

FIRE DEPARTMENT • CITY OF NEW YORK



**STUDY MATERIAL FOR THE EXAMINATION FOR
THE CERTIFICATE OF FITNESS FOR**

**Testing of In-Building Auxiliary Radio Communication Systems
(Citywide)**

B-03

This book is provided to the public for free by the FDNY.

ALSO INCLUDED IN THIS BOOKLET YOU WILL FIND THE FOLLOWING:
ALTERNATE ISSUANCE PROCEDURES (AIP)

EXAM SPECIFIC INFORMATION FOR B-03 CERTIFICATE OF FITNESS

Save time and submit application online!

B-03 applicants must submit and pay the COF application online.

It can take about 30 minutes to complete. Completing application and paying online will eliminate waiting outside in the long lines.

Simplified instructions for online application and payment can be found here:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf>

Create an Account and Log in to:

<http://fires.fdnyccloud.org/CitizenAccess/>

REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION

General requirements:

Review the General Notice of Exam:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf>

Special requirements for the B-03 Certificate of Fitness:

- B-03 can only be obtained by qualifying for an exemption on the basis of education, experience or other qualifications. **B-03 is only issued via Alternate Issuance Procedures (AIP) after submitting the required documents.**
- B-03 Certificate of Fitness holder must be employed by an FDNY approved ARC company. **If the ARC company has not been approved, the company owner/principal must mail the ARC company application to the FDNY after submitting the B-03 application online.**

Find the information regarding the ARC company application:

<https://www1.nyc.gov/site/fdny/business/all-certifications/certificates-auxiliary-radio-comm.page>

Application fee (Cash is NO LONGER ACCEPTED):

Pay the **\$25** application fee online by one of the following methods:

- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)

A convenience fee of 2% will be applied to all credit card payments.

Revised on 12/15/2021 updated NOE and AIP procedure

For fee waivers submit: ***(Only government employees who will use their COF for their work-related responsibilities are eligible for fee waivers.)***

- A letter requesting fee waiver on the Agency's official letterhead stating applicant full name, exam type and address of premises; **AND**
- Copy of identification card issued by the agency

REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE (AIP)

This Certificate of Fitness can only be obtained by the alternative issuance procedure. Qualified applicants should review and complete the B-03 Certificate of Fitness Alternative Issuance Procedure Application Affirmation Form:

<https://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-b03-aip.pdf>

The AIP applicants must submit the application, required documents and payment on **FDNY Business**:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf>

WEBSITE

Please always check for the latest revised booklet at FDNY website before you apply, the Certificate of Fitness Study Material link, below:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-b03-noe-study-materials.pdf>

RENEWAL REQUIREMENTS

General renewal requirements:

Review the General Notice of Exam:

<https://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf>

Special renewal requirements. B-03 Certificate of Fitness: None

QUESTIONS?

FDNY Business Support Team: For questions, call 311 and ask for the FDNY Customer Service Center or send an email to FDNY.BusinessSupport@fdny.nyc.gov.

Contents

EXAM SPECIFIC INFORMATION FOR B-03 CERTIFICATE OF FITNESS	2
INTRODUCTION.....	5
Appendix A: Fire Code Sections-FC 105 and FC 511	6
Appendix B: 3RCNY 511-01.....	7
Appendix C: Relevant NYC Building Code.....	17
Appendix D: ARC System Visual and Functional Testing Procedures	18
APPENDIX E: Auxiliary Radio Communication (ARC) System Visual and Functional Testing Form	25

INTRODUCTION

Section 907.2.13.2 of the 2014 Building Code requires that all high-rise buildings (except those buildings determined by the FDNY as not requiring such systems) be provided with a Fire Department Auxiliary Radio Communication (ARC) System. ARC system is a wireless two-way radio communication enhancement system installed in buildings to propagate Fire Department frequencies for the use of the Fire Department personnel in case of an emergency. This requirement went into effect on December 31, 2014.

Section 917.1.2 of the 2014 Building Code requires that the installation, acceptance testing and the maintenance and operation of ARC system be in accordance with the Fire Code and the FDNY rules. Section 511 of the 2014 Fire Code also authorizes the FDNY to develop rules for the installation, acceptance testing and the operation and maintenance of ARC system.

Upon installation of an ARC system in accordance with the Fire Department-approved documents, a commissioning test must be conducted. The test must be performed by a person holding a B-03 Certificate of Fitness (C of F) for ARC system, who is employed by a business holding an approved Fire Department company certificate. The B-03 Certificate of Fitness holder who conducted the commissioning test shall be present at the premises during the acceptance test and demonstrate operation of the ARC system in the presence of Fire Department representatives. The Fire Department representatives will not conduct a second commissioning test but will perform a limited test of the ARC system to confirm its operational readiness for the Fire Department use.

