so I cannot forward this to them. If you have any of those addresses, would you please forward this not to them? Also, when you begin your discussions I would appreciate your adding these comments into the mix. Thank you.

Duncan

-----Original Message-----
From: David Jones [mailto:drj@SFCS.com]
Sent: Tuesday, June 10, 2003 5:39 PM
To: Duncan Abernathy; Charles Callaghan (E-mail); Charles Henry (E-mail); Jim Snowa (E-mail); John McGrann (E-mail); Kenney Payne (E-mail); Marvin Cantor (E-mail)
Subject: RE: Revised draft USBC/SFPC code change in-building emergency communication radio system

I did some talking to current and past representatives of the two largest US manufacturers of two-way communications systems and they all had basically the same comments. Distilled down, they are essentially:

1. Many localities in VA do not have compatible systems between police, fire and rescue. They cannot talk to each other with or without this system. Will the owner have to put in multiple systems or will someone pick only one emergency response group to serve? Who takes the responsibility for that decision?

2. Radio systems change and so do frequencies. Actually on a fairly regular basis as users buy new systems. And the entire 800 mhz emergency service band may be moving in the future (where most current trunked systems are). Is the owner responsible for trying to retrofit a new system in an occupied building each time this occurs? Who pays?

3. Without trying to figure if the system could be made to operate as specified, everyone expressed concern that these systems could cause interference to regular emergency communications and might cause more harm than help. This needs real study and real input from the companies that design the radio systems for police, fire and rescue and not just input from a local dept.'s technician.

4. Everyone tells me their company is coming out with new radio equipment that solves the issues this system would address. I will have to take their word for this, but such equipment would negate the need for this at some point.

5. Proposal may be trespassing in FCC's exclusive rights area. I leave that to the lawyers and feds to resolve. But it should be looked into. If their are problems or interference, the owner is responsible and subject to federal fines and forfeiture.

Bottom line from my point of view; Has any real research been done on this proposed addition? Has anyone actually talked with the major radio manufacturers? Has anyone surveyed the state localities for compatibility of police, fire and rescue radios to talk to each other? Has anyone bothered to check the proposal against federal law and FCC regulations? Does anyone know of a way to calculate if a building would need such a system in the first place and who would be responsible for that calculation - document sealing professionals? If it would work, I would be 100% behind it. I just don't think the proposal is ready to be incorporated into the state code yet.

David R. Jones, Jr. AIA

-----Original Message-----
From: Duncan Abernathy [mailto:daber@aiava.org]
Sent: Wednesday, June 04, 2003 1:32 PM
To: Charles Callaghan (E-mail); Charles Henry (E-mail); David Jones; Jim Snowa (E-mail); John McGrann (E-mail); Kenney Payne (E-mail); Marvin Cantor (E-mail)
Subject: FW: Revised draft USBC/SFPC code change in-building emergency communication radio system

Attached please find amended language for the in-building communication stuff. Any comments?

Duncan

-----Original Message-----
From: Emory Rodgers [mailto:ERODGERS@dhcd.state.va.us]
Sent: Wednesday, June 04, 2003 12:56 PM
To: Duncan Abernathy; mingrao@aoba-metro.org; Pkmrama@aol.com; robertson@chesterfield.gov; CLEMENTSRO@co.chesterfield.va.us; Curtis McIver; Ed Altizer; Glenn Dean; Jack Proctor; Norman Crumpton; Rick Farthing; Jeffrey.Coffman@FairfaxCounty.gov; mtoalson@hbav.com; janderson@rcc.com; CHAINER@vbgov.com; cwhyte@vectrecorp.com; cking@vfp.state.va.us; fmphi@widmaker.coml
Subject: Revised draft USBC/SFPC code change in-building emergency communication radio system

The 6-4-03 revised draft is based on comments from Jack Proctor, Jack Anderson and Mark Ingrao.

~ 12/20/2004

APPENDIX IV – Draft Proposed USBC Code Change

HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM
(Use this form to submit changes to building and fire codes)

Address to submit to:

DHCD, the Jackson Center
501 North Second Street
Richmond, VA 23219-1321

Tel. No. (804) 371 – 7150
Fax No. (804) 371 – 7092
Email: bhcd@dhcd.state.va.us

Document No. _____

Committee Action: _____

BHCD Action: _____

Submitted by: DHCD

Representing: DHCD for VDFP/Client Work Group

Address: 501 2nd Street, Richmond, VA

Phone No.: 804-371-7140

Regulation Title:2003 USBC/SFPC

Section No(s): 2003 USBC/IBC 902, 912 & SFPC 511

Proposed Change: USBC IBC 902.0 Definitions

Add 902.1 Definitions.

Emergency Communication Equipment. Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel. Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

Add new section into the USBC IBC Section 912.0 In-building Emergency Communication Radio Coverage

912.1. General. The locality shall determine by a written policy that it is necessary to require an in-building emergency communication radio system to be designed and constructed so that emergency public safety personnel may send and receive emergency communications from within those structures or be equipped with emergency communication equipment so that emergency public safety personnel may send and receive emergency communications from within those structures within the locality or designated geographical areas of the locality. An in-building emergency communication equipment for emergency public safety personnel shall be provided in unlimited area buildings and buildings of Construction Types I, II, III, IV and V as regulated by the International Building Code.

Exceptions:

1. Local and state governments, federal space within private buildings and private buildings/spaces with top security clearance requirements where the building official has approved an alternate method to provide emergency communication equipment for emergency public safety personnel.
2. Where the owner provides documentation from a qualified individual approved by the building official where emergency communication equipment would not be required for two-way radio communication.
3. Above-grade single story buildings of 12,000s.f. or less.
4. USBC Group R-5 of the International Residential Code and Groups R-3 and R-4 of the International Building Code.
5. Construction Type IV and V buildings of combustible construction without basements.
6. Where the building official approves alternate technology to provide in-building emergency

