

Bi-Directional Amplifier Plan Review Guidelines For Electrical.
TWO-WAY RADIO COMMUNICATIONS ENHANCEMENT SYSTEM.
Based on NFPA 72, 2013. NFPA 70, 2014. Section 118, FBC Broward County, May 21, 2018.

FBCBC (Broward County) 6th Edition Section 107. NFPA 72, Chapter 7. Approval and Permitting. Plans to be signed and sealed by an Engineer. FS 471 Engineering Exemption does not apply. Specification sheets and installation instructions of all equipment to be included in or on the submitted plans. Plans shall indicate the Code Edition being used. Other code editions used that are not adopted in the state of Florida are to be approved by the AHJ and Owner or General Contractor. **(NFPA 1,1.4)**

NFPA 72, 24.5.2.1.2 Approval and Permit. Plans shall be submitted for approval prior to installation. At the conclusion of successful acceptance testing, a renewable permit shall be issued for the public safety radio enhancement system where required by the authority having jurisdiction.

FBCBC CH 118.1.5. Installation and permit must be by a Licensed Electrical Contractor or a Licensed Fire Alarm Contractor or both if necessary for a BDA system. **Contractor must provide prior installation and maintenance experience.**

FS 489.119. Permit holder must be the qualifying agent of the business organization. **Aiding and abetting an unlicensed contractor is against the law.** Types of licenses needed to obtain permits are; Electrical Contractor (EC), Certified Alarm System Contractor 1 (EF), and Registered Alarm System Contractor (EY) are currently the only types of licensees that can be used for BDA permits.

FBCBC 118.2.1(2). City and County FCC License holder approval of plans for BDA system shall be provided to fire prevention bureau office prior to electrical plan review.

FBCBC Section 118.2 #8. Plans shall show that the BDA enclosure shall be painted red. A sign affixed next to or stenciling on the enclosure shall be provided in high contrasting letters over a red background and shall include the following information:

Fire Department Signal Booster

Permit Number: _____

Serviced by: Vendor name and telephone.

NFPA 70, 110.3. (B) Installation and Use. Listed or labeled equipment shall be installed and used in accordance with any instructions included with the listing or labeling equipment or components. **BORA FI #22 allows the engineer of record to specify the brand and model number of the bi-directional amplifier, the antenna and the component parts until 6 months after a standard is written and published. After that time a listed BDA or field evaluation will be acceptable to fulfill NEC 110.3.B. The engineer shall submit a letter to the AHJ describing the equipment that is being "approved".**

NFPA 70, 110.8 Wiring Methods. Recognized method of wiring shall be used.

Cable listed for wet locations to be used outdoors and underground locations.

NFPA 70. 300.4. Protection from physical damage. Wiring to be protected using this section.

NFPA 70, 110.21. Marking. The organization responsible for any product shall be placed on all electrical equipment.

NOTE. Text in Red are the preparers comments. Yellow Highlighting are points important information.

NFPA 70, 800.24. Mechanical Execution of Work. All work shall be installed in a neat and workmanlike manor.

FBC(Building) 1023.5 Penetrations. Penetrations into or through *interior exit stairways* and *ramps* are prohibited except for equipment and ductwork necessary for independent ventilation or pressurization, sprinkler piping, standpipes, **electrical raceway for fire department communication systems** and electrical raceway serving the *interior exit stairway* and *ramp* and **terminating at a steel box not exceeding 16 square inches** (0.010 m²). Such penetrations shall be protected in accordance with FBC Section 714. There shall not be penetrations or communication openings, whether protected or not, between adjacent *interior exit stairways* and *ramps*.

Exception: Membrane penetrations shall be permitted on the outside of the *interior exit stairway* and *ramp*. Such penetrations shall be protected in accordance with Section 714.3.2.

NFPA 70, 820.26. Spread of Fire or Products of Combustion. Openings around penetrations of communications cables and communication raceways through fire-resistant rated walls, partitions, floors or ceilings shall be fire stopped.

FBC(Building) 714.2. Fire Assembly Detail. Provide installation detail for all through penetrations of fire protective assemblies.

FBC(Building) 714.3.1 Through penetrations. Through penetrations of fire-resistance-rated walls shall comply with Section 714.3.1.1 or 714.3.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the *annular space* between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:

1. In concrete or masonry walls where the penetrating item is a **maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929m²)**, concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the *fire-resistance rating*.
2. The material used to fill the *annular space* shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.

NFPA 70, 810.15. Grounding. Masts and metal structures supporting antennas shall be grounded in accordance with 810.21.

NFPA 70, 820.133(A)(2). Installation of Coaxial Cables and Equipment. Coaxial Cable shall be separated at least 2" from conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications circuit. **Exception: If coaxial cable is in a raceway this code does not require the separation between wires.**

NFPA 72 24.3.6 Pathway Survivability.

NFPA 72 24.3.6.1 Pathway survivability levels shall be as described in **Section 12.4.**

NFPA 72 12.4.1 Pathway Survivability Level 0. Level 0 pathways shall not be required to have any provisions for pathway survivability.

NFPA 72 12.4.2 Pathway Survivability Level 1. Pathway survivability Level 1 shall consist of pathways in buildings that are fully protected by an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, with any interconnecting conductors, cables, or other physical pathways installed in **metal raceways**.

NFPA 72 12.4.3 Pathway Survivability Level 2. Pathway survivability Level 2 shall consist of one or more of the following:

- (1) 2-hour fire-rated circuit integrity (CI) cable
- (2) 2-hour fire-rated cable system [electrical circuit protective system(s)]
- (3) 2-hour fire-rated enclosure or protected area
- (4) 2-hour performance alternatives approved by the authority having jurisdiction.

