Two-Way Radio Communications Enhancement Systems

Emergency Responder Radio Coverage

AFAA-NE and SFPE-NE are professional associations and societies formed to specifically represent the fire alarm industry and fire protection engineering.

Meeting Overview

- **John Houlihan**
  - **Member AFAA-NE Board of Directors**
  - **Brief Code History**
  - **Current Code Requirements**
- **Chief Gary McCarraher**
- **Joe Brooks Radio Supervisor BFD**
- **Admir Surkovic, Radio Engineer, CEO RSI**
- **Question & Answer**
- **Depart Enlightened and Informed!**

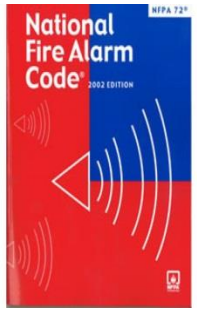
1997

780 CMR

- 780 CMR 6th Edition
- Introduced February 1997
  - Based on BOCA 1993
- Section 403.6 Fire department communication system
  - Hardwired Telephone handset two-way system
  - Exception: Fire Department Radio Systems

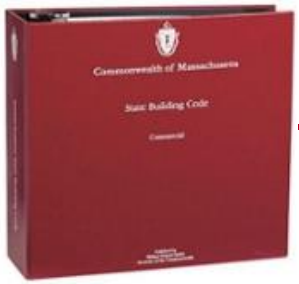
NFPA 72

- NFPA-72 1996 with Base Code
- Updated to NFPA-72 2002 in July 2003



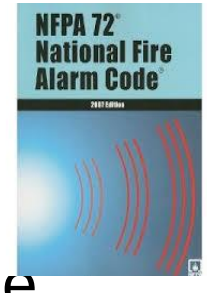
- Neither Edition of the NFAC addressed Fire Department Radios

2007



780 CMR

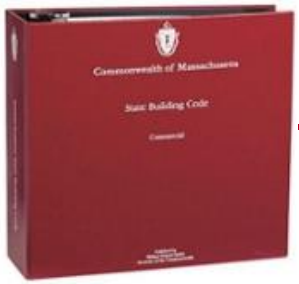
- 780 CMR 7th Edition
- Introduced January 2007
- Based on the 2003 IBC
- Section 907.2.12.3 addressed Fire Department Communication System
  - Hardwired Telephone handset two-way system
  - Exception: Fire Department Radio Systems



NFPA 72

- NFPA-72 2007 was adopted by Reference
- Section 6.10.2 is NEW section for Two-Way In-Building Radio Communications Enhancement Systems
- Provided guidance to radio systems installed under 907.2.12.3 Exception

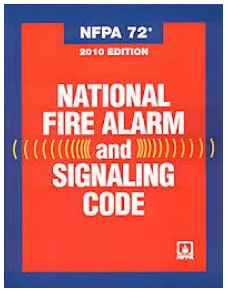
2010



780 CMR

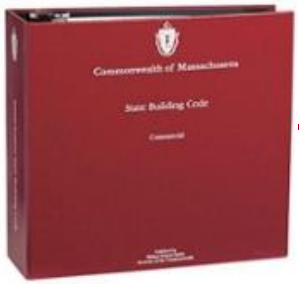
- 780 CMR 8th Edition
- Introduced August 2010
- Based on the 2009 IBC
- New Section 915
- Emergency Responder Radio Coverage
  - Now Required to improve radio signal strength into and out of building if necessary

NFPA 72



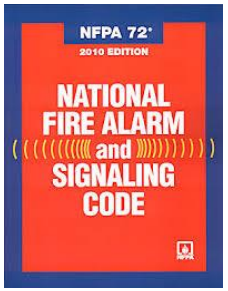
- NFPA-72 2010 was adopted by Reference
- Two-Way In-building Communications relocated to ECS Chpt 24
- Further defined technical coverage and signal strength levels
- Added requirements for pathway survivability

2014



780 CMR

- Updated in April 2014
- Emergency Responder Radio Coverage section
  - Removed technical benchmarks from text of code, points to NFPA-72 2010 edition for technical design and compliance



NFPA 72

- Moved Fire Alarm system supervision from Annex to body of code
- Included list of critical areas for signal strength that mimicked the previous Building Code
- Added plans and permits to text of code

780 CMR 915

915 Emergency Responder Radio Coverage

- **915.1**
  - Coverage SHALL be provided in all new buildings
- **915.2**
  - All buildings shall have approved coverage , based on the existing levels of coverage at the exterior of the building
  - Does not apply to existing buildings
  - EX1 – wired communication system if approved
  - EX2 – if determined by AHJ coverage is not needed
- **915.3**
  - Designed and installed per NFPA-72

NFPA-72 2010 24.5.2

24.5.2* Two-Way Radio Communications Enhancement Systems.

- **24.5.2.1 General.**
  - Two-Way Radios have become prevalent communication system in the fire service
- **24.5.2.1.1 Non-Interference.**
  - Amplification equipment can not interfere with the Public Safety radio system – must be approved by AHJ
- **24.5.2.1.2 Approval and Permit.**
  - Plans must be submitted before approval is given

NFPA-72 2010 24.5.2

24.5.2* Two-Way Radio Communications Enhancement Systems.

- **24.5.2.2 Radio Coverage.**
- **24.5.2.2.1 Critical Areas.**
  - Command Center, Fire Pump Rm, Exit Stairs, Exit passageway, Elevator Lobbies, standpipe cabinets, sprinkler sectional valves, other areas req. by AHJ **99% coverage**
- **24.5.2.2.2 General Building Areas.**
  - All areas shall have **90% coverage**

NFPA-72 2010 24.5.2

24.5.2* Two-Way Radio Communications Enhancement Systems.

