Emergency Radio Communications Enhancement System (ERCES) Plan Review Check Sheet

Fire Review

- ☐ Reviewed/approved Radio Signal Strength test on file demonstrating need for enhancement [City of Largo]
- ☐ ERCES installation shall be applied for under a fire alarm permit [City of Largo]
- ☐ Provide building owner/agent and address [61G6 FAC]
- ☐ Provide scope of work narrative [FFPC 1:1.7.12.3]
- ☐ Provide name of FCC GROL license holder and number noted on cover sheet [City of Largo]
- ☐ Provide EF/EC contractor name, address, city, state and license number on each drawing. [City of Largo] (Must be licensed EF or EC to pull permit)
- ☐ Provide signature and seal of the Engineer of Record (EOR).
  - o Name, PE number, business name, address, and contact information provided the plans.
  - o AHJ may require that the Engineer of Record shall provide evidence of experience and training in Electrical Engineering. [61G15-30.003(2) FAC]
- ☐ Provide note indicating design conforms to the following codes/edition dates:
  - o FFPC, 6th Edition
  - o NFPA 72, (2013)
  - o NFPA 70, (2014)
  - o NFPA 1221, (2016)
  - o FCC Title 47 CFR
  - o Motorola R56
  - o IEEE 1692
  - o TIA 569, and TIA 607.
  - o UL 2524/UL 60950 [61G15-30.003(1b)]
- ☐ Provide building description indicating:
  - o building construction
  - o building occupancy
  - o total square footage
  - o number of floors
  - o total height of building [61G15 FAC]
- ☐ Provide note indicating that the proposed system will be capable of transmitting all public safety radio frequencies assigned to the AHJ and capable of using any modulation technology. [NFPA 72(2013):24.5.2.4]
- ☐ Provide note indicating that system shall be capable of being upgraded. [NFPA 72(2013):24.5.2.4.2]
- ☐ Provide note indicating that the proposed system components are compatible with the existing public safety radio system. [NFPA 72(2013):24.5.2.5.1]
- ☐ Provide note on cover sheet stating: "*The system shall never be energized for testing or operation until written, or on site, approval is obtained from the FCC License Holder*." [PCR&T]
- ☐ Provide note indicating that an information binder, stored next to the amplifier, shall be provided and shall include:
  - o As-built drawings
  - o Manufacturer's data sheets and specs

- Heat map
- Final signal strength measurement (dB)
- Maintenance contract
- Pinellas County Radio & Technology Final Retransmission Agreement
- Maintenance Repair Log [City of Largo]

☐ Provide note indicating a placard (2 inch high white letters on red background) will be posted on or near the FACP stating: "*This building is equipped with an Emergency Radio Communications Enhancement System*". [PCR&T]

☐ Provide equipment specifications with manufacturer's parts numbers for ALL proposed system components that includes equipment temperature limits. [61G15 FAC]

☐ For **signal booster(s)**, provide note indicating that:
- All signal boosters have FCC Certification.
- All signal boosters are minimum Class B (Class A preferred) [PCR&T]
- All signal boosters are compatible with both analog and digital communications simultaneously at the time of installation. [NFPA 72(2013):24.5.2.5.4]

☐ Provide detail indicating proposed radio coverage shall meet a minimum of:
- **99% in critical areas**, such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ
- **90% in non-critical areas**. [NFPA 72(2013):24.5.2.2]

☐ Provide detail indicating that isolation shall be maintained between the donor antenna and all inside antennas and ***shall be a minimum of 20 dB above the signal booster gain*** under all operating conditions. [NFPA 1221:9.6.9]

☐ Submit a complete set of drawings including:
- Circuit pathways, type(s) and class of each circuit (if applicable)
- Original approved RSS test grid plan with initial signal test results
- Riser diagram
- Sequence of operation in either an input/output matrix or narrative form
- Date of each sheet origination and any subsequent revisions noted
- Each sheet must show the sheet number and the total number of sheets included
- Clearly labeled match lines to show where the sheets match each or adjoin each other
- Drawings must be submitted on paper. [NFPA 72(2013):7.2.1]