NFPA 72 12.4.4 Pathway Survivability Level 3. Pathway survivability Level 3 shall consist of pathways in buildings that are fully protected by an automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and one or more of the following:

- (1) 2-hour fire-rated circuit integrity (CI) cable
- (2) 2-hour fire-rated cable system [electrical circuit protective system(s)]
- (3) 2-hour fire-rated enclosure or protected area
- (4) 2-hour performance alternatives approved by the authority having jurisdiction

NFPA 72 24.3.6.8.1* Where a two-way radio communications enhancement system is used in lieu of a two-way in-building wired emergency communications system, it shall have a pathway survivability of Level 1, Level 2, or Level 3.

NFPA 72 24.3.6.3* The pathway survivability requirements in 24.3.6.4 through 24.3.6.12 shall apply to notification and communications circuits and other circuits necessary to ensure the continued operation of the emergency communications system.

24.3.6.4.2 **For systems that do not employ relocation** or partial evacuation, a Level 0, Level 1, Level 2, or Level 3 pathway survivability shall be required. **(BDA'S)**

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24.3.6.8.1* Where a two-way radio communications enhancement system is used in lieu of a two-way in-building wired emergency communications system, it shall have a pathway survivability of Level 1, Level 2, or Level 3.

NFPA 72 24.3.6.8.1.1 The feeder and riser coaxial cables shall be rated as plenum cables.

NFPA 72 24.3.6.8.3* Riser coaxial cables shall be rated as riser cables and routed through a 2-hour rated enclosure. Examples of 2-hour-rated enclosures could include stairwells and elevator hoist-ways for first responders—use elevators.

24.3.6.8.4 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 24.3.6.9.1 Area of refuge emergency communications systems shall have a pathway survivability of Level 2 or Level 3.

NFPA 72 24.3.6.10 Elevator emergency communications systems shall have a pathway survivability of Level 0, Level 1, Level 2, or Level 3.

NFPA 72. 24.5.2.5.1. All components shall be “approved”, included are repeaters, transmitters, receivers, signal boosters, cabling, and the fiber-distributed antenna system. **BORA FI # 22 applies to this code also. This section is similar to NFPA 70, 110.3(b).**

NFPA 72. 24.5.2.5.2. Component Enclosures. All repeaters, transmitters, batteries, receivers and signal boosters shall be contained and installed in an UL approved NEMA 4 or 4X TYPE enclosure.

NFPA 72 24.5.2.5.5 Power Supplies. At least two independent and reliable power supplies shall be provided for all repeater, transmitter, receiver, and signal booster components, one primary and one secondary.

NFPA 72 24.5.2.5.5.1 Primary Power Source. The primary power source shall be supplied from a dedicated branch circuit and comply with 10.6.5.1.

NFPA 72 10.6.5.1 Branch Circuit. The branch circuit supplying the fire alarm equipment(s) or emergency communication system(s) shall supply no other loads and shall be supplied by one of the following:

- (1) Commercial light and power
- (2) An engine-driven generator or equivalent in accordance with 10.6.11.2, where a person specially trained in its operation is on duty at all times
- (3) An engine-driven generator or equivalent arranged for cogeneration with commercial light and power in accordance with 10.6.11.2,

NFPA 72 24.5.2.5.5.2* Secondary Power Source. The secondary power source shall consist of one of the following:

- (1) A storage battery dedicated to the system with **at least 12 hours of 100 percent system** operation capacity and arranged in accordance with 10.6.10.
- (2) An automatic-starting, engine-driven generator serving the dedicated branch circuit or the system with at least 12 hours of 100 percent system operation capacity and storage batteries dedicated to the system with at least 2 hours of 100 percent system operation capacity and arranged in accordance with 10.6.11.3

NFPA 72 10.6.5.2 Circuit Identification and Accessibility.

NFPA 72 10.6.5.2.1 The location of the branch circuit disconnecting means shall be permanently identified at the control unit.

NFPA 72 10.6.5.2.2 System circuit disconnecting means shall be permanently identified as to its purpose in accordance with the following:

- (1) "FIRE ALARM" for fire alarm systems
- (2) "EMERGENCY COMMUNICATIONS" for emergency communications systems
- (3) "FIRE ALARM/ECS" for combination fire alarm and emergency communications Systems.

NFPA 72 10.6.5.2.3 For fire alarm and/or signaling systems, the circuit disconnecting means shall have a red marking.

NFPA 72 10.6.5.2.4 The red marking shall not damage the overcurrent protective devices and shall not obscure the manufacturer's markings.

NFPA 72 10.6.5.2.5 The circuit disconnecting means shall be accessible only to authorized personnel.

NFPA 72 10.6.5.3 Mechanical Protection. The branch circuit(s) and connections shall be protected against physical damage.

NFPA 72 10.6.5.4 Circuit Breaker Lock. Where a circuit breaker is the disconnecting means, a listed breaker locking device shall be installed

NFPA 70, 2014 Section 480. Storage Batteries. Requirements for storage battery installations.

NFPA 72 24.5.2.5.5.3 Monitoring Integrity of Power Supplies. Monitoring the integrity of power supplies shall be in accordance with 10.6.9.

NFPA 72 10.6.9.1 Unless otherwise permitted or required by 10.6.9.1.3 and 10.6.9.1.6, all primary and secondary power supplies shall be monitored for the presence of voltage at the point of connection to the system.

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NFPA 72 10.6.9.1.1 Failure of either supply shall result in a trouble signal in accordance with Section 10.15.

NFPA 72. 24.5.2.6.2* Dedicated Panel. A dedicated monitoring panel shall be provided within the fire command center 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:

- (1) Normal ac power
- (2) Signal booster trouble
- (3) Loss of normal ac power
- (4) Failure of battery charger
- (5) Low-battery capacity