- **24.5.2.2.3 Amplification Components.**
  - If 90% general area & 99% Critical areas can not be met,
    - certified signal booster &
    - distributed antenna system (DAS) must be installed
    - to achieve required adequate radio coverage

NFPA-72 2010 24.5.2

24.5.2.3 Signal Strength

- **24.5.2.3.1 Inbound.**
  - Min of -95dBm
- **24.5.2.3.2 Outbound.**
  - Min of -95dBm
- **24.5.2.3.3 Isolation.**
  - Minimum of 15dB isolation between the donor antenna and signal booster gain

NFPA-72 2010 24.5.2

24.5.2.4* System Radio Frequencies

- **24.5.2.4.1 List of Assigned Frequencies.**
  - System must be capable of all frequencies assigned by AHJ
  - AHJ must maintain list of all inbound/outbound frequencies required for signal booster in jurisdiction
- **24.5.2.4.2* Frequency Changes.**
  - Allow for upgrades to allow for changes and additions to system

NFPA-72 2010 24.5.2

24.5.2.5 System Components.

- **24.5.2.5.1 Component Approval.**
  - Signal Boosters, Cables, antennas, shall be approved and compatible with public safety radio system
- **24.5.2.5.2 Component Enclosures.**
  - Signal Booster shall be in NEMA 4 or NEMA 4X cabinet
- **24.5.2.5.3 External Filters.**
  - External filters are not permitted
- **24.5.2.5.4 Signal Booster Components**
  - MUST be FCC certified, and capable of simultaneous Digital & Analog communication

NFPA-72 2010 24.5.2

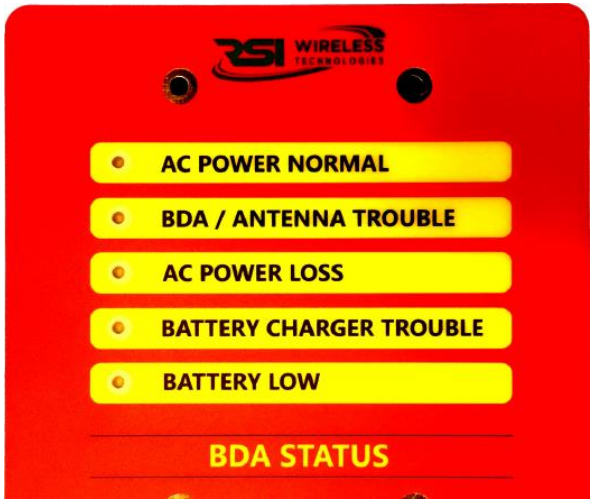
24.5.2.6 System Monitoring.

- **24.5.2.6.1 Fire Alarm System.**
  - Antenna Malfunction
  - Signal booster failure
  - Power supply signals
    - Loss of AC power
    - Failure of battery charger
    - Low battery capacity @ 70%

NFPA-72 2010 24.5.2

24.5.2.6 System Monitoring.

- **24.5.2.6.2* Dedicated Panel.**
  - Located in the Command Center
  - Normal AC power
  - Signal Booster Trouble
  - Loss normal AC power
  - Failure for battery charger
  - Low battery capacity



NFPA-72 2010 24.5.2

- **24.5.2.7 Technical Criteria.**
  - AHJ will maintain and provide
    - Required Frequencies
    - Location of Radio Sites
    - Maximum Propagation delays
    - Specifically approved components
    - Supporting technical information to design system
- **24.5.2.8 Inspection and Testing.**
  - **Test and inspection in accordance with Chapter 14**
    - Section 14.4.12
    - All testing shall be done Annually
    - Record of Completion Form Section 11
    - ITM Form Section 3 & 7.6

NFPA-72 2010 24.3.5

- **24.3.5 Pathway Survivability.**
- **24.3.5.1** Pathway survivability levels shall be as described in Section 12.4.
- **24.3.5.8.1**
  - When TWRCES are used in lieu of a two-way in-building wired emergency communications system, it shall have a pathway survivability of Level 2 or Level 3.
- **24.3.5.8.2**
  - When TWRCES are used in lieu of a two-way in-building wired emergency communications system, the design of the system shall be approved by the AHJ.

NFPA-70 2014 Article 820

Article 820 Community Antenna Television and Radio Distribution Systems

- **Similar to other cable Articles**
  - Remove abandoned cables
  - Installed in neat and workman like manner
  - Accumulation of cable shall not prevent opening of panels of suspended ceiling
- **Cables need Grounding and Bonding**
  - Manufactures/Designers will recommend proper methods
  - No Smaller than 14AWG or Larger than 6AWG
- **Cables permitted in Conduit**
  - If recommended by design
  - Conduit fill tables do not apply

NFPA-70 2014 Article 820

Article 820 Community Antenna Television and Radio Distribution Systems

- **Cables support**
  - Cables shall not be supported by raceways
- **Cable – plenum is typically used**
  - Plenum Cable
  - Riser Cable
  - General Cable
  - Limited use

Technical Resources

- www.mass.gov/bbrs
  - Unofficial copy of the building code amendments to IBC 2009, updates on the 9th Edition 780 CMR
- www.sec.state.ma.us
  - Massachusetts Secretary of State Book Store
- www.nfpa.org/72
  - Fire Alarm Code
- www.iccsafe.org
  - International Code Council IBC, IFC

Closing

Thank You

Presented by:

John Houlihan
Fire Command Systems, Inc.
AFAA-NE Board of Directors
978.401.9840 x 110 office
508.541.1029 cell
john@firecommandsystems.com