communications for emergency public safety personnel.
912.1.1. Applicability. The provisions of this section shall apply to building applications filed on and after the set forth effective date of this code.
912.2. General. Where required, in-building radio coverage shall be designed, installed, inspected and tested in accordance with provisions of this section.
912.2.1. A minimum signal strength of –95dBm, as measured at the antenna terminal of the public safety portable transceiver, shall be available to receive and transmit in 95% of the area on each floor of the building from or to the designated public safety radio system. A minimum received signal strength of –95dBm, as measured at the designated radio system fixed end receiver terminal, shall result for portable radio transmissions made in 95% of the area on each floor of the building. The building official shall be permitted to accept lower minimum signal strength specifications where required for the radio system technology used in a jurisdiction.
912.2.1.1. Where bi-directional amplifier systems are installed, the proof of performance signal strength measurement for the downlink path shall be based on a control channel or traffic channel signal from the designated public safety radio system. Signal strength measurements for the uplink path shall be based on one input signal generated using a portable radio operated at the worst-case extremity of the distributed antenna system. Bi-directional amplifiers shall be maintained an out of band noise, intermodulation, and spurious emissions to desired carrier ratio of at least 35 dBc when measured against public safety system carrier signal levels.
912.2.2. The in-building emergency communication radio system shall be designed for a 95% reliability factor.
912.2.3. Where the installed in-building emergency communication radio system contains electrically powered components there shall be an independent power source to provide power for a period of twelve ours without external power input. Where a battery system is installed there shall be automatic charging in the presence of an external power input.
912.2.4. The in-building emergency communication radio system shall have the capability for self-monitoring of the emergency communication equipment. Where there is a requirement for a supervised fire alarm system the emergency communications equipment self-monitoring can be tied into the building fire alarm system. Where there is no required supervised fire alarm system, there shall be a visual/audible alarm for self-monitoring in the vicinity of the emergency communication equipment.
912.3. Acceptance test procedures. Upon completion of the installation, the performance of the in-building emergency communication radio system shall be tested to ensure that the 95% area and 95% reliability requirements are satisfied.
912.3.1. The text shall be conducted using a public safety portable radio with speaker microphone or equivalent portable radios approved by the building official.
912.3.2. Where bi-directional amplifier systems are installed, the gain value and output levels of all uplink and
downlink amplifiers shall be measured and documented, and the acceptance test results shall be kept on file with the building owner for verification each year during the annual inspection and tests.
912.3.3. A copy of the acceptance test records shall be kept on the premises and a copy shall be submitted to the fire official.
912.3.4. The acceptance tests shall be conducted and certified by a qualified individual approved by the building official.

Add new section to the SFPC 511.0. Maintenance of in-building emergency communication radio systems

511.1 General. In-building emergency communication radio systems shall be maintained in accordance with the USBC and the provisions of this section.
511.2. Annual inspection. The annual inspection shall test all components of the system, including but not limited to, amplifiers, independent power sources, antennas and wiring a minimum of once every twelve months.

511.2.1. The annual and five-year inspection tests shall be performed by the locality or by qualified individuals or agencies approved by the fire official.
511.2.2. Amplifiers shall be tested to ensure that the gain and output levels are the same as designated on the approved acceptance test. The independent power source shall be tested under load for a period of one hour.
511.2.3. All components shall function in accordance with the manufacturer's specifications and intended purpose.
511.3. Five-year tests. No less than every five years, a radio coverage test shall be performed to ensure that the in-building emergency communication radio system meets the requirement of the original acceptance coverage test in accordance with the USBC under which the building was built. Note: The USBC requires on each floor 95% coverage and minimum signal strength of 95dBm for receiving and transmission.
511.4. Field tests. After providing reasonable notice to the owner or their representative the fire official, fire or police chief or their agents shall have the right during normal business hours to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner or the owner's representative.
511.5. A copy of the annual and five-year inspection tests shall be kept on the premises and the fire official shall retain a copy.

Supporting Statement:
IBC 902 add definitions from the Code of Virginia
IBC 912 add new section
IBC 912.1 Scope Requires localities to have systems installed in Construction Types I, II, III, IV and V unless they fall into the 6 exceptions. Offers the opportunity for the locality to opt in. Another option that will be considered concurrently is to seek legislative action amending 36-99.6.2 to allow local optional enforcement. The exceptions provide for alternate means and new technology; allows the owner to provide data to contest the requirement; and, allows for most all smaller commercial and residentia buildings to be exempted. Some commenters believe the 12,000 s.f. is too low and should be raised, but a substitute number has not been proposed. The VSAIA recommencs that the Scope to be limited to Construction Types I which are the larger multi-story buildings. or very large one story unlimited area buildings such as retail box stores Multi-family mid-rise buildings of 3 to 5 story buildings of Construction Types IV and V without basements would be exempted and most of the ones with basements would probably not be designated for wiring/conduits. Some want Groups E and I exempted as they are generally not considered "commercial buildings" as referenced in the law.
IBC 912.1.1 Only applicable to buildings built after the effective date of this code.
IBC 912.2 Set forth the technical, inspection and testing requirements. These are industry standards used by multiple vendors and different type systems. Localities can use lower signal strengths per 912.2.1.
912.2.3 Provides separate power source to ensure operation with loss of building power.
912.2.4 Provides self-monitoring so maintenance personnel or public safety personnel can tell system is operable.
912.3 Provides the acceptance test criteria for new installations.
SFPC 511.0 to 511.5. Provides for an annual inspection and five-year tests of the entire system to be based on the standards and USBC built under.

This code change will increase the cost of construction for those building designated to have these systems installed. Cost estimates run from a few thousand dollars to several hundreds of thousands of dollars. Based on meeting discussions not every new building designated within 912.1 would need to be wired or provide amplification equipment. To date there isn't a consensus on this code change proposal.

VIRGINIA ACTS OF ASSEMBLY -- CHAPTER

An Act to amend the Code of Virginia by adding a section numbered 36-99.6:2, relating to the Uniform Statewide Building Code; installation of communication equipment for emergency public safety personnel.

[H 2529]
Approved

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding a section numbered 36-99.6:2 as follows:

§ 36-99.6:2. Installation of in-building emergency communication equipment for emergency public safety personnel.

The Board of Housing and Community Development shall promulgate regulations as part of the Building Code requiring such new commercial, industrial, and multifamily buildings as determined by the Board be (i) designed and constructed so that emergency public safety personnel may send and receive emergency communications from within those structures or (ii) equipped with emergency communications equipment so that emergency public safety personnel may send and receive emergency communications from within those structures.

For the purposes of this section:

"Emergency communications equipment" includes, but is not limited to, two-way radio communications, signal boosters, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or any combination of the foregoing.

"Emergency public safety personnel" includes firefighters, emergency medical services personnel, law-enforcement officers, and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes, and terrorist attacks.

Legislative Information System

B
Group, F, BM, R2

inside to outside is the problem

Vernon Hodge

From: Cheri B. Hainer [CHainer@vbgov.com]
Sent: Tuesday, January 16, 2007 5:09 PM
To: Emory Rodgers; Vernon Hodge; Witt, Rick; Glenn Dean; rcgva@comcast.net; Guy Tomberlin; JOHN CATLETT; J. D. Mitchell; vpffld@aol.com; Mark Ingrao; Duncan Abernathy; Dale.Johnson@alexandriava.gov; michael.reilly@fairfaxcounty.gov; wernerc@charlottesville.org; ccsingleton@aol.com; steve.souder@fairfaxcounty.gov; Chip Dicks; GHUFFMAN@co.roanoke.va.us; djohnston@boma.org; harris@meckcom.net; Wayne Campagna
Cc: Bill Shelton; Ed Altizer; Shelton, Willie G. "Billy"
Subject: RE: 1-9-07 In-building Emergency Communication Work Group 2nd Meeting Notes
Attachments: Code Change in bldg 0107.cbh.doc

This is a first draft. Please feel free to make any comments. Thanks

Cheri B. Hainer, CBO
Permits and Inspections Administrator
Planning/Permits and Inspections
2405 Courthouse Drive Building 2 Room 100
Virginia Beach, Virginia 23456
Office 757-385-4211
Fax 757-385-5777

