

## § 511-01 In-Building Auxiliary Radio Communication Systems.

(a) **Scope.** This section sets forth requirements for the design, installation, operation and maintenance of *in-building auxiliary radio communication systems*. In-building radio communication systems that were approved for installation by the *Department of Buildings* and/or the *Department* prior to December 31, 2014, and that were designed to enhance *Department* communications in a manner similar to an *in-building auxiliary radio communication system*, shall be subject to the requirements of this section to the extent set forth in R511-01(j).

(b) **Definitions.** The following terms shall, for purposes of this section and as used elsewhere in the rules, have the meanings shown herein:

**Appendix Q.** Section 24.5.2 of Appendix Q to the *Building Code*, as codified in *Department of Buildings* rule 1 RCNY § 3616-04. *Appendix Q* amends NFPA Standard 72, a Referenced Standard to the *Building Code* and Fire Code.

**ARC system.** An *in-building auxiliary radio communication system*.

**Base station.** A transceiver that receives radio signals from an antenna system and retransmits them through the antenna system in an amplified and/or otherwise enhanced manner.

**Critical areas.** Areas of a building within which radio communication is critical for emergency response operations.

**FCC.** United States Federal Communications Commission.

**General areas.** All areas of a building within which radio communication is to be made available for emergency response operations, excluding *critical areas*.

**In-building auxiliary radio communication system.** A wireless two-way building communication system dedicated for *Department* use and designed in accordance with *Appendix Q* to propagate *Department* wireless radio frequencies within a building. Such a system typically consists of a radio console, base station, cabling, amplifiers and antenna system.

**Technical criteria.** Technical specifications and standards for the design and operation of *ARC systems* established pursuant to Section 24.5.2.7 of *Appendix Q*. *Technical criteria* include but are not limited to operating frequencies; maximum time domain interference; unit ID and emergency alert signaling; dedicated radio console and other installation specifications; and testing equipment specifications.

**Testable area.** Locations within a building in which an *ARC system* commissioning test can be conducted, including all areas designed for human occupancy. Mechanical rooms and other utility areas are testable areas if, and to the extent that, they are accessible.

(c) **Permit.** Pursuant to FC105.6, a *permit* shall be obtained from the *Department* to maintain or operate an *ARC system*. Application for a *permit* shall be made in accordance with R511-01(d)(3).

(d) **General Provisions.**

(1) **General.** *ARC systems*, whether required by Sections 403 or 917 of the *Building Code* or installed voluntarily, shall be designed, installed, operated and maintained in compliance with FCC regulations, FC511, Section 917 of the *Building Code*, NFPA Standard 72 as amended by *Appendix Q*, this section and applicable *technical criteria*. Any potential conflicts among these requirements shall be promptly reported to the Technology Management Unit of the *Bureau of Fire Prevention*.

(2) **Required frequencies.** An *ARC system* shall be designed to operate on the simplex *Department* frequencies designated as Channels 1 through 10 and Channel 16, or the duplex *Department* frequencies designated as Channels 11 and 12, as set forth in the *technical criteria*. Pursuant to Section 24.5.2.4.2 of *Appendix Q*, *ARC systems* shall be designed to be upgraded to accommodate changes in *Department* frequencies. The design, installation, operation and maintenance requirements set forth in *Appendix Q*, the *technical criteria* and this section may not be applicable to other *Department* communications and the frequencies on which they are propagated. Any *owner* seeking to install and maintain an in-building radio communication system that operates on any *Department* frequency other than the channels specified in this section shall first obtain *Department* approval in such manner and subject to such terms and conditions as the *Department* may prescribe.

(3) **Application and approval process.** The following *Department* approvals shall be obtained to install and maintain an *ARC system*:

(A) **Application for system design approval.** An application shall be filed by or on behalf of the *owner*, and include *design and installation documents* prepared in accordance with FC105.4 and R511-01(e) and detailing the design and intended operation of the *ARC system*; a written agreement executed by the *owner*, for use of *Department* frequencies, as set forth in R511-01(d)(4); and such other documentation as the *Department* may require.