Operation of the ARC system, other than by Fire Department personnel, including inspection and testing for the commissioning test, annual certification and five-year recertification required by 3 RCNY511-01(f) and (g), shall be under the personal supervision of a person holding a B-03 C of F and a General Radiotelephone Operator License issued by the FCC pursuant to 47 CFR Part 90, who is employed by an approved FDNY company holding an ARC system testing company certificate. All tests procedures should follow the FDNY approved procedures (refer to the appendix D of this document).

The B-03 C of F should record all testing results in the logbook or other approved form and the record must be maintained for a period of 6 years. The entries must include (1) commissioning test results; (2) daily inspection of the system status; (3) annual certification test results; (4) fire-year recertification test results; (5) out-of-service conditions. The logbook or other approved form of recordkeeping all the results and maintain the record

Other duties of B-03 C of F holder also 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 the Fire Department representative;
- (B) the portable radios programmed with the Fire Department frequencies are used solely for purposes of ARC system testing, and for no other purpose; and
- (C) notifications to the Fire Department required by the Fire Rule R511-01.

The C of F will be issued based upon an Alternate Issuance Procedure (AIP), including the Fire Code requirement that such person holds an FCC license.

Appendix A: Fire Code Sections-FC 105 and FC 511

Section FC 105 Permits and Other Approvals

105.4 Design and installation documents. Design and installation documents required to be submitted to the department pursuant to the provisions of this code, the rules or the construction codes, including but not limited to those set forth below, or as directed by the commissioner to demonstrate or document that a device, equipment, system, operation or facility regulated by this code is designed and installed in accordance with this code, shall be submitted in accordance with this section. Such submissions shall be reviewed by the department for compliance with the requirements of this code, the rules and other applicable laws, rules and regulations enforced by the department. The time limitations for approval of design and installation documents and for deeming such submissions abandoned shall be as set forth in FC 105.2.3 and 105.2.4.

Section FC 511 In-Building Auxiliary Radio Communication Systems

511.1 General. The design, installation, operation and maintenance of in-building auxiliary radio communication systems dedicated for fire department use, whether required by the Building Code or installed voluntarily, shall comply with this section and the rules.

511.2 Design and installation. In-building auxiliary radio communication systems for fire department use shall be designed and installed in accordance with the construction codes, including the Building Code, and the Electrical Code.

511.2.1 Installer qualifications. In-building auxiliary radio communication systems for fire department use shall be installed by a master electrician licensed by the Department of Buildings and such other qualifications as may be prescribed by rule.

511.2.2 Installation acceptance. In-building auxiliary radio communication systems for fire department use shall be tested for department acceptance in compliance with the requirements of this section and the rules.

511.2.2.1 Commissioning test. Upon completion of installation of an in-building auxiliary radio communication system for fire department use, a commissioning test shall be conducted in accordance with Annex O of NFPA 1 by a person holding a Federal Communication Commission general radio telephone operator license and such other qualifications as may be prescribed by rule.

511.2.2.2 Department acceptance test. Upon successful completion of the commissioning test, the owner shall submit to the department a detailed report of the results of the commissioning test and request a department acceptance test. The department acceptance test shall serve to demonstrate the system is functioning satisfactorily and is ready for department use. The in-building auxiliary radio communication system shall be demonstrated in the presence of a department representative by a representative of the owner. Upon satisfactory completion of the department acceptance test, the department shall issue a permit for such system.

511.3 Operation and maintenance. The operation and maintenance of in-building auxiliary radio communication systems for fire department use shall be in accordance with this section and the rules.

511.3.1 General. In-building auxiliary radio communication systems for fire department use shall be maintained in good working order.

511.3.2 Out-of-service systems. The department shall be notified immediately if an in-building auxiliary radio communication system for fire department use, or part thereof, is out of service. A tag identifying the system as out of service shall be placed on the fire command center or other approved location when the system is out of service.

Appendix B: 3RCNY 511-01

3 RCNY §511-01, entitled “In-Building Auxiliary Radio Communication Systems”

NOTICE IS HEREBY GIVEN PURSUANT TO THE AUTHORITY VESTED in the Fire Commissioner of the City of New York pursuant to Section 102 of the New York City Fire Code, and in accordance with the requirements of Section 1043 of the New York City Charter, that the New York City Fire Department has adopted a new rule, 3 RCNY §511-01, entitled “In-Building Auxiliary Radio Communication Systems.”