From: Emory Rodgers [mailto:Emory.Rodgers@dhcd.virginia.gov]
Sent: Tuesday, January 09, 2007 12:35 PM
To: Vernon Hodge; Witt, Rick; Glenn Dean; rcgva@comcast.net; Guy Tomberlin; JOHN CATLETT; J. D. Mitchell; vpffld@aol.com; Mark Ingrao; Duncan Abernathy; Dale.Johnson@alexandriava.gov; michael.reilly@fairfaxcounty.gov; Cheri B. Hainer; wernerc@charlottesville.org; ccsingleton@aol.com; steve.souder@fairfaxcounty.gov; Chip Dicks; GHUFFMAN@co.roanoke.va.us; djohnston@boma.org; harris@meckcom.net; Wayne Campagna
Cc: Bill Shelton; Ed Altizer; Shelton, Willie G. "Billy"
Subject: 1-9-07 In-building Emergency Communication Work Group 2nd Meeting Notes

Attendees and copied parties:

1. The parties attending representing VFCA, VBCOA, VSFA and VPFF crafted the concept for a new code change that Cheri Hainer from Va. Beach will prepare and circulate for comments.
2. The new code change for the 2006 USBC and SFPC will be a stepping stone and seeks consensus among all the parties specifically to gain support from the development, design and building owner's stakeholders.
3. The code change will, like the earlier version, limit the scope to larger buildings and those of nom-combustible construction.
4. The USBC code change would require owners to only install conduit and leaky type cable at a far less cost then installing the more expensive antennas, amplifiers, etc that localities would then provide where they deemed necessary and paid for by the localities with owners providing access and space. The pre-wiring could be eliminated when at the time of construction the locality or the owner agree pre-wiring is unnecessary. The pre-wiring would be for only emergency communications and one system.
5. The SFPC code change would only require the owner to provide access to the locality for testing at the expense of the locality.
6. the goal is to have consensus or at least high acceptance by the end of January so staff could prepare the code changes for the BHCD's Codes and Standards Committee Meeting on February 20th at 9:30 here at DHCD.

The attendees believe this is a win-win for all parties as it substantially reduces the cost for compliance to owners and

DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us		Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to allow emergency public safety personnel to send and receive emergency communications* shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
3. Above grade single story buildings of less than 12,000 square feet.
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof is exempt from the requirements of this section.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be pre-wired to accommodate and perpetuate continuous emergency communication through the installation of radiating coaxial cable.

912.2.1 Installation. Radiating coaxial cable or equivalent shall be installed in dedicated conduit compatible for the installation and other provisions of this code.

912.2.2 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
402.13.1	Covered malls
403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Applicable sections referenced in Table 912.1.1, found in the *International Building Code.*

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Applicable sections referenced in Table 912.1.1, found in the *International Fire Code.*

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION RADIO SYSTEMS

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the locality denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field Tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's communication system. Other localities were experiencing the same issues and several joined the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus between the code, construction and building owners communities could be reach and the codes were not adopted. But the concern for the emergency public safety personnel is still prevalent, so the interested parties have come back to the table and arrived at this compromise as a first step to addressing this issue.

Vernon Hodge

From: Emory Rodgers

Sent: Wednesday, January 17, 2007 6:54 AM

To: Cheri B. Hainer; Vernon Hodge

Cheri: 912.4 and 511.3: Not sure owner needs report unless it is on the conduit or cable? So would suggest both places clarify owner gets report only if these two items have problems?
511.2: Last sentence not making sense for me? Is it "if the owner denies the locality access"?
I am still not convinced that 912.1 Exception 2 at 12,000s.f. makes sense for then requiring a 13,000 s.f. building to do the conduit and cable for all the required occupancies and construction types? Heard Chief Werner and others say it was in much larger one story buildings.

Thanks

Vernon Hodge

From: Cheri B. Hainer [CHainer@vbgov.com]
Sent: Tuesday, January 23, 2007 12:11 PM
To: Emory Rodgers; Witt, Rick; Vpffld@aol.com; mark@naahq.org; ssterling@aoba-metro.com; Dale.Johnson@alexandriava.gov; rcgva@comcast.net; wernerc@charlottesville.org; Tomberlin, Guy
Cc: Ed Altizer; Vernon Hodge; Shelton, Willie G. "Billy"; Glenn Dean; Bill Shelton
Subject: FW: In-Building Emergency Communication Ad-hoc Wrok Group-DHCD
Attachments: Code Change - In Building.PDF; In_Building_In_Tunnel_Ordinances_Report.pdf; FW FCC puts Cyren Call Plan out for public comment.txt; Code Change in bldg 0107.cbh.doc

Sorry to send it out this way but I want to make sure everyone had the Oct 31, 2006 meeting notes as reference. There has been some discussion in that meeting it was decided to exempt Group R-2 but I can't find it in my notes anywhere so please let me know if I am missing something. However, based on recent communications, I have made a few amendments to the latest proposal (denoted in bold italics) to exempt the dwelling units of R-2 , and especially in high-rises. There are already provision in the USBC so it isn't a new condition. I also changed 12,000 to 20,000 for single story buildings, again aligning with sprinkler requirements. I did not change the dedicated conduit requirement because it reads "compatible with the installation" - if the cable won't function in a conduit and meets the requirements of Chapter 7, then I think we are ok. Also, to address the frequency issue (cable must match frequency), the locality would need to supply that information the same way it supplies water calculations for sprinkler systems - I don't really see that as an issue. We had already decided that if the locality changes their system, they were responsible for the updates. Please let me know what you think.

From: Emory Rodgers [mailto:Emory.Rodgers@dhcd.virginia.gov]
Sent: Wednesday, November 01, 2006 12:49 PM
To: GHUFFMAN@co.roanoke.va.us; J. D. Mitchell; Wayne Campagna; Cheri B. Hainer; Carol Saulnier; chris.essid@governor.virginia.gov; sward@vhha.com; Julia Ciarlo Hammond; Mark Ingrao; steve@agcva.org; mflynn@vml.org; Fields, Mary Jo; ccsingleton@aol.com; Richard W. Harris; vpffld@aol.com; mouse260@msn.com; rcgva@comcast.net; djohnston@boma.org; Witt, Rick; jack.anderson@fairfaxcounty.gov; steve.souder@fairfaxcounty.gov; Duncan Abernathy; dale.johnson@alexandriava.gov; Mike Toalson; Chip Dicks
Cc: Bill Shelton; Ed Altizer; Vernon Hodge; Glenn Dean; Shelton, Willie G. "Billy"
Subject: In-Building Emergency Communication Ad-hoc Wrok Group-DHCD

Attendees and Interested Parties: On October 31, 2006 representatives from Virginia Fire Chiefs Association, Apartment and Owners Building Association, Building Owners and Management Association, Virginia Professional Fire Fighters, Virginia State Firefighter Association and the City of Virginia Beach/Virginia Building and Code Officials Association met, as a Department of Housing and Community Development's ad-hoc work group, to see if the parties could initiate a dialogue and then develop consensus a code change for the 2006 Uniform Statewide Building Code. The 2006 USBC will be promulgated by the Board of Housing and Community Development during 2007 with an estimated effective date of March of 2008.