(B) **Plan approval.** The *Department* will review the application for system design approval in accordance with FC105.4 and, if it determines the application to be satisfactory, will approve the documents in accordance with FC105.4.4.

(C) **Commissioning test and application for system acceptance and permit issuance.** Upon installation of an *ARC system* in accordance with the *Department*-approved documents, a commissioning test shall be conducted in accordance with FC511.2.2.1 and R511-01(f)(2). The test shall be performed by a person holding a *certificate of fitness* for *ARC system* professional, who is employed by a business holding a *Department* company certificate, as set forth in R115-01. Upon successful completion of the commissioning test, the *owner* shall file an application with the *Department* requesting an acceptance test of the system and issuance of a *permit*. The application shall include a detailed report of the results of the commissioning test, as set forth in R511-01(e)(2) and R511-01(f)(2), and such other information and documentation as the *Department* may require.

(D) **Acceptance test.** The *owner* shall request that the *Department* schedule an acceptance test. The *certificate of fitness* holder who conducted the commissioning test shall be present at the acceptance test and demonstrate operation of the *ARC system* in the presence of *Department* representatives. The *Department* representatives will not conduct a second commissioning test but perform a limited test of the *ARC system* to confirm its operational readiness for *Department* use.

(E) **Permit issuance.** Upon successful completion of the acceptance test, the *Department* will issue a *permit* to maintain and operate the *ARC system*.

(4) **City agreement to operate on FCC-licensed radio frequencies.** *ARC systems* operate on radio frequencies licensed by the *FCC* to the City of New York. The installation of an *ARC system* in accordance with *Building Code* and Fire Code requirements does not constitute legal authority to operate on such licensed radio frequencies. The *owner*, prior to operating an *ARC system*, must obtain the consent of the City of New York to operate on such licensed radio frequencies by executing a written agreement with the City of New York in a form approved by the *Department* and submitting it to the *Department* as set forth in R511-01(d)(3)(A). The City will grant temporary consent for purposes of system installation and commissioning testing at the time of plan approval, and final consent upon permit issuance.

(5) **Prevention of interference.** An *ARC system* shall be designed, installed, operated and maintained in a manner that does not interfere with any other FCC-licensed radio frequency, including police department, fire department and other public safety agency radio communications. Immediate measures shall be taken to remedy any such interference, including interference intermodulation and spurious emissions, in accordance with *FCC* regulations (as set forth in 47 C.F.R. Part 90), this section and other applicable laws, rules and regulations. The *owner*, and its contractors and agents, shall cooperate with the *Department* in immediately addressing interference issues, and shall repair or replace any *ARC system* or system component causing interference.

(6) **Supervision.** Operation of the *ARC system*, other than by *Department* personnel, including inspection and testing for the commissioning test, annual certification and five-year recertification required by R511-01(f) and (g), shall be under the *personal supervision* of a person holding a *certificate of fitness* as *ARC system* professional and a General Radiotelephone Operator License issued by the *FCC* pursuant to 47 C.F.R. Part 90, who is employed by a company holding an *ARC testing* company certificate. The duties of such *certificate of fitness* holder include ensuring that:

(A) use of the *ARC system* is immediately discontinued if, upon testing, it is found to cause interference in violation of *FCC* regulations and/or other applicable laws, rules and regulations, or upon being directed to do so by a *Department* representative;

(B) the portable radios programmed with *Department* frequencies are used solely for purposes of *ARC system* testing, and for no other purpose; and

(C) notifications to the *Department* required by this section are made in accordance with this section.

(7) **Sharing of system components.** All *ARC system* components shall be dedicated for system use, except that system radio frequency (RF) cabling may be shared with other in-building radio communication systems if such sharing does not interfere with or otherwise impair the operation of the *ARC system*.