☐ Provide floor plan, drawn to a graphic scale, for each floor or building detailing:
- Floor or level identification
- Point of compass on all floor plan/elevation sheets
- Layout of system device locations, control equipment, and FACP (if applicable)
- System riser location(s)
- Locations of monitor/control interfaces to other systems
- Type and number of system components/devices on each circuit, on each floor or level
- All fire-rated enclosures (call out fire-rated enclosure for cables and BDA room)
- Room/area descriptions
- All doors and windows
- Circuit pathways, type(s), class of each circuit, conduit runs
- Type and quantity of conductors and conduit for each circuit
- Propagation modeling [NFPA 72(2013):7.4.5]

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- ☐ System riser diagrams shall be coordinated with the floor plans and shall include:
  - o General arrangement of the system in building cross-section
  - o Number of risers
  - o Type and number of circuits in each riser
  - o Type and number of system components/devices on each circuit, on each floor or level
  - o Number of conductors for each circuit [NFPA 72(2013):7.4.6]
- ☐ Control unit diagrams shall be provided for all control equipment, power supplies, battery chargers, and annunciators and shall include:
  - o Identification of the control equipment depicted
  - o Location(s) of control equipment
  - o All field wiring terminals and terminal identifications
  - o All circuits connected to field wiring terminals and circuit identifications
  - o All indicators and manual controls
  - o Field connections to supervising station signaling equipment, releasing equipment, or emergency safety control interfaces, where provided [NFPA 72(2013):7.4.7]
- ☐ Provide antenna mast structural installation detail. [FFPC 1:1.7.12.3]
  - o Mast shall be installed per FBC, 6th Edition
  - o Donor antenna orientation shall be coordinated with Pinellas County R&T.
  - o Include FAA lighting (if applicable)
  - o Exterior antennae shall be:
    - ▪ Narrow band
    - ▪ High-gain
    - ▪ Vertically-polarized
    - ▪ Designed for specific frequency band
    - ▪ Yagi or corner-reflector type recommended
    - ▪ Shall be rated 160MPH or higher wind gusts
    - ▪ Shall meet the wind loading requirements of the FBC and ANSI/TIA-222-G [PCR&T]
- ☐ Propagation (heat) map drawings shall include the following:
  - o Indoor prediction legend
  - o Materials legend
  - o Pictogram legend
  - o Cables legend
  - o Calculations legend
  - o Number of channels
  - o Frequencies
  - o Predictive propagation on floor plans
  - o Name of certified designer and company [FFPC 1:1.7.12.3]
  - o Propagation delay shall not exceed 8 µS. [PCR&T]
- ☐ Provide battery calculations equipment with independent battery source. [NFPA 72(2013):24.5.2.7]
- ☐ Provide all firewall penetration details, etc. [61G15 FAC]
- ☐ Indicate all riser and donor antenna coaxial cables are routed through a 2-hour-rated enclosure. [NFPA 72(2013):24.3.6.8.3]