Summary Notes of the October 31st meeting:

- Emory Rodgers, Deputy Director, Building and Fire Regulations Division-DHCD, facilitated the meeting. A brief history of the past attempts to study and then reach a consensus on code changes were reviewed with the attendees. In 2003 the Virginia Department of Fire Programs undertook a study of the matter and filed a report in 2004 with the General Assembly. The Board of Housing and Community Development appointed an ad-hoc committee in 2004 to develop consensus code changes without success.
- Cheri Hainer, Virginia Beach Building Official, reviewed the 2004 code change that was submitted to the BHCD. The code change had technical equipment specifications and testing requirements that generally were okay with most of the parties. The scope or application to what type buildings was fairly expansive and wasn't supported by owners and design professionals. The maintenance provisions were another set of requirements that lacked

consensus and clarity on who would pay for repairs, replacement of equipment and how enforcement would take place with identification of non-compliance.

- Attendees reviewed a list of technical, administrative and legal issues that were and are today unresolved. Some of the issues included inoperability and compatibility of 1st responders when perhaps 50% of emergency communication systems are still on the 150-400 MHz and 50% on the 800 MHz; initial costs ranging from a few thousand dollars to tens of thousands of dollars for equipment and modeling tests being done to determine application; rebanding of the frequencies by the FCC was not done and today is still not done in the state with perhaps another 3 years to complete; legal liability issues for owners from civil litigation; and, changing technology.
- Discussions took place on where might some options exists for the group members to find some common ground. Two ideas emerged. The 1st was to narrow the scope to perhaps 3-4 types of buildings such as large garages, both above and underground; large box stores and mall complexes; large educational buildings and hospitals. The 2nd suggestion was to only require at the time of construction for these designated buildings that conduit and some type wiring be the only requirements on the floors and installed to the roofs thus avoiding most legal liability issues; reducing down the initial costs and essentially not having then to determine responsibility for subsequent expensive repairs or new amplification equipment, antennas and back-up power supplies. Cheri Hainer will craft a new draft and Art Lipscomb will coordinate with her on his thoughts of a passive type system.
- A PDF file on this subject is being attached from the Department of Homeland Security.
- Legislative action was briefly discuss that might consider amending the Code of Virginia for local option as a zoning and land-use/proffer system. There didn't seem to be a high interest to follow this approach.
- To have the next two meeting to be more focused and to ensure all the interested parties are at the table those copied and who didn't attend this 1st meeting would be asked to attend the next meeting. It would be especially important for representation to be present from Fairfax, Charlottesville, Arlington and Alexandria, the VML and VACO organizations, technical consultants to local governments and the industry representatives from Motorola and Maycom, Virginia Society of AIA, Sheriff and Police Associations. Ed Rhodes, Art Lipscomb and Richard Harris will make contacts with the 1st responder groups to have them send a representative. Emory will request the design professionals, hotels and hospital representatives to attend the next meeting.
- **The next two meeting will be at the Department of Housing and Community Development set for January 9th and March 13th starting at 9:30 to 1:30. Please email emory.rodgers@dhcd.virginia.gov on your planned attendance at both of these meetings.**

Attendees please feel free to bring forth additional comments to this summary. I want to extend my appreciation and thanks for the work done at this 1st meeting and the very professional and positive positions that each of you brought to the table.

Have attached for your information FCC intent to put out for comment proposal to expand the options for the 700MHz for public safety agencies.

DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us		Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to allow emergency public safety personnel to send and receive emergency communications* shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, ***within dwelling units of R-2***, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
3. Above grade single story buildings of less than ***20,000*** square feet.
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof is exempt from the requirements of this section.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be pre-wired to accommodate and perpetuate continuous emergency communication through the installation of radiating coaxial cable.

912.2.1 Installation. Radiating coaxial cable or equivalent shall be installed in dedicated conduit compatible for the installation and other provisions of this code.

912.2.2 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
402.13.1	Covered malls
403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Applicable sections referenced in Table 912.1.1, found in the *International Building Code.*

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.1 exception 6. Within dwelling units in Group R-2 in accordance with Section 310.1.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Applicable sections referenced in Table 912.1.1, found in the *International Fire Code.*

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION ~~RADIO SYSTEMS~~ *EQUIPMENT*

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the ***building owner*** denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field Tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. ***~~Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative~~.***

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's communication system. Other localities were experiencing the same issues and several joined the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus between the code, construction and building owners communities could be reach and the codes were not adopted. But the concern for the emergency public safety personnel is still prevalent, so the interested parties have come back to the table and arrived at this compromise as a first step to addressing this issue.

DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us	2/16/07	Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to allow emergency public safety personnel to send and receive emergency communications* shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, ***within dwelling units of R-2***, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
3. Above grade single story buildings of less than ***20,000*** square feet.
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof is exempt from the requirements of this section.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be able ~~pre-wired~~ to accommodate and perpetuate continuous emergency communication through the installation of radiating coaxial cable or conduit by providing the space xxxx and need slab cut.

~~**912.2.1 Installation.** Radiating coaxial cable or equivalent shall be installed in dedicated conduit compatible for the installation and other provisions of this code.~~

912.2.2 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

~~**912.3 Other required installations.** In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.~~

~~**TABLE 912.3.1**~~
~~**ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS**~~

~~**SECTION**~~	~~**SUBJECT**~~
~~402.13.1~~	~~Covered malls~~
~~403.8.1~~	~~High-rise buildings~~
~~406.3.10.1~~	~~Motor vehicle related occupancies~~
~~507.9~~	~~Unlimited area buildings~~
~~IFC~~	~~Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*~~

~~**912.4 Acceptance Test.** Upon completion of installation, after providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.~~

~~**Applicable sections referenced in Table 912.1.1, found in the *International Building Code.***~~

~~**Section 402.13.1.** Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.~~

~~***Section 403.1 exception 6. Within dwelling units in Group R-2 in accordance with Section 310.1.***~~

~~**Section 403.8.1.** High rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.~~

~~**Section 406.3.10.1.** Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.~~

~~**Section 507.9:** Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.~~

~~**Applicable sections referenced in Table 912.1.1, found in the *International Fire Code.***~~

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION ~~RADIO SYSTEMS~~
EQUIPMENT (THIS GOES INTO SFPC)

511.1 General. In-building emergency communication equipment shall be maintained by the locality ~~in accordance with the USBC and the provisions of this section.~~

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the ***building owner*** denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field Tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. ~~***Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative***~~.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's communication system. Other localities were experiencing the same issues and several joined the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus between the code, construction and building owners communities could be reach and the codes were not adopted. But the concern for the emergency public safety personnel is still prevalent, so the interested parties have come back to the table and arrived at this compromise as a first step to addressing this issue.

DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us	Request proposal from Cheri 3/16/07 Probably 3/13	Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC / SFPC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to* allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
3. Above grade single story buildings of less than 20,000 square feet.
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof ***does not impede emergency communication signals.***

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be ~~pre-wired~~ equipped throughout with dedicated infrastructure to accommodate and perpetuate continuous emergency communication ~~through the installation of radiating coaxial cable.~~

912.2.1 Installation. R~~R~~adiating cable systems, such as coaxial cable or equivalent shall be installed in dedicated conduits, raceways, plenums, attics, ***or roofs,*** compatible for these specific installations ~~and~~ as well as other applicable provisions of this code.

912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to and the ability to operate such equipment, sufficient space within the building shall be provided.

912.2.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
402.13.1	Covered malls
403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, ***emergency public safety personnel*** shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Applicable sections referenced in Table 912.1.1, found in the *International Building Code*, *in accordance with Section 101.2 of the Virginia Uniform Statewide Building Code.*

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.1 exception 6. Within dwelling units in Group R-2 in accordance with Section 310.1.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Applicable sections referenced in Table 912.1.1, found in the *International Fire Code*.

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that increased amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the building owner denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field Tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's emergency communication system. Other localities were experiencing similar issues and several joined in the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus could be reached among the code, construction and building owners communities and consequently no codes were adopted. But the concern for and by the emergency public safety personnel is still prevalent, prompting the introduction of House Bill 2554 2007. Accordingly, the interested parties have come back to the table and as the In-Building Communications Work Group, have arrived at this compromise as a first step to addressing this issue. The installation and maintenance costs and responsibilities of the building owner have been greatly reduced as they now need only provide basic and generic infrastructure, capable of enhancing any supplemental emergency communication equipment, which will be provided and maintained by the locality.

DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us	Latest proposal from Cheri - 3/15/07	Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC / SFPC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to* allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
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4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.
5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof ***does not impede emergency communication signals.***

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be ~~pre-wired~~ equipped throughout with dedicated infrastructure to accommodate and perpetuate continuous emergency communication ~~through the installation of radiating coaxial cable.~~

912.2.1 Installation. R~~R~~adiating cable systems, such as coaxial cable or equivalent shall be installed in dedicated conduits, raceways, plenums, attics, ***or roofs,*** compatible for these specific installations ~~and~~ as well as other applicable provisions of this code.

912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to and the ability to operate such equipment, sufficient space within the building shall be provided.

912.2.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
402.13.1	Covered malls
403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, ***emergency public safety personnel*** shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Applicable sections referenced in Table 912.1.1, found in the *International Building Code*, *in accordance with Section 101.2 of the Virginia Uniform Statewide Building Code.*

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.1 exception 6. Within dwelling units in Group R-2 in accordance with Section 310.1.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Applicable sections referenced in Table 912.1.1, found in the *International Fire Code*.

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that increased amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the building owner denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field Tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's emergency communication system. Other localities were experiencing similar issues and several joined in the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus could be reached among the code, construction and building owners communities and consequently no codes were adopted. But the concern for and by the emergency public safety personnel is still prevalent, prompting the introduction of House Bill 2554 2007. Accordingly, the interested parties have come back to the table and as the In-Building Communications Work Group, have arrived at this compromise as a first step to addressing this issue. The installation and maintenance costs and responsibilities of the building owner have been greatly reduced as they now need only provide basic and generic infrastructure, capable of enhancing any supplemental emergency communication equipment, which will be provided and maintained by the locality.

VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CODE CHANGE FORM

Address to submit to: DHCD, The Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.virginia.gov	Glenn Dean's notes from 3/13 mtg. 3/13/07	Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: Cheri Hainer Representing: City of Virginia Beach

Address: 2405 Courthouse Drive, Bldg. 2, Room 100, Virginia Beach, VA 23456

Phone No. (757) 385-4211

Regulation Title: USBC / SFPC Section No(s): New IBC Section 912, New IFC Section 511

(USBC / SFPC; New IBC Section 912, New IFC Section 511)

Proposed Change:

(latest changes shown in brackets [ ])

SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to* ***allow emergency public safety personnel to send and receive emergency communications*** shall be provided in new buildings and structures in accordance with this section.

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, ***within dwelling units of R-2***, R-3, R-4, R-5, and U.
2. Buildings of Type IV and V construction without basements.
3. Above grade single story buildings of less than ***20,000*** square feet.
4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.

5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof ~~is exempt from the requirements of this section.~~ doesn't impede emergency communications.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be [~~pre-wired~~ equipped throughout with dedicated infrastructure] to accommodate and perpetuate continuous emergency communication [~~through the installation of radiating coaxial cable~~] . or roof access

912.2.1 Installation. Radiating [cable systems, such as] coaxial cable or equivalent shall be installed in dedicated [~~conduit~~ conduits, raceways, plenums, ~~or~~ attics] compatible for [~~the~~ these specific] installations [~~and~~ as well as] other [applicable] provisions of this code.

[912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to as well as the ability to operate such equipment, sufficient space within the building shall be provided.]

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912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
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403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

Emergency public safety personnel

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, the ~~fire official, police chief,~~ and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

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Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Chevy doesn't object to delete.

~~**Section 907.9:** Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.~~

~~**Applicable sections referenced in Table 912.1.1 found in the *International Fire Code.***~~

SFPC IFC

SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION ~~RADIO SYSTEMS~~ *EQUIPMENT*

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional In-Building Emergency Communications Installations. If it is determined by the locality that [increased] amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the ***building owner*** denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

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DEPT. OF HOUSING AND COMMUNITY DEVELOPMENT REGULATORY CHANGE FORM

(Use this form to submit changes to building and fire codes)

Address to submit to: DHCD, the Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.state.va.us	Emory's Notes from 3/13 meeting. 3/16/07	Document No. _____ Committee Action: _____ BHCD Action: _____

Submitted by: **Cheri Hainer** Representing: **City of Virginia Beach**

Address: **2405 Courthouse Drive Bldg 2 Room 100 Va Beach VA 23456** Phone No.: **757-385-4211**

Regulation Title: **USBC / SFPC** Section No(s): **NEW Section 912 IBC & 511 IFC**

Proposed Change:

[F] SECTION 902 DEFINITIONS

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[F] SECTION 912 IN-BUILDING EMERGENCY COMMUNICATIONS COVERAGE

912.1 General. In-building emergency communication equipment *to* allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

Formatted

EXCEPTIONS:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.
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5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof ***does not impede emergency communication signals.***

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be equipped throughout with dedicated infrastructure to accommodate and perpetuate continuous emergency communication.

Deleted: pre-wired

Deleted: through the installation of radiating coaxial cable.

912.2.1 Installation. Radiating cable systems, such as coaxial cable or equivalent shall be installed in dedicated conduits, raceways, plenums, attics, ***or roofs,*** compatible for these specific installations, as well as other applicable provisions of this code.

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912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to and the ability to operate such equipment, sufficient space within the building shall be provided.