The public hearing was held on July 30, 2015. The amendments to the rules shall take effect on January 1, 2016.

The Notice of Adoption, final rule and the Statement of Basis and Purpose of Final Rule, will be available on the Fire Department’s website (www.nyc.gov/fdny) and NYC RULES (www.nyc.gov/NYCRULES).

Statement of Basis and Purpose of Final Rule

As of December 31, 2014, the New York City Building Code requires, in Sections 403.4.4 and 907.2.13.2, that an in-building auxiliary radio communication (ARC) system be installed and maintained in all newly-constructed high-rise buildings. An ARC system is a wireless two-way building communication system for Fire Department use only that receives and transmits Fire Department portable radio frequencies within the building. An ARC system typically consists of a transceiver (base station) connected to a building-wide antenna system, with a radio console in the building lobby. Section 917.1.2 of the New York City Building Code and Section FC 511 of the New York City Fire Code together require that ARC systems be installed, acceptance tested, operated and maintained in accordance with the Fire Code and the rules of the Fire Department.

The Fire Department adopts this rule to establish requirements for the design, installation, operation and maintenance of ARC systems, including the testing procedures necessary to confirm that the ARC system is providing adequate radio coverage in the building in all areas accessible for firefighting operations. The rule seeks to ensure that ARC systems achieve their intended purpose and, once installed, are continuously maintained in good working order.

The new rule, 3 RCNY §511-01, sets forth standards, requirements and procedures for installation, acceptance testing, daily inspection, annual certification and five-year recertification of ARC systems. It requires that the testing of ARC systems be supervised by a person holding a Fire Department license, known as a Certificate of Fitness, who knows the New York City Building Code, Fire Code and Fire Department rule standards that apply to ARC systems. The rule reflects the Fire Code requirement that this person hold a General Radiotelephone Operator License issued by the United States Federal Communications Commission (FCC).

The new rule also addresses the operation and maintenance of pre-existing in-building radio communication systems similar to ARC systems that were approved for installation by the Department of Buildings and/or the Fire Department prior to December 31, 2014. As set forth in Section 511-01(j) of the rule, a commissioning test must be conducted and the results submitted to the Fire Department; a Fire Department permit must be obtained; operation of the system for maintenance and testing purposes must be under the supervision of a certificate of fitness holder; and the system must be operated and maintained in compliance with the requirements for ARC systems set forth in the rule.

The Fire Department is additionally amending two existing Fire Department rules in connection with the ARC system requirements of the Fire Code and Section 511-01.

The Fire Department is amending Fire Department rule 3 RCNY §115-01 to establish a company certificate for businesses that test ARC systems. These company certificates seek to ensure that the businesses that test ARC systems, including operating the systems to perform the required testing, are subject to the same standards as the individual Fire Department Certificate of Fitness holders whom they employ to perform the testing. The Fire Department regulates blasting and fireworks contractors, private fire alarm central stations, fumigation companies, portable fire extinguisher sales and servicing companies, and smoke detector maintenance companies in a similar fashion by requiring both the individuals who perform the work and the companies that employ them to be certified.

Lastly, the Fire Department is amending Fire Department rule 3 RCNY §4601-01 to adopt fees for the ARC system testing company certificate and for ARC system acceptance testing by Fire Department personnel. The fee for the ARC

system testing company certificate will cover the Fire Department's costs in issuing the certificate and programming and periodically inspecting the portable radios that each company will use to operate on Fire Department frequencies to test the ARC systems. The fee for the ARC system permit is amended to cover the cost of acceptance testing by the Fire Department.

In response to public comment, the Fire Department has revised Section 511-01 to clarify that the ARC system must be capable of operating on either the Fire Department simplex channels or duplex channels designated in the rule, and is not required to be capable of operating on both. The rule has also been revised to allow the cabling for ARC systems that carries or radiates the radio frequencies (RF) to be shared with other building communication systems, provided that the owner demonstrates that such sharing will not impair the operation of the ARC system. Additional revisions seek to clarify the terminology associated with preexisting in-building radio communication systems similar to ARC systems.

Finally, the rule has been revised to authorize owners of ARC systems, as well as impairment coordinators and persons who install or maintain ARC systems, to possess a citywide standard key. A citywide standard key is the key that enables Fire Department personnel and other authorized persons to operate elevator firefighter service and other devices and locked boxes. The ARC system console will be accessed using a citywide standard key.