(8) **Citywide standard key.** Owners, impairment coordinators, and persons authorized to install or maintain *ARC systems*, may possess a *citywide standard key*.

(e) **Design and Installation Requirements.** An *ARC system* shall be designed and installed in accordance with Section 917 of the *Building Code*, the *Electrical Code*, FC 511, NFPA Standard 72 as amended by *Appendix Q*, this section and the *technical criteria*. *ARC system design and installation documents* shall set forth the information and documentation required by Section 917 of the *Building Code* and such other information and documentation as the *Department* may require, including the following documents:

(1) **Application for system design approval.** A riser diagram and floor plan showing the location of base stations, amplifiers, antennas and other *ARC system* components, formatted and submitted for *Department* review and approval in the same manner as fire alarm system installations, as set forth in R105-01(c)(1). Any sharing of system radio frequency (RF) cabling with other in-building radio communication systems shall be clearly indicated and accompanied by documentation demonstrating that such sharing will not interfere with or otherwise impair the operation of the *ARC system*.

(2) **Application for system acceptance and permit issuance.** A floor plan containing the information set forth in R511-01(f)(2), formatted to folio (11" x 17") size, with a copy of the plan in an *approved* electronic format on a compact disk.

(f) **Commissioning and Acceptance Testing.** Commissioning and acceptance testing shall be conducted in accordance with the following requirements, standards and procedures.

(1) **Radio coverage performance standards.** *ARC systems* shall be designed to achieve, and in operation shall achieve, the radio coverage performance standards set forth in Sections 24.5.2.2 and 24.5.2.3 of *Appendix Q*, as measured in the manner set forth in this section.

(A) **Required minimum signal strength and delivered audio quality.** The minimum signal strength of inbound *ARC system* radio signals (as received by a *Department* portable radio at a location remote from the dedicated radio console) and outbound *ARC system* radio signals (as received by the dedicated radio console from a *Department* portable radio) and the average delivered audio quality shall be as set forth in Sections 24.5.2.1.3 and 24.5.2.2 of *Appendix Q*.

(B) **Signal strength measurements.** The signal strength of radio signals received or retransmitted by the *ARC system* shall be measured in the following manner:

(1) Measurements shall be taken using:

(a) two (2) portable radios, lawfully programmed to transmit on *Department* frequencies pursuant to R115-01(d)(4), one to transmit a radio communication to the *ARC system* and one to receive the retransmission from the *ARC system*;

(b) a calibrated spectrum analyzer or a calibrated automatic signal level measurement recording system;

(c) a receiving antenna with a gain equal to the antenna on a *Department* portable radio; and

(d) a resolution bandwidth nearest the bandwidth of the channel being tested.

(2) Signal strength measurements shall be taken as close as possible to the center of each grid cell.

(3) Signal strength measurements shall be taken with the antenna held in a vertical position with a center-line between three (3) and four (4) feet above the floor.

(4) The delivered audio quality readings shall be assessed and documented on the floor plans.

(5) The gain values of any and all amplifiers shall be measured and documented.

(C) **Critical area radio coverage.** The radio coverage performance standard set forth in *Appendix Q* of 100 percent of floor area shall be met in the *critical areas* designated in Section 24.5.2.2.1 of *Appendix Q*, including *sprinkler system* control valves and *standpipe system* hose connections, and any other area of a building designated by the *Department* as a *critical area* based on the *Department's* review of the *design and installation documents* submitted for an *ARC system* in a particular building.

(D) **General area radio coverage.** The radio coverage performance standard set forth in *Appendix Q* of 95 percent of floor area shall be met or exceeded in all *general areas*.