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912.2.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Other required installations. In addition to the requirements of Section 912.1, in-building emergency communications shall also be required in certain special use occupancies as indicated in Table 912.3.1.

TABLE 912.3.1
ADDITIONAL EMERGENCY COMMUNICATION SYSTEMS

SECTION	SUBJECT
402.13.1	Covered malls
403.8.1	High-rise buildings
406.3.10.1	Motor vehicle related occupancies
507.9	Unlimited area buildings
IFC	Emergency communication equipment requirements as set forth in Section 511 of the *International Fire Code*

912.4 Acceptance Test. Upon completion of installation, after providing reasonable notice to the owner or their representative, ***emergency public safety personnel*** shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

Applicable sections referenced in Table 912.1.1, found in the *International Building Code,* *in accordance with Section 101.2 of the Virginia Uniform Statewide Building Code.*

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.1 exception 6. Within dwelling units in Group R-2 in accordance with Section 310.1.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Applicable sections referenced in Table 912.1.1, found in the *International Fire Code.*

SPFC **SECTION 511 MAINTENANCE OF IN-BUILDING EMERGENCY COMMUNICATION**

SPFC **511.1 General.** In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

SPFC **511.2 Additional In-Building Emergency Communications Installations.** If it is determined by the locality that increased amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the building owner denies the locality access and /or appropriate space, the building owner shall be responsible for the installation and maintenance of these additional systems.

SPFC **511.3 Field Tests.** After providing reasonable notice to the owner or their representative, the fire official, police chief, and/or their agents shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's emergency communication system. Other localities were experiencing similar issues and several joined in the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no consensus could be reached among the code, construction and building owners communities and consequently no codes were adopted. But the concern for and by the emergency public safety personnel is still prevalent, prompting the introduction of House Bill 2554 2007. Accordingly, the interested parties have come back to the table and as the In-Building Communications Work Group, have arrived at this compromise as a first step to addressing this issue. The installation and maintenance costs and responsibilities of the building owner have been greatly reduced as they now need only provide basic and generic infrastructure, capable of enhancing any supplemental emergency communication equipment, which will be provided and maintained by the locality.

VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CODE CHANGE FORM

Address to submit to:

DHCD, The Jackson Center
501 North Second Street
Richmond, VA 23219-1321

Tel. No. (804) 371 – 7150
Fax No. (804) 371 – 7092
Email: bhcd@dhcd.virginia.gov

6/14/2007
Workgroup 2
MBBTAC

Document No. _____

Committee Action: _____

BHCD Action: _____

Submitted by: Cheri Hainer Representing: City of Virginia Beach

Address: 2405 Courthouse Drive, Bldg. 2, Room 100, Virginia Beach, VA 23456

Phone No. (757) 385-4211

Regulation Title: 2003 USBC and SFPC Section No(s): USBC 902, 912 and SFPC 511

Proposed Change:

(1) In the USBC, add new definitions to Section 902 of the IBC as follows:

Emergency Communication Equipment. Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel. Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

(2) In the USBC, add Section 912 to the IBC as follows:

Section 912. In-Building Emergency Communications Coverage.

912.1 General. In-building emergency communication equipment to allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

Exceptions:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.

2. Buildings of Type IV and V construction without basements.

3. Above grade single story buildings of less than 20,000 square feet.

4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.

5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof does not impede emergency communication signals.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be equipped throughout with dedicated infrastructure to accommodate and perpetuate continuous emergency communication.

912.2.1 Installation. Radiating cable systems, such as coaxial cable or equivalent shall be installed in dedicated conduits, raceways, plenums, attics, or roofs, compatible for these specific installations as well as other applicable provisions of this code.

912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to and the ability to operate such equipment, sufficient space within the building shall be provided.

912.2.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Acceptance test. Upon completion of installation, after providing reasonable notice to the owner or their representative, emergency public safety personnel shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

(3) In the SFPC, add Section 511 to the IFC as follows:

Section 511. Maintenance of In-Building Emergency Communication Equipment.

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional in-building emergency communications installations. If it is determined by the locality that increased amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the building owner denies the locality access or appropriate space, or both, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, or their agents, shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's emergency communication system. Other localities were experiencing similar issues and several joined in the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and no

consensus could be reached among the code, construction and building owners communities and consequently no codes were adopted. But the concern for and by the emergency public safety personnel is still prevalent, prompting the introduction of House Bill 2554 2007. Accordingly, the interested parties have come back to the table and as the In-Building Communications Work Group, have arrived at this compromise as a first step to addressing this issue. The installation and maintenance costs and responsibilities of the building owner have been greatly reduced as they now need only provide basic and generic infrastructure capable of enhancing any supplemental emergency communication equipment, which will be provided and maintained by the locality.

10/10/2007
STAKEHOLDER MTG FOR CONSIDERATION OF NC PROPOSALS

VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
DIVISION OF BUILDING AND FIRE REGULATION

2006 Code Change Cycle – Code Change Evaluation Form

USBC – Virginia Construction Code
Code Change No. C-912.1

Nature of Change: (text is on code change form)

To provide the basic infrastructure capable of supporting emergency communication equipment in the construction of certain new buildings.

Proponent: City of Virginia Beach (and In-Building Emergency Communications Task Group)

Staff Comments:

This proposal was developed cooperatively through the In-Building Communications Task Group and Workgroups 2 and 3. While the current proposal is not as extensive as former proposals, the groups determined that it would provide a good first step in enhancing the ability of firefighters and emergency responders to effectively communicate where building feature impediments are present. It was recognized that the technology utilized in emergency communications is still in a state of change, which plays a factor in developing a more comprehensive proposal. All groups recommend this change to move forward as consensus.

Codes and Standards Committee Action:

_____ Approve as presented. _____ Disapprove.

_____ Approve as modified (specify):

_____ Carry over to next cycle. _____ Other (specify):

VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CODE CHANGE FORM

Address to submit to: DHCD, The Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.virginia.gov		Document No. C-912.1 Committee Action: _____ BHCD Action: _____

Submitted by: Cheri Hainer Representing: City of Virginia Beach

Address: 2405 Courthouse Drive, Bldg. 2, Room 100, Virginia Beach, VA 23456

Phone No. (757) 385-4211

Regulation Title: 2003 USBC and SFPC Section No(s): USBC 902, 912 and SFPC 511

Proposed Change:

(1) In the USBC, add new definitions to Section 902 of the IBC as follows:

Emergency Communication Equipment. Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel. Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

(2) In the USBC, add Section 912 to the IBC as follows:

Section 912. In-Building Emergency Communications Coverage.

912.1 General. In-building emergency communication equipment to allow emergency public safety personnel to send and receive emergency communications shall be provided in new buildings and structures in accordance with this section.

Exceptions:

1. Buildings of Use Groups A-5, I-4, within dwelling units of R-2, R-3, R-4, R-5, and U.

2. Buildings of Type IV and V construction without basements.

3. Above grade single story buildings of less than 20,000 square feet.

4. Buildings or leased spaces occupied by federal, state, or local governments, or the contractors thereof, with security requirements where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.