Terms used in the rule that are defined in the Fire Code or elsewhere in the Fire Department's rules are indicated by *italics*.

Text to be deleted is indicated by [brackets]. Text to be added is underlined.

"Shall" and "must" denote mandatory requirements and may be used interchangeably in Fire Department rules, unless otherwise specified or unless the context clearly indicates otherwise.

Guidance with respect to the interpretation of the Fire Code and Fire Department rules may be obtained using the Public Inquiry Form on the Fire Department's website, www.nyc.gov/html/fdny/html/firecode/index.shtml#p6.

Section 1. Chapter 5 of Title 3 of the Rules of the City of New York is amended by adding a new section 511-01, to read as follows:

§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 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 CFR 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 CFR 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 3 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).

3 RCNY 511-01

Table 1

ARC System Component/System Malfunction
<i>Dedicated Radio Console</i>
Control unit
Lamps and LEDs
Radio desk-set
Audio levels
Control levels
<i>Base Station</i>
Wireless signals
Transceivers
System performance
Radio ID pass-through
Emergency alert pass-through
<i>Base Station Failure Monitoring</i>
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
<i>Antenna Systems</i>
Amplifiers
Antennas
<i>Power Supply</i>
Primary (main) power supply
Engine-driven generator
Secondary (standby) power supply
Uninterrupted power supply (UPS)
<i>Battery Tests</i>
Primary battery performance test
Secondary battery/batteries performance test

§2. Subdivisions (a), (d), and (f) of Section 115-01 of Title 3 of the Rules of the City of New York are amended by amending subdivision (a) and adding a new paragraph eight to subdivision (d) and a new paragraph four to subdivision (f) to read as follows:

§ 115-01 Company Certificates

(a) Scope. This section sets forth standards, requirements and procedures for issuance of company certificates, including blasting contractor, central station, commercial cooking exhaust system servicing, fireworks contractor, fumigation and [thermal] insecticidal fogging operation, portable fire extinguisher sales, portable fire extinguisher servicing, pyrotechnic supplier [and], smoke detector maintenance company certificates and *ARC system* testing.

* * *

(d) Special Qualifications. In addition to general qualifications set forth in R115-01(c), applicants for the following company certificates shall possess and satisfactorily demonstrate to the *Department* that the company, its principals and officers, possess the following qualifications:

* * *

(8) *ARC system* testing company certificates.

(A) One (1) or more principals or officers of the company shall hold a General Radiotelephone Operator License issued by the *FCC* pursuant to 47 CFR Part 90.

* * *

(f) Special Application Requirements. In addition to the general application requirements set forth in R115-01(e), applications for the following company certificates shall include the following information and documentation:

* * *

(4) *ARC system* testing company certificates. Application for such a company certificate shall include:

(A) a list of the *ARC systems*, or other in-building radio communication systems, installed and/or tested by the company, its principals or officers, in the three-year period prior to the date of filing, including the addresses of the buildings in which such systems were installed and/or tested and the dates of such installation and/or testing;

(B) documentation of any enforcement action taken by *FCC* or other governmental authority with respect to an *FCC* General Radiotelephone Operator License or other radio communication-related license or permit held or formerly held by any principal or officer of the company in the five-year period prior to filing;

(C) a request, in a form approved by the *Department*, for *Department* approval to purchase two (2) or more portable radios of the type utilized by *Department* personnel, and for *Department* programming of such

portable radios to operate on radio frequencies licensed by the *FCC* to the City of New York, solely for purposes of the company certificate holder's testing of *ARC systems*; and

- (D) A written agreement, executed by a principal or officer of the company, in the form specified by the *Department*, that sets forth terms and conditions for use, by the company and its personnel, of portable radios that operate on Department frequencies, including compliance with FCC regulations and other applicable, laws, rules and regulations, and the authority of the *Department* to direct the company and its personnel to immediately discontinue operating on the frequencies and to submit the company's portable radios to the *Department* for removal of *Department* programming.