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- ☐ The connection between the riser and feeder coaxial cables shall be made within the 2-hour-rated enclosure, and passage of the feeder cable in and out of the 2-hour-rated enclosure shall be fire stopped to 2-hour ratings. [NFPA 72:24.3.6.8.4]
- ☐ Feeder and riser coaxial cables shall be rated as plenum cable. [NFPA 72(2013):24.3.6.8.1.1]
- ☐ The feeder coaxial cables shall be connected to the riser coaxial cable using hybrid coupler devices of a value determined by the overall design. [NFPA 72:24.3.13.8.1.2]
- ☐ Pathway survivability level shall be 1, 2, or 3.
  - For Level 1, all coaxial cables shall be in metal raceways. [NFPA 72(2013):12.4]
- ☐ The following components shall be protected in a NEMA 4 or 4X enclosure:
  - Repeaters
  - Transmitter receptacles
  - Signal booster components
  - Battery system components [NFPA 72(2013):24.5.2.5.2]
- ☐ Provide note indicating that signal booster enclosure(s) shall be fire engine red color, with locking mechanism, and 2 inch high contrasting letters with the following data:
  - Fire Department Radio Signal Booster
  - Permit Number _____
  - Serviced by _____ [PCR&T]
- ☐ No permanent external filters and attachments are permitted. [NFPA 72:24.5.2.5.3]
- ☐ Detail that power supplies have at least two independent sources. [NFPA 72(2013):24.5.5]
  - **Primary** power shall be from a dedicated circuit in compliance with NFPA 72:10.6.5. [NFPA 72(2013):24.5.5.1]
  - **Secondary** power source shall consist of one of the following:
    - Battery with at least 12 hours of operation at 100%.
    - Life Safety generator with at least 12 hours of operation at 100% and a battery with at least 2 hours of operation at 100%. [NFPA 72(2013):24.5.2.5.5.2]
- ☐ Detail that the fire alarm system shall monitor the following supervisory items as a minimum:
  - Antenna malfunction
  - Signal booster failure
  - For RF/Fiber Optics converters: malfunction of main/expansion hubs
  - Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted.
  - Link between ERCES and FACP shall be monitored for integrity. [PCR&T]
- ☐ Separate alarm required for oscillating amplifiers
  - Signal booster shall be capable of *AGC Overdrive* and *Oscillation Control*
    - Includes (but not limited to) alarm for auto-shutdown of oscillating amplifiers
  - Power supply signals shall include the following for each signal booster:
    - Loss of normal AC power
    - Failure of battery charger [NFPA 72(2013):24.5.2.6.1]
- ☐ Provide dedicated panel (annunciator panel) that shall indicate:
  - Normal AC power
  - Signal booster trouble
  - Loss of normal AC power
  - Failure of battery charger

- Low battery capacity
- Donor Antenna Malfunction
- Link between annunciator and ERCES monitored for integrity. [NFPA 1221(2016):9.6.13.2]

☐ Integrity of the circuit monitoring signal booster(s) and power supply(ies) shall comply with NFPA 72:24.10.6.9 and NFPA 72:12.6.

☐ When an elevator(s) is(are) present in the building, an antenna is typically required to be mounted in the elevator shaft(s) to get coverage inside the elevator car(s).

- A note on the plan shall be provided: “Contractor shall obtain written approval from the elevator inspector prior to any work inside an elevator shaft or machine room.” [NFPA 72(2013):24.5.4] [ASME A17.1]
- The elevator code does not allow the elevator shaft to be used for coaxial cable risers. [ASME A17.1.2.8.1]

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Electrical Review

- ☐ Detail grounding and mounting details for antenna, mast, surge protection, BDA, power supply, battery enclosure, etc. [61G15 FAC]
  - o connected to building electrical ground system and coaxial lightning protector
  - o Motorola R56 and Harris Site Grounding and Lightning Protection Guidelines
- ☐ Provide antenna lightning protection per NFPA 780. [61G15 FAC]
  - o Impedance 50 Ω
  - o Frequency range as needed
  - o VSWR/SWR = 1.1:1 or better
  - o Insertion Loss = 0.1dB or better
  - o Impulse Discharge Current = 10KA or better
  - o Turn-on voltage = 600V
  - o Turn-on time = 2.5nS for 2kV/nS
  - o Energy Throughput Rating = 5nJoules for 3kA (8/20µS waveform)
  - o Continuous handling RF power = 100W or better [PCR&T]
- ☐ Indicate the panel and circuit breaker ID; detail panel location on plan [NFPA 72(2013)]
- ☐ Indicate provision of circuit breaker lock. [NFPA 72(2013)]
- ☐ Detail how the system components are wired to power (120V). [NFPA 70(2014):110.2(B)]
- ☐ Indicate that circuit will have an isolated ground, if required by the manufacturer. [NFPA 70(2014)]
- ☐ Detail all listing and labeling requirements [NFPA 70(2014):110.2]
- ☐ Detail minimum conduit sizes and minimum conduit 90-degree bend radii. [NFPA 70(2014):110.3]
- ☐ Indicate system equipment will be installed in an air-conditioned and mechanically ventilated room where the manufacturer's installation document requires a temperature limitation and/or ventilation. [NFPA 70(2014):110.3]