5. Where the owner provides technological documentation from a qualified individual that the structure or portion thereof does not impede emergency communication signals.

912.2 Where required. For localities utilizing public safety wireless communications, new buildings and structures shall be equipped throughout with dedicated infrastructure to accommodate and perpetuate continuous emergency communication.

912.2.1 Installation. Radiating cable systems, such as coaxial cable or equivalent shall be installed in dedicated conduits, raceways, plenums, attics, or roofs, compatible for these specific installations as well as other applicable provisions of this code.

912.2.2 Operations. The locality will assume all responsibilities for the installation and maintenance of additional emergency communication equipment. To allow the locality access to and the ability to operate such equipment, sufficient space within the building shall be provided.

912.2.3 Inspection. In accordance with Section 113.3, all installations shall be inspected prior to concealment.

912.3 Acceptance test. Upon completion of installation, after providing reasonable notice to the owner or their representative, emergency public safety personnel shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner. Any noted deficiencies shall be provided in an inspection report to the owner to the owner or the owner's representative.

(3) In the SFPC, add Section 511 to the IFC as follows:

Section 511. Maintenance of In-Building Emergency Communication Equipment.

511.1 General. In-building emergency communication equipment shall be maintained in accordance with the USBC and the provisions of this section.

511.2 Additional in-building emergency communications installations. If it is determined by the locality that increased amplification of their emergency communication system is needed, the building owner shall allow the locality access as well as provide appropriate space within the building to install and maintain necessary additional communication equipment by the locality. If the building owner denies the locality access or appropriate space, or both, the building owner shall be responsible for the installation and maintenance of these additional systems.

511.3 Field tests. After providing reasonable notice to the owner or their representative, the fire official, police chief, or their agents, shall have the right during normal business hours, or other mutually agreed upon time, to enter onto the property to conduct field tests to verify that the required level of radio coverage is present at no cost to the owner.

Supporting Statement:

In 2002, on behalf of my locality, I made a proposal to require the pre-wiring of buildings to supplement and enhance the locality's emergency communication system. Other localities were experiencing similar issues and several joined in the effort to codify the issue. In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office (Fire Programs) to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, several versions of this code provision were developed and presented to the Board of Housing. However, there were numerous undetermined construction and cost factors involved and nc

consensus could be reached among the code, construction and building owners communities and consequently no codes were adopted. But the concern for and by the emergency public safety personnel is still prevalent, prompting the introduction of House Bill 2554 2007. Accordingly, the interested parties have come back to the table and as the In-Building Communications Work Group, have arrived at this compromise as a first step to addressing this issue. The installation and maintenance costs and responsibilities of the building owner have been greatly reduced as they now need only provide basic and generic infrastructure capable of enhancing any supplemental emergency communication equipment, which will be provided and maintained by the locality.

REGULATORY CHANGE FORM

(This form is to be used during the NORIA, PROPOSED and FINAL adoption stages to submit suggested changes. To PETITION a BOARD to develop a new regulation or amend an existing regulation, the "REGULATORY PETITION FORM" is be used.)

SEND TO: **Department of Housing and Community Development** **501 North 2nd Street** **Richmond, VA 23219-1321** **Email:** erodgers@dhcd.state.va.us **Fax: (804) 371-7092**		**DOC. NO.** _____ **CMTE:** _____ **ACTION:** _____ _____ _____ **BOARD:** _____ **ACTION:** _____ _____ _____ _____

DO NOT WRITE ABOVE THIS LINE **PLEASE READ REVERSE SIDE**

SUBMITTED BY: _Cheri Hainer_____

ADDRESS: __2405 Courthouse Drive__Room 100 __Virginia Beach, VA 23456_____

PHONE NUMBER: (757) 427_- 4211_____ **REPRESENTING:** _City of Virginia Beach_____

REGULATION TITLE: _USBC_____ **SECTION NUMBER:** ___NEW* 912__IBC & IFC_____

PROPOSED CHANGE:

[F] SECTION 902 DEFINITIONS

Emergency Communication Equipment - Emergency communication equipment, includes, but is not limited to, two-way radio communications, signal booster, bi-directional amplifiers, radiating cable systems or internal multiple antenna, or a combination of the foregoing.

Emergency Public Safety Personnel - Emergency public safety personnel includes firefighters, emergency medical personnel, law-enforcement officers and other emergency public safety personnel routinely called upon to provide emergency assistance to members of the public in a wide variety of emergency situations, including, but not limited to, fires, medical emergencies, violent crimes and terrorist attacks.

[F] SECTION 912 IN-BUILDING RADIO COVERAGE

912.1 : General. Where a local governing body takes official action to enact the following requirements, in-building emergency communication equipment to enhance communications for emergency public safety personnel shall be required.

EXCEPTIONS:

1. **Buildings of Use Groups ~~A-5~~, I-4, R-3, R-4, R-5, and U.**
2. ~~**Buildings of Use Group E, in accordance with House Bill 2529.**~~
3. **Buildings of Type IV and V construction without basements.**
4. **Above grade single story buildings of less than 12,000 square feet.**
5. **Buildings or leased spaces occupied by federal, state, or local governments with top security clearances where the building official has approved an alternative method to provide emergency communication equipment for emergency public safety personnel.**
6. **Where the owner provides documentation from a qualified individual that the construction is exempt from the requirements of this section.**

912.1.1 Applicability. The provisions set forth in this section shall apply to the building application filed on and after the effective date set forth by the local action.

912.2 General. Where required, in-building radio coverage shall be designed, installed, inspected, tested, and maintained in accordance with the provisions of this section. When measuring the performance of a bi-directional amplifier, signal strength measurements are based on one input signal adequate to obtain a maximum continuous operating output level.

912.2.1 A minimum signal strength of -95 dBm, as measured at the antenna terminal of the public safety portable transceiver, shall be available to receive and transmit in 95% of the area on each floor of the building from or to the designated public safety radio system. A minimum received signal strength of –95dBm, as measured at the designated radio system fixed end receiver terminal, shall result for portable radio transmissions made in 95% of the area on each floor of the building. The building official shall be permitted to accept lower minimum signal strength specifications where required for the radio system technology used in a jurisdiction.

912.2.1.1 Where bi-directional amplifier systems are installed, the proof of performance signal strength measurement for the downlink path shall be based on a control channel or traffic channel signal from the designated public safety radio system. Signal strength measurements for the uplink path shall be based on one input signal generated using a portable radio operated at the worst-case extremity of the distributed antenna system. Bi-directional amplifiers shall maintain an out of band noise, intermodulation, and spurious emissions to desired carrier ratio of at least 35dBc when measured against public safety system carrier signal levels.

912.2.2 The in-building emergency communication radio system shall be designed for a 95% reliability factor.

912.2.3 Where the installed in-building emergency communication radio system contains electrically powered components there shall be an independent power source to provide power for a period of twelve hours without external power input. Where a battery system is installed there shall be automatic charging in the presence of an external power input.