§3. Subdivision (c) and item 24 of subdivision (e) of Section 4601-01 of Title 3 of the Rules of the City of New York are amended to read as follows:

(c) Certificate Fees (FC A01). [Reserved] FCA01.1 is amended to read as follows:

* * *

16. ARC system testing company certificate

Original application	\$ 105.00
Renewal application	\$ 50.00
Original portable radio programming (per radio)	\$ 75.00
Portable radio inspection (per radio)	\$ 75.00

(e) Permit, Inspection and Plan Examination Fees (FC A03). [Reserved] FC A03 is amended to read as follows:

* * *

24. [Fire department in-building] In-building auxiliary radio communication systems and other in-building radio communication systems

To maintain and operate an in-building auxiliary radio communication system or other in-building radio communication system

Original application (including acceptance testing)	\$ 105.00, plus \$50.00 per building floor included in application
Renewal application	\$ 105.00

Appendix C: Relevant NYC Building Code

New York City 2014 Building Code

403.4.4 Emergency responder radio coverage. Emergency responder radio coverage shall be provided in accordance with the New York City Fire Code and Section 907.2.13.2 of this code.

907.2.13.2 Fire Department communication system. A Fire Department Auxiliary Radio Communication System (ARCS), which shall be in accordance with Section 917, shall be required in all high-rise buildings.

Exception:

Where it is determined by the Fire Department that a radio communication system is not required.

Section BC 917

Fire Department In-Building Auxiliary Radio Communication System (ARCS)

917.1 General. This section covers the design, installation and performance criteria of Fire Department In-Building Auxiliary Radio Communication System (ARCS). Where required to be installed by Section 403, Section 907, or the New York City Fire Code or where installed voluntarily, such systems shall be designed and installed in accordance with this section, NFPA 72 as modified in Appendix Q, the New York City Electrical Code and as per requirements set forth by the Fire Department.

917.1.1 Construction documents. Construction documents for ARCS shall be submitted for review and approval to the department and the Fire Department prior to system installation. Construction documents shall include, but need not be limited to, all of the following:

1. Type of radio equipment and antenna.
2. Riser diagram and floor plans showing location of elements of the ARCS, including but not limited to building fire command center or fire alarm control panel, dedicated radio console, base station/s and all other critical system components such as antennas, amplifiers, cables as applicable.
3. Legend of all ARCS symbols and abbreviations used.
4. Location of primary and secondary power source.
5. Specification and listing details for all equipments, devices and cables.

917.1.2 Acceptance testing, maintenance and operational testing. Acceptance testing, maintenance and operational testing of the ARCS shall be performed in accordance with the New York City Fire Code and rules promulgated by the Fire Department.

917.2 Instructions. Operating, testing and maintenance instructions and record drawings (“as-builts”) and detailed specifications of all the components shall be provided at an approved location.

Appendix D:
ARC System Visual and Functional Testing Procedures



Fire Department • City of New York
Bureau of Fire Prevention
9 MetroTech Center
Brooklyn, NY 11201

TM-ARCS-2 - Supplement #1

ARC System Visual and Functional Testing Procedures

1. General

Functional testing and visual inspection of the ARC System must be conducted in compliance with this document.

A log must be maintained on the premises in which all testing and inspection conducted on the ARC System is documented.

FDNY reserves the right at any time to inspect the logs and verify that the system is maintained in accordance with NYC Fire Code and NYC Fire Department Rules.

Testing shall be performed only on designated FDNY channels and during dates/times that have been previously communicated and acknowledged by FDNY by emailing request to ARCradios@fdny.nyc.gov. Channels specified for use on the ARC System are live operational channels and could be needed for FDNY operations at any time.

When transmissions on ARC System channels are required, ARC System professionals are asked to exercise caution. If an ARC System professional hears FDNY operational traffic on an ARC System channel, all testing of the ARC System requiring transmissions must be discontinued immediately.

2. Testing Procedures

2.1 Dedicated Radio Console

2.1.1 Console Testing - At a minimum, radio control console equipment must be tested to verify correct input and output signals and associated audio levels, Emergency Alert and ID information, display information (such as LEDs or alpha numeric display), and overall fitness of the primary and auxiliary power supply.

2.1.2 Radio Console - Verify location and condition.

2.1.3 Lamps and LEDs - Lamps and LEDs must be illuminated. Record result (i.e. functional, non-functional with LED description).

2.1.4 Transmission and Audio Level Testing

The following testing procedure must be carried out for each of the radio channels within the ARC System:

- (1) Select a radio channel for testing. Lift the handset of the radio desk-set and depress the Push-to-Talk switch (PTT). Verify on portable radio that the base-station/repeater is transmitting. Provide a five count and determine if transmit audio can be heard on the portable radio, determine the Delivered Audio Quality (DAQ) and record level.

