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**Engineering Specification – PRELIMINARY**

**Honeywell EMERGENCY RADIO COMMUNICATION ENHANCEMENT SYSTEM**

**(BDA SYSTEM)**

* + - 1. EMERGENCY RADIO COMMUNICATION ENHANCEMENT SYSTEM (BDA SYSTEM)
         1. General

Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local fire department and other agencies and authorities having jurisdiction. System users shall receive and transmit radio broadcasts from their portable radio units within the building. This shall be accomplished utilizing the following components:

Bi Directional Amplifiers (Signal Boosters)

Plenum rated Coaxial Cable

Antennas

Cable taps

Connectors

Power dividers

Other components and interconnecting circuitry as required

The system shall comply with the requirements of UL2524 1st Edition (pending) In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018, as referenced.

The entire system shall meet with approval of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).

The work in this section shall include the responsibility for all filings with the AHJ. Where filings require engineer’s signature, documents shall be submitted for his review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.

Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner

Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included as the part of the required work.

The in-building emergency radio communication enhancement system shall use a UL2524 1st Edition (pending), NFPA-72 2010 Edition, NFPA 1221 2016 Edition and IFC 2018 compliant Honeywell signal booster or approved equal.

* + - * 1. Design requirements

In-building emergency radio communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.

Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 100% floor area radio coverage.

General building areas shall be provided with 95% radio coverage, or as specified by AHJ.

The In-building emergency radio communication enhancement systems must provide the following signal strengths:

Downlink - Minimum signal strength of -95 dBm throughout the coverage area.

Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System.

The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.

EC shall sub-contract an approved manufacturer or a qualified and approved vendor to supply, test and determine locations of components which are required for proper operation as well as to supply, deploy, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.

All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.

The system design shall be based on the Honeywell line of Public Safety Signal Boosters UL2524 1st Edition (pending), NFPA-72 2010 Edition, NFPA 1221 2016 Edition, IFC 2018 Edition and FCC compliant to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waiver any requirement or performance of individual components described in the specifications.

Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.

Survivability from attack by fire shall meet NFPA 72, National Fire Alarm and Signaling Code, 2010 edition and NFPA 1221 2016 edition.

The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.

Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

* + - * 1. Technical Specifications and Performance Requirements

The system specified shall be based upon Honeywell line of Public Safety UL2524 1st Edition (pending), NFPA-72 2010 Edition, NFPA 1221 2016 Edition, IFC 2018 Edition compliant signal boosters

The signal booster shall be a Class B Public Safety type as designated by the FCC and as required by the AHJ.

The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA-72, 2010 edition and NFPA 1221,2016 edition. The signal booster shall have both the primary and the secondary power supplies built in a fully sealed NEMA-4 type approved enclosure.

All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product datasheets and technical submittals. The ID must also be displayed on the product as required by the FCC.

The signal booster shall be set and tuned by the equipment manufacturer to pass frequencies as specified by the local fire department.

To reduce the possibility of unwanted interference affecting the operation of the system, signal boosters shall be band or channel selective type with a maximum 3dB channel bandwidth of 200KHz (Fc +/- 100KHz). Wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.

Signal Boosters shall have oscillation prevention circuitry to protect the public safety radio system in case of signal booster malfunction.

Signal Booster gain shall be rated at minimum of 80dB and the gain shall be adjustable in a minimum of 25dB range. System gain shall be set and documented at the time of the final system test.

Maximum Propagation delay of the signal booster system shall be 14μs (microseconds) or as specified by AHJ.

The signal booster system shall include built-in automatic alarming of malfunctions of the signal booster and battery system as per NFPA 1221 2016 Edition Section 9.6, NFPA 72, 2010 Edition, Sections 24.5.2.6.1, and 24.5.2.6.2. Aftermarket equipment add-ons and modifications to comply with this specification will not be accepted.

A dedicated supervised monitoring panel shall be provided within the emergency command center or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

Normal AC power

Signal booster trouble

Antenna Failure

Loss of normal AC power

Failure of battery charger

Low battery capacity

The signal booster system shall include six alarm relay outputs with line termination for Fire Alarm Panel connection for monitoring the signal booster.

The vendor shall verify the system monitoring requirements with the AHJ prior to system installation. System monitoring shall be fully compliant with the AHJ requirements.

External filters, attachments or other aftermarket modifications of the original equipment shall not be accepted.

All signal booster components shall be contained in a NEMA4-type approved waterproof cabinet. All enclosures shall be painted red with signage in bright yellow or as required by AHJ

* + - * 1. Installation Requirements

Assembly and installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code, NFPA-70 and the National Fire Alarm and Signaling Code, NFPA-72, NFPA 1221 current enforceable editions.

At least 2 independent and reliable power supplies shall be provided as specified in sections 2 and 3 below.

The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72, National Fire Alarm and Signaling Code, 2010 edition and NFPA 1221 2016 edition.

The emergency responder radio coverage enhancement system shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall supply power automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage enhancement system for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a non-vented NEMA4 Type approved enclosure. Batteries shall be enclosed in a separate, vented NEMA 3R Type approved enclosure.

The signal booster shall be designed to allow degraded performance in adverse conditions, such as high temperatures in the event of heat from a nearby fire, voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) are not acceptable. External UPS (Uninterruptable Power Supplies) are not acceptable. It is the purpose of this specification to assure the maximum possible level of communications to public safety personnel depending upon the signal booster, even to the extent of damaging the signal booster, as long as some communications benefit can be provided during the emergency.

System design shall be such that neither the failure of the normal power source, the transfer to an emergency source, nor the re-transfer to the normal source shall cause a change in system status.

The amplifier shall be housed in a 2-hour fire rated room or other suitable space as approved by the Engineer, or where specifically shown on the drawing.

Radiating cable, if used, shall be run without conduit. All other cable can be run in conduit if required for mechanical protection of the cable, or where specified by the electrical engineer.

RF Coaxial Cable shall be a fire-resistant, low-smoke type, U.L. classified as plenum. The classification shall be clearly marked on the outer surface of the cable regular intervals.

* + - * 1. Acceptance and Test Procedures

Acceptance testing for an in-building radio system is required upon completion of installation.

The coverage testing shall be done in accordance with NFPA 72, National Fire Alarm and Signaling Code, 2010 edition, NFPA 1221 2016 edition and as required by the local AHJ

All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.

All test records along with system diagrams, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project.