912.2.4 The in-building emergency communication radio system shall have the capability for self-monitoring of the emergency communication equipment. Where there is a requirement for a supervised fire alarm system the emergency communication equipment self-monitoring can be tied into the building fire alarm system. Where there is no required supervised fire alarm system, there shall be a visual/audible alarm for self-monitoring in the vicinity of the emergency communication equipment.

912.3 Acceptance test procedures. Upon completion of installation, the performance of the in-building emergency communication radio system shall be tested to ensure that the 95% area and 95% reliability requirements are achieved.

912.3.1 The test shall be conducted using a public safety portable radio with speaker microphone or equivalent portable radios approved by the building official.

912.3.2 Each floor of the building shall be divided into a grid of approximately twenty (20) equal areas. A maximum of two (2) nonadjacent areas will be allowed to fail the test.

912.3.2.1 In the event that three (3) of the areas fail the test, in order to be more statistically accurate, the floor may be divided into forty (40) equal areas. In such event, a maximum of four (4) nonadjacent areas will be allowed to fail the test.

912.3.2.2 After the forty (40) area test, if the system continues to fail, the system shall be altered to meet the 90% coverage requirement.

912.3.3 The gain values and output levels of all uplink and/or downlink amplifiers shall be measured and documented, and the acceptance test results shall be kept on file with the building owner for verification each year during the annual inspections and tests.

912.3.4 A copy of the acceptance test records shall be kept on the premises and a copy submitted to the fire official.

912.3.5 The acceptance tests shall be conducted and certified by a qualified individual approved by the building official.

912.4 Where the locality changes the designated public safety radio system such that the installed in-building emergency communication system is no longer in operational compliance, the locality shall bear the responsibility and cost of upgrading, retrofitting or replacing the system as needed to make it compatible with the designated public radio system.

912.5 Where newly constructed buildings interfere with the transmitting signals for existing in-building emergency communication radio systems installed under these provisions, the building official, prior to the issuance of the building permit, shall require the owner of the new building to provide remedial measures to ensure continued operation and USBC compliance if the existing in-building emergency communication radio system.

Additional applicable sections:

Section 402.13.1. Covered mall buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 403.8.1. High-rise buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 406.3.10.1. Motor vehicle related occupancies shall be provided with in-building coverage for emergency communications in accordance with Section 912.

Section 507.9: Unlimited area buildings shall be provided with in-building coverage for emergency communications in accordance with Section 912.

SUPPORTING STATEMENT:

The events of 9/11 have changed the way many of us go about performing our daily job responsibilities. It is still undetermined if firefighter lives could have been saved had communications been extended into the building.

During the development of these provisions, many fire officials expressed similar concerns that if they couldn't reach their personnel and thus control an emergency situation, they routinely withdraw their personnel from a hazardous situation, which often results in property damage. These provisions allow communications from a command center outside the building to emergency personnel anywhere in the building.

The exceptions from the requirement are based on the height and area limits from Table 503, IBC. Those use groups listed will so limit the size of structures for those uses that there shouldn't be a problem. In addition, research has indicated the more fire resistive the construction, such as reinforced concrete, safety glass, and steel framing, the more sound transmissions are obscured and the more a system such as this is needed. Accordingly, these requirements specifically apply to the special use and occupancies outlined above.

There has been concern about the installation costs of these provisions. Based on information available, it is significantly less expensive to pre-wire the building rather than retrofitting. Such information recommends the building owner assume the responsibility for installation costs. Discussions with fire and communication personnel indicate in-building coverage is as critical as sprinklers or alarms, and those costs are included in the overall construction costs of the building. However, if the building is constructed in accordance with the provisions above and amplifiers are needed and/or exterior equipment is upgraded or amended, those costs would be incurred by the locality. Furthermore, other systems such as sprinklers, fire alarms, and smoke control, have been determined essential to the safe occupancy of buildings. It has taken several series of code changes to develop construction and performance standards for these systems that adequately address the intent of life safety code provisions.

Research has indicated topography, structures on adjoining properties, and existing communication towers can impact the performance of these systems. Many localities had been using conditional use permits and proffers as a means of requiring and implementing these requirements. The intention of this provision is to allow localities that have identified a need for in building coverage to establish a program based on the provisions of the USBC.

In 2003, General Assembly Joint Bill 588 required the State Fire Marshall's office to study the necessity for appropriate code provisions. A task group representing all affected parties, such as Building and Fire Officials, Building Owners, Contractors, and Radio Systems Technical Advisors meet to discuss this issue and determined there was a need for this to be referenced in the Uniform Statewide Building Code. Based on the outcome of that study as well as the language in House Bill 2529 2003, the preceding code provisions were developed.

This is information that had been included in previous submittals. In reviewing my notes and the last comments, it appears most of this is now redundant or too much detail for code provisions. I didn't want to lose it though, just in case we needed it again.

The frequency range which must be supported shall be 806 - 824 MHz and 850-869 MHz or adaptable to other appropriate emergency frequencies (700MHz or greater).

912.3 Alternatives. Buildings and structures which cannot support the required level of radio coverage shall be equipped with either a radiating cable system or an internal multiple antenna system with or without FCC type accepted bi-directional 800 MHz amplifiers as needed.

912.3.1 If any part of the installed system or systems contains an electrically powered component, the system shall be capable of operating on an independent battery and/or generator system for a period of at least twelve (12) hours without external power input. The battery system shall automatically charge in the presence of an external power input. If used, bi-directional amplifiers shall include filters to reduce adjacent frequency interference at least 35 dB the public safety carrier signal levels.

912.5 Annual Tests. In-building radio system shall test all active components of the system, including but not limited to amplifiers, power supplies and backup batteries, a minimum of once every twelve (12) months.

912.5.1 Amplifiers shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance. Backup batteries and power supplies shall be tested under load for a period of one (1) hour to verify that, they will properly operate during an actual power outage. If within the one (1) hour test period, in the opinion of the testing technician, the battery exhibits symptoms of failure, the test shall be extended for additional one (1) hour periods until the testing technician confirms the integrity of the battery.

912.5.2 All other active components shall be checked to determine that they are operating within the manufacturer's specifications for the intended purpose.

912.6 Five Year Tests. In addition to the annual test, no less than once every five (5) years, a radio coverage test shall be performed to ensure that the radio system continues to meet the requirements of the original acceptance test. The procedure set forth above shall apply to such tests.

912.7 Qualifications of Testing Personnel. All tests shall be conducted, documented and signed by a person in possession of a current FCC license, or a current technician certification issued by the Associated Public-Safety Communications Officials International (APCO) or the Personal Communications Industry Association (PCIA). The building owner shall retain all test records on the inspected premises and a copy shall be submitted to the Fire Department officials.

912.8 Field Testing: After providing reasonable notice to the owner or his representative, police and fire personnel shall have the right to enter onto the property to conduct field testing to be certain that the required level of radio coverage is present.