- (2) Connect an audio meter to the line output of the radio desk-set. While transmitting, measure the audio level from the radio desk-set (console) Record audio level (in dB).
- (3) Depress the PTT on the portable radio. Verify on the radio desk-set that the transmitted audio is heard in the handset, determine the DAQ and record level.
- (4) In the case of a simplex-type system, verify that unit ID is displayed on the radio desk-set.
- (5) Depress the emergency button on the portable radio:
 - a. In the case of a simplex-type system, verify that the emergency alert and corresponding unit ID is received and displayed on the radio desk-set.
 - b. In the case of a repeater-type system, verify on a second portable radio that the emergency alert and corresponding unit ID is received and displayed.
- (6) Place the handset back into its resting position (on-hook or hung up). Depress the PTT on the portable radio. Check that audio is present on the speaker of the radio desk-set.
- (7) Connect audio meter to the line input of the radio desk-set. Measure the received audio from the base-station/repeater. Record audio level (in dB).
- (8) Perform a lamp/LED test on all components of the console where applicable.
- (9) Repeat steps 1 – 8 for all radio channels associated with the ARC System.

2.2 Base-Station or Repeater Testing

2.2.1 Wireless Signals - Transmit and measure and record the following transmit functions:

- (1) Power output;
- (2) Voltage standing wave ratio (VSWR);
- (3) Channel frequency;
- (4) Transmit and PL deviation;
- (5) With Continuous Tone Coded Squelch Signal (CTCSS) [where applicable];
- (6) Without Continuous Tone Coded Squelch Signal (CTCSS) [where applicable];
- (7) DC voltage under load;
- (8) For repeater-type ARC System, repeat for all radio channels;
- (9) Receive, measure and record the following receive functions:
 - a. Receiver sensitivity at 12 dB SINAD (Signal + Noise And Distortion);
 - b. Squelch release (μ volts);
 - c. Audio output (to console) in dB under 1 kHz deviation 1 μ volt on frequency signal injected into receiver;
 - d. For repeater-type ARC System, repeat for all radio channels.

2.2.2 ID and Emergency Alert Pass-Through Testing - In the case of repeater deployment for ARC System it is necessary to test the pass-through of the Emergency Alert and Radio ID, and record the results:

- (1) Radio ID:
 - a. Place two portable radios designated Portable "A" and Portable "B" on the same repeater channel.
 - b. PTT on portable radio A and verify that the proper ID is displayed on radio "B".
 - c. Reverse the process and PTT on radio "B" and verify that the proper ID is displayed on radio "A".
- (2) Emergency Alert:
 - a. Depress the Emergency Alert button on radio "A" and verify that the Emergency Alert activated radio "B".
 - b. Clear the Emergency Alert signal in all portable radios.
 - c. Depress the Emergency Alert button on Radio "B" and verify that the Emergency Alert activated radio "A". Record Results.
- (3) Repeat for all radio channels on repeaters.

2.2.3 System performance test for repeater systems - The test is to simultaneously transmit on the console to the portable on one repeater channel, while transmitting on a second portable radio to the console on the other repeater channel.

- (1) System must be operated with portable radios handsets simultaneously.
- (2) Voice quality and clarity must be verified.
- (3) As part of the system performance testing, audio testing from the console to the portable radio and audio testing from the portable radio to the console is necessary. The results must be recorded in DAQ and the reverse test should be performed.

2.3 Base-station/Repeater Failure Monitoring Testing

Functional testing for the base-station/repeater consists of the following tests. Record all results:

2.3.1 Low Transmit Power

- (1) Simulate low transmit power from the base-station/repeater
- (2) Key the base-station/repeater
- (3) Verify the low transmit power alarm is activated

2.3.2 Over Temperature

- (1) Simulate over temperature at the base-station/repeater (procedure dependent on manufacturer)
- (2) Verify the over temperature alarm is activated

2.3.3 High VSWR

- (1) Un-terminate the antenna from the base-station/repeater
- (2) Key the base-station/repeater
- (3) Verify that the high VSWR alarm is activated

2.3.4 Loss of primary power source

- (1) Disconnect AC power or other primary power source on the base-station/repeater

- (2) Verify that the AC power or primary power source alarm has activated

2.3.5 Low Battery Capacity

- (1) Disconnect battery from base-station/repeater
- (2) Simulate a low battery capacity condition
- (3) Verify that the low battery capacity alarm has activated

2.3.6 Antenna Failure (where applicable)

- (1) Simulate an antenna failure within the system
- (2) Verify the antenna failure alarm has activated

2.3.7 Signal Amplification (where applicable)

- (1) Simulate a signal amplification failure
- (2) Verify the signal amplification alarm has activated

2.3.8 Tamper Switch

- (1) Secure the base-station/repeater cabinet door (or other access panel)
- (2) Verify that no tamper switch alarm is active
- (3) Open the base-station/repeater cabinet door (or other access panel)
- (4) Verify that the tamper switch alarm is active

2.4 Power Supplies Primary (Power) Supply Testing

2.4.1 Primary Power - All primary (main) power supplies must be disconnected, and the occurrence of required trouble indication for loss of primary power must be verified.

