



Booster Amplifiers: Building Codes & New Rules

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Purpose

- **Discuss Building Codes for Indoor Radio Coverage**
 - Many cities have adopted codes for indoor radio coverage
 - Primarily a replacement for old fire fighter telephone systems
 - Codes vary widely, but this need not be the case
 - Annex O to NFPA 1, Fire Code, is excellent standard for all
- **Explain New FCC Rules for Booster Amplifiers**
 - FCC Report & Order, Feb 20, 2013, FCC 13-21 WT Docket 10-4
 - Designed to prevent harmful interference
 - New manufacturer standards
 - New registration requirements for owners and licensees
 - Existing booster amplifiers must be registered by Nov 1, 2014

Indoor Radio Coverage

Don't let a
"Bonk" ruin
your day.



Bldg. Codes for Indoor Covg.

- **Becoming More Common, But Lack Uniformity**
- **Problem was addressed after 9/11 by NIST:**

“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.”

- **Two National Codes:**
 - Section 510 of the International Fire Code (IFC), which is part of the International Building Code (IBC), and
 - Annex O to the NFPA Fire Code, NFPA 1

Bldg. Codes for Indoor Covg.

- **Section 510 of IFC is Brief (2/3 of one column)**
 - Not comprehensive and therefore not very useful
 - But most cities use the IBC/IFC, not NFPA, so this leads to the desire to develop local indoor covg. codes
- **Annex O to NFPA 1 is Comprehensive**
 - Defines Radio Enhancement System (RES) (i.e., BDA)
 - Defines permitting process through AHJ (e.g., fire department)
 - Specifies min signal level in critical and general areas
 - Specifies reliable backup power
 - Requires system monitoring
 - Specifies how to test, both acceptance and periodic
 - Specifies maintenance responsibilities

Annex O Features

- **Signal Coverage**

- Min signal is -95 dBm inbound and outbound
- Critical areas must have 99% coverage, general building areas require 90% coverage
- Examples of critical areas are command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets

- **Backup Power**

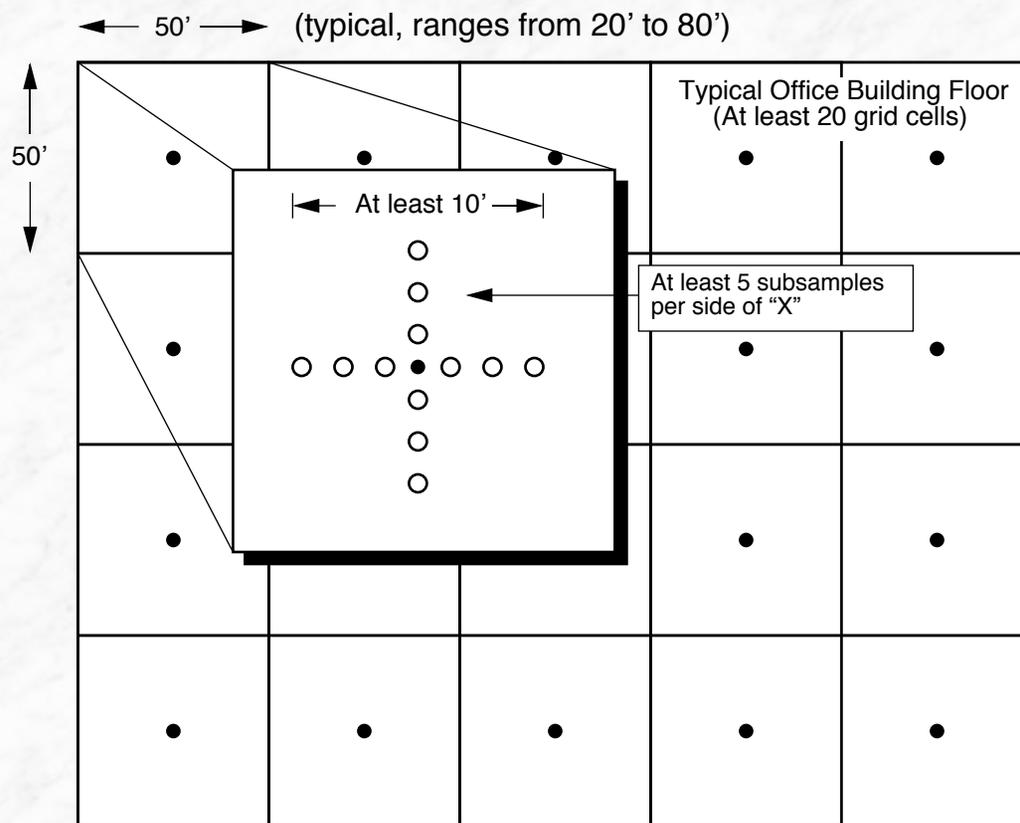
- Minimum 12 hours backup, automatic starting generator
- Two hours battery backup in case generator does not start