(2) **Commissioning test.** Upon installation of an *ARC system*, a commissioning test of the *ARC system*, including a radio coverage survey and an inspection and testing of system components, shall be conducted, and the results reported to the *Department*, as follows:

(A) **Radio coverage survey.** The commissioning test shall be conducted in accordance with Annex O of NFPA Standard 1, this section and the *technical criteria*, and shall be considered successful if it confirms that the *ARC system* meets or exceeds the following radio coverage performance standards:

(1) On each floor, radio coverage meets or exceeds the standards set forth in R511-01(f)(1).

(2) There shall not be a failure of radio coverage in the same grid area on consecutive floors, such as a consistent failure to achieve the required radio coverage in vertically corresponding grids on multiple consecutive floors of a building.

(3) The dedicated radio console is functioning properly and monitoring all system components in accordance with *Appendix Q*.

(B) **Inspection and testing of system components.** *ARC system* components, including those listed on Table 1 of this section, shall be inspected and tested to confirm that the system components are in good working order and are operating as designed.

(C) **Retesting.** Any floor of a building that initially fails to meet or exceed the radio coverage standards shall be retested. The resolution of the floor

grid size used for testing purposes shall be decreased by reducing the size of each grid area by at least 50 percent to facilitate precise identification of the building areas in which radio coverage is lacking. A commissioning test that fails to confirm radio coverage requirements meeting or exceeding the standards set forth in R511-01(f)(1) shall be treated as unsuccessful and shall result in a redesign of the *ARC system* on the floor or floors found to have failed the commissioning test.

(D) **Submission of commissioning test results.** The results of the radio coverage survey and inspection and testing of system components shall be signed by the *certificate of fitness* holder who personally supervised the test and submitted by the *ARC system testing* company that employs the certificate holder to the *Department* for review and acceptance. The commissioning test results shall be submitted in the form prescribed by the *Department* and shall include the following information and documentation, and such other information and documentation as the *Department* may require:

(1) An audio recording of delivered audio quality at each grid location, with an audio description of the floor designation, marker location and the time of recording.

(2) A table setting forth the following information for each test location:

- (a) Marker location;
- (b) Received signal strength;
- (c) Radio frequency used for test;
- (d) The average delivered audio quality value; and
- (e) Date of last calibration of spectrum analyzer test equipment used to conduct test.

(3) A floor plan for each floor, showing the building's floor area on a series of grids. Each grid shall be a maximum of five (5) percent of the total square footage of *testable area* on each floor, but not more than 1,600 square feet. If an irregular shaped floor plate makes this grid criteria unsatisfactory for testing purposes, an alternative testing grid may be used, subject to *Department* approval. The floor plan shall set forth the following information for each test location:

- (a) Marker location, correlated with the tabular submission;
- (b) Grid size(s);
- (c) *Critical areas*;
- (d) *General areas*; and
- (e) Areas that are not *testable areas*, with an explanation as to why such areas are not *testable areas*.

(4) A description of the inspection and testing conducted of each of the system components.

(5) A summary and conclusions section. The report shall clearly summarize the test results, and shall include a statement as to whether the test results confirm that the *ARC system* meets or exceeds the standards required by this section, or if not, in what respects it is deficient.

(g) **Operational and Maintenance Requirements.** An *ARC system* shall be operated and maintained in accordance with FC511, this section and the *technical criteria*.

(1) **General.** An *ARC system* shall be maintained in good working order.

(2) **Daily inspection.** The *dedicated radio console* shall be inspected daily to confirm that the *ARC system* is operational and that there is no indication of a system malfunction. Daily inspection may, with *Department* approval, be conducted by means of remote monitoring.

(3) **Annual certification.** An *ARC system* shall be inspected and tested not less than once every 12 months to confirm that the system is in good working order, except that every fifth year a five-year recertification pursuant to R511-01(g)(4) shall be conducted in lieu of the annual certification. The inspection and testing of the *ARC system* shall include the system components listed in Table 1, except that a radio coverage survey is not required. Certification of such inspection and testing and satisfactory system performance shall be submitted to the *Department* in connection with the application for permit renewal in such form and manner as the *Department* may prescribe.