- a. The system's standby and alarm current demand must be measured or verified, and, using manufacturer's data, the ability of batteries to meet standby and alarm requirements shall be verified.
- b. The system must be operated for a minimum of 15 minutes. Primary (main) power supply must be reconnected at end of test.

2.4.2 Secondary (Standby) Power Supply Testing

- a. All secondary (standby) power must be disconnected and tested under maximum load, including all active components requiring simultaneous operation.
- b. All secondary (standby) power must be reconnected at end of test. For redundant power supplies, each power supply must be tested separately.

2.4.3 Engine-driven generator Testing

If an engine-driven generator dedicated to the system is used as a required power source, operation of the generator must be verified in accordance with NFPA 110, Standard for Emergency and Standby Power Systems, by the building owner.

2.5 Batteries – General

2.5.1 General - Batteries must be replaced in accordance with the recommendations of the equipment manufacturer or when the recharged battery voltage or current falls below the manufacturer's recommendations. Batteries must be inspected for corrosion or leakage. Tightness of connections shall be checked and ensured. If necessary, battery terminals or connections must be cleaned and coated. Electrolyte level in lead-acid batteries must be visually inspected.

- 2.5.2 Charger Test - Operation of battery charger must be checked in accordance with charger test for the specific type of battery.
- 2.5.3 Discharge Test - With the battery charger disconnected, the batteries must be load tested following the manufacturer's recommendations. The voltage level must not fall below the levels specified. Exception: An artificial load equal to the full system load connected to the battery must be permitted to be used in conducting this test.
- 2.5.4 Load Voltage Test - With the battery charger disconnected, the terminal voltage must be measured while supplying the maximum load required by its application. The voltage level must not fall below the levels specified for the specific type of battery. If the voltage falls below the level specified, corrective action must be taken and the batteries must be retested. (Exception: An artificial load equal to the full system load connected to the battery must be permitted to be used in conducting this test.)

2.6 Batteries – Specific

- 2.6.1 Primary battery load voltage test - The maximum load for a No. 6 primary battery must not be more than 2 amperes per cell. An individual (1.5 volt) cell must be replaced when a load of 1 ohm reduces the voltage below 1 volt. A 6volt assembly shall be replaced when a test load of 4 ohms reduces the voltage below 4 volts.
- 2.6.2 Lead Acid type
- (1) *Charger test* - With the batteries fully charged and connected to the charger, the voltage across the batteries must be measured with a voltmeter. The voltage must be 2.30 volts per cell ± 0.02 volts at 77°F (25°C) or as specified by the equipment manufacturer.
 - (2) *Load voltage test* - Under load, the battery must not fall below 2.05 volts per cell.
 - (3) *Specific gravity* - The specific gravity of the liquid in the pilot cell or all of the cells must be measured as required. The specific gravity must be within the range specified by the manufacturer. Although the specified specific gravity varies from manufacturer to manufacturer, a range of 1.205-1.220 is typical for regular lead-acid batteries, while 1.240-1.260 is typical for high-performance batteries. A hydrometer that shows only a pass or fail condition of the battery and does not indicate the specific gravity shall not be used, because such a reading does not give a true indication of the battery condition.
- 2.6.3 Nickel-cadmium type
- (1) *Charger test* - With the batteries fully charged and connected to the charger, an ampere meter shall be placed in series with the battery under charge. The charging current must be in accordance with the manufacturer's recommendations for the type of battery used. In the absence of specific information, 1/20 to 1/25 of the battery rating must be used.
 - (2) *Load voltage test* - Under load, the float voltage for the entire battery shall be 1.42 volts per cell, nominal. If possible, cells must be measured individually.
- 2.6.4 Sealed lead-acid type
- (1) *Charger test* - With the batteries fully charged and connected to the charger, the voltage across the batteries must be measured with a voltmeter. The voltage shall be 2.30 volts per cell ± 0.02 volts at 77°C (25°C) or as specified by the equipment manufacturer.

Revised on 12/15/2021 updated NOE and AIP procedure

- (2) *Load voltage test* - Under load, the battery must perform in accordance with the battery manufacturer's specifications.