- **System Monitoring**

- Loss of ac power, signal booster failure, low battery charge (70%)

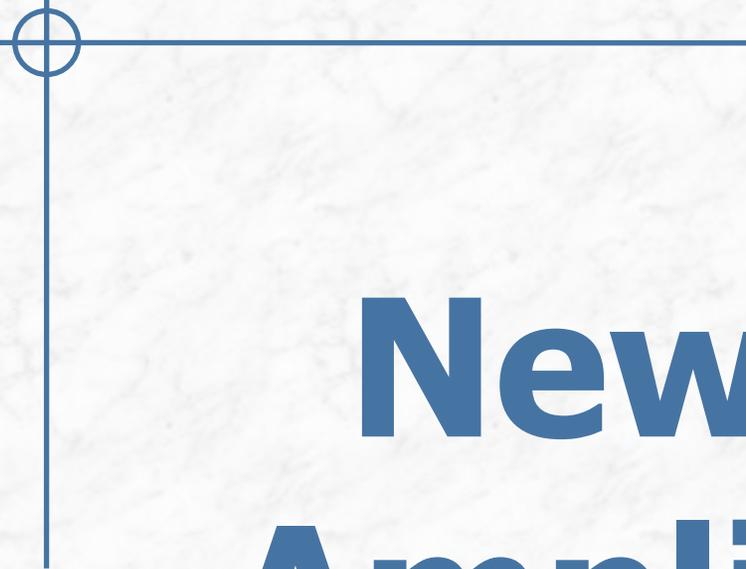
Annex O Testing

- Recommends testing for voice calls using actual radios as well as test receiver or spectrum analyzer
- Measure on uniform grid as shown to the right:



Responsibilities of the AHJ

- **AHJ = Authority Having Jurisdiction**
 - Usually building department or fire department (or both)
 - May require participation of city/county radio shop
- **Responsibilities**
 - Decide which buildings must comply. All buildings? Beyond a certain size in square feet? Grandfathering for old buildings? This can be very political as these systems are not cheap and the building owner must pay.
 - Specify which frequencies must be amplified
 - Maintain records of all RES/BDA's (see new FCC rules)
 - Be mindful of interference and compatibility with the rest of the system. Should AHJ maintain list of approved vendors?
 - Must maintain staff to review plans and conduct/oversee testing



New Booster Amplifier Rules

Booster Amplifiers

- **Also Called BDAs, DAS**

- Root of the problem is over-the-air feed
- Broadband amplifiers boost wanted and unwanted signals
- Can cause significant interference to other users

- **Two Types of Boosters**

- Class A booster is channelized, amplifying no more than 75 kHz
- Class B booster is broadband, amplifying more than 75 kHz
- Class B is more common due to low cost

Problems with Class B Boosters

- **Poor Donor & Coverage Antenna Isolation**
 - Results in positive feedback
 - Creates oscillation with unpredictable results
 - Interference can be broadband or frequency-shifting carriers
 - Typical Part 90 amplifier can wreck havoc over 18 MHz
- **FCC Solution: Three Parts**
 - Mandate hardware protections in all new booster amplifiers
 - Require permission from licensee before installing booster
 - Require registration of all booster amplifiers

Rule Summary – Part 90.219

- **Device Specifications (Part 90, non-consumer)**

- Output power limited to 5 Watts ERP
- Noise figure < 9 dB in either direction
- Spurious emissions less than -13 dBm in 100 kHz
- All signals transmitted must be on original channel
- No change in occupied bandwidth of original signal
- Must meet unwanted emission limits of Part 90.210
- After March 1, 2014 must be labeled as Class A or B and must show the following language:

“WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.”

Rule Summary – Part 90.219

- **Licensee and User Requirements**

- Licensee may deploy boosters inside the service contour
- Licensee may authorize non-licensee to install booster
 - Permission must be express (written) and on file for FCC
- Users may not install boosters without permission
- Must “maintain reasonable level of control” over boosters
- Mobile boosters not allowed after Nov 1, 2014
- Booster use is on a secondary, non-interference basis
- Must work to resolve interference per Part 90.173(b)
- New and existing boosters must be registered
- Use <https://signalboosters.fcc.gov/signal-boosters/>

Deadlines

- **Booster Product Protections**
 - March 1, 2014
- **Licensee and Users**
 - New boosters should be registered starting Mar 1, 2014
 - New and existing boosters must be registered by Nov 1, 2014
- **What Should Licensees Do?**
 - Identify all boosters owned or authorized by licensee
 - Notify non-licensee users of new rules
 - Register all boosters immediately on FCC web site
 - Keep good records

For More Information

**See the white papers and case studies on our web site,
www.pericle.com**



Questions?