(4) **Five-year recertification.** An *ARC system* shall be recertified as properly functioning not less than once every five (5) years in the following manner.

(A) A radio coverage survey of the *ARC system* shall be conducted in the same manner as the commissioning test, and the radio coverage performance standards set forth in R511-01(f) shall apply.

(B) The *Department* shall be given reasonable advance notice of the date of each five-year certification test, which shall be conducted within a continuous 72-hour period. The *Department* reserves the right to require that such test be conducted in the presence of *Department* representatives, and to conduct its own operational readiness testing.

(C) The recertification test shall compare the results with those of the original commissioning test to determine whether there has been any degradation in system performance. If the *ARC system* fails to meet or exceed the applicable radio coverage performance standards, the system shall be repaired or upgraded to achieve such standards.

(D) *ARC system* components, including each of the components listed on Table 1, shall be inspected and tested to confirm that the system components are in good working order and are continuing to operate as designed. Any system component impairing *ARC system* operation or reliability shall be repaired or replaced prior to submission of recertification results.

(E) Successful recertification test results shall be submitted to the *Department* in connection with the application for *permit* renewal in such form and manner as the *Department* may prescribe.

(5) **Department-ordered testing and demonstrations.** Upon reasonable notice to the owner, the *Department* may order a test of an *ARC system* to confirm that it is in good working order or to familiarize *Department* personnel with use of such system.

(h) **Out-of-service systems.** The following actions shall be taken to mitigate the consequences of any *ARC system* that is not fully functional, whether as a result of planned removal from service for maintenance, repair or construction, or an unplanned malfunction affecting system operation.

(1) **Impairment coordinator.** The owner shall designate an *impairment coordinator* to take the actions required by this section when an *ARC system* is out of service. In the absence of a specific designee, the *owner* will be considered the impairment coordinator.

(2) **Planned removal from service.** The *impairment coordinator* shall be made aware in advance of any planned removal from service of an *ARC system* for maintenance, repair or construction. The *impairment coordinator* shall authorize the removal of the *ARC system* from service. Before authorizing removal of the system from service, the *impairment coordinator* shall:

- (A) determine the extent and expected duration of the out-of-service condition;
- (B) maintain the system in service until the maintenance, repair or construction work is ready to begin;
- (C) place an impairment tag indicating the nature of the out-of-service condition at the dedicated radio console, *fire command center* or other *approved* location indicating that the *ARC system* is out of service; and
- (D) notify the *Department* as set forth in R511-01(h)(4).

(3) **Unplanned out-of-service condition.** Any person who becomes aware that an *ARC system* is out of service for any reason other than a planned removal from service must, upon becoming aware of the out-of-service condition, notify the *owner*, the *impairment coordinator* or, if such persons are not known or not available, any person in charge of the premises of such condition. The *owner* or *impairment coordinator* shall promptly act to address the out-of-service condition in accordance with the procedures set forth in R511-01(h)(2)(A), (C) and (D).

(4) **Notification of Department.** Pursuant to FC107.1, *ARC systems* shall be continuously maintained in good working order. Notification shall be made to the *Department* of any condition impairing the operational readiness of the *ARC system*, including complete or partial system failure or loss of radio coverage in one or more areas of the building, when the system is not restored to service within 48 hours. Such notification shall be made by calling the telephone number set forth in FC401.2.2 for the borough in which the *ARC system* is located, and shall include the information set forth in FC901.7.5.3 as it relates to the out-of-service condition affecting the *ARC system*. Notification shall not be made for conditions that do not presently affect the operational readiness of the system, such as warning signals of the need for future servicing.

(5) **Restoring system to service.** When the *ARC system* has been repaired and restored to service, the impairment coordinator shall:

- (A) verify that all inspections and tests required by law, rule, regulation or Referenced Standard, including Annex O of NFPA Standard 1, have been conducted to confirm that the system has been restored to good working order;
- (B) if notification was required to be made to the *Department* pursuant to R511-01(h)(4), notify the *Department* that the system has been restored to good working order; and
- (C) remove impairment tags.

(i) **Recordkeeping.** A logbook or other *approved* form of recordkeeping for the maintenance of the *ARC system* shall be maintained for a period of six (6) years, together with a complete copy of test results and other documentation of *ARC system* maintenance. The logbook shall include entries for the following maintenance requirements:

- (1) Commissioning test results, as required by R511-01(f)(2);
- (2) Daily inspection of the system status, as required by R511-01(g)(2);
- (3) Annual certification test results, as required by R511-01(g)(3);
- (4) Five-year recertification test results, as required by R511-01(g)(4);
- (5) Planned removals from service for maintenance, repair or alteration of the *ARC system*, including the extent and duration of any removal and related notifications to the *Department*; and
- (6) Unplanned out-of-service conditions, including a description, extent and duration of any system malfunction, corrective actions taken, and related notifications to the *Department*.

(j) **Lawfully Existing In-Building Radio Communication Systems.** Notwithstanding the provisions of this section, the operation of an in-building radio communication system that was approved for installation by the *Department of Buildings* and/or the *Department* prior to December 31, 2014, and that was designed to enhance *Department* communications in a manner similar to an *ARC system*, may be continued under the following circumstances and subject to the following requirements:

- (1) **Prior approval.** Such system must have been approved for installation by the *Department of Buildings* and/or the *Department* prior to January 1, 2015.
- (2) **Applicable standards.** Such system shall be operated and maintained in compliance with the *design and installation documents* and standards under which such system was approved, and the following requirements:
  - (A) **Permit.** A *permit* shall be obtained for such system.
  - (B) **Use of City frequencies and compliance with FCC regulations.** A written agreement with the City of New York for use of *Department* frequencies shall be executed and such system shall be operated and maintained in compliance with R511-01(d)(1), (2), (4), (5) and (6).
  - (C) **Supervision.** Operation of such system shall be supervised in accordance with R511-01(d)(6).
  - (D) **Radio coverage.** A commissioning test shall be conducted in accordance with Section R511-01(f)(2) within one (1) year from [EFFECTIVE DATE OF THIS SECTION], and an *ARC system* company certificate holder shall submit such results to the *Department*. Any such system that fails to meet or exceed the radio coverage performance standards set forth in R511-01(f)(1) shall be upgraded to meet or exceed such standards, or an application made to the *Department* for approval of appropriate mitigation measures to address gaps or other deficiencies in radio coverage. Such measures may include signage in building lobbies and/or in areas of the building in which such gaps exist.
  - (E) **Operational and maintenance requirements.** Such systems shall be operated and maintained in accordance with R511-01(g), (h) and (i).

<b>R511-01</b>
<b>Table 1</b>
<b>Commissioning Test and Periodic Maintenance Requirements for In-Building Auxiliary Radio Communication Systems</b>
<b>ARC System Component/System Malfunction</b>
<b>Dedicated Radio Console</b>
Control unit
Lamps and LEDs

Radio desk-set
Audio levels
Control levels
<b>Base Station</b>
Wireless signals
Transceivers
System performance
Radio ID pass-through
Emergency alert pass-through
<b>Base Station Failure Monitoring</b>
Low transmit power
Over temperature
High voltage standing wave ratio
Loss of alternating current (AC) or primary power source on the base station
Low battery capacity
Antenna failure
Signal amplification
Tamper switch
<b>Antenna Systems</b>
Amplifiers
Antennas
<b>Power Supply</b>
Primary (main) power supply
Engine-driven generator
Secondary (standby) power supply
Uninterrupted power supply (UPS)
<b>Battery Tests</b>
Primary battery performance test
Secondary battery/batteries performance test

(Added City Record 12/1/2015, eff. 1/1/2016)