TM-ARCS-2-Supplement #1 (4/16)

APPENDIX E:
Auxiliary Radio Communication (ARC) System Visual and Functional
Testing Form



**Fire Department • City of New York
Bureau of Fire Prevention
9 MetroTech Center
Brooklyn, NY 11201**

**TM-ARCS-2
AUXILIARY RADIO COMMUNICATION (ARC) SYSTEM
VISUAL AND FUNCTIONAL TESTING FORM**
(to be completed by holder of ARC System Professional Certificate of Fitness)
Attach additional sheets, data, or calculations as necessary to provide a complete record.

Date	
------	--

1. PREMISES INFORMATION

Building No.:	Street Name:	BIN #:
Borough:	NY	ZIP:
Building Predominant Occupancy Group:		

2. BUILDING OWNER

Last Name:	First Name:	
Business Name :		
Business Address:		
Phone:	Fax:	E-Mail:

3. TYPE OF SYSTEM

Transceiver : <input type="checkbox"/> Simplex <input type="checkbox"/> Repeater <input type="checkbox"/> Other. Please Specify _____
Antenna System: <input type="checkbox"/> Passive Distributed Antenna System (DAS) <input type="checkbox"/> Active Distributed Antenna System (DAS) <input type="checkbox"/> Other. Please Specify _____

3.1 System Features

- Components enclosed in enclosure as required in the ARCS bulletin
- Enclosure is locked and accessible only via Firefighter 2642 Key Tamper Switch monitored at FCC
- Communication Cables have 2 hour fire-rated protection

3.2 System Documentation

- An owner's manual, a copy of the manufacturer's instructions, operating instructions, and a copy of the as-builts are stored on site.

Location:	
-----------	--

3.3 Maintenance Logs

A record of inspections, tests, exercising operations and repairs is maintained on the premises

Location:

4. SYSTEM POWER

4.1 Primary Power

Input voltage of control panel:	Control panel amps:
---------------------------------	---------------------

4.2 Secondary Power - Engine-Driven Generator

This system does not have a generator.

Location of generator:	
Location of fuel storage:	Type of fuel:

4.3 Uninterruptible Power System

This system does not have a UPS.

Equipment powered by a UPS system:
Location of UPS system:

Calculated capacity of UPS batteries to drive the system components connected to it:

In standby mode (hours):	In full operating mode (minutes):
--------------------------	-----------------------------------

4.4 Batteries

Type:	Nominal voltage:	Amp/hour rating:
-------	------------------	------------------

Calculated capacity of batteries to drive the system:

In standby mode (hours):	In full operating mode (minutes):
--------------------------	-----------------------------------

Batteries are marked with date of manufacture.

5. RELATED DEVICES (AMPLIFIERS, ANTENNAS, AND ALL OTHER ACTIVE COMPONENTS)

5.1 Location and Description of Devices

Device 1:	Manufacturer:	Type:
Location:		
Device 2:	Manufacturer:	Type:
Location:		
Device 3:	Manufacturer:	Type:
Location:		

6. NOTIFICATIONS MADE PRIOR TO TESTING

Building management	Contact:	Time:
Building occupants	Contact:	Time:
FDNY	Contact:	Time:
Other, if required	Contact:	Time:

7. TESTING RESULTS

7.1 Console

7.1.1 Console Overview

Description	Visual Inspection	Functional Test	Test Results
Control unit functions and no diagnostic failures are indicated	<input type="checkbox"/>	<input type="checkbox"/>	
Control Unit Reset	<input type="checkbox"/>	<input type="checkbox"/>	
Lamps/LEDs/LCDs	<input type="checkbox"/>	<input type="checkbox"/>	
Radio Desk-Set	<input type="checkbox"/>	<input type="checkbox"/>	
Ground-fault monitoring	<input type="checkbox"/>	<input type="checkbox"/>	
Panel supervision	<input type="checkbox"/>	<input type="checkbox"/>	
Audio Levels	<input type="checkbox"/>	<input type="checkbox"/>	
Control Levels	<input type="checkbox"/>	<input type="checkbox"/>	

7.1.2 Console Power Supplies

Description	Test Results
Primary Power Supply	
Secondary Power Supply	
Battery condition	
Load voltage	
Voltage Recorded	
Discharge test	
Charger test	
Other (specify)	

7.2 Base-Station/Repeater

Description	Test Results
Wireless Signals	
Antenna	
Transceivers	
Radio ID Pass-Through	
Emergency Alert Pass-Through	
System performance	
Other (specify)	

7.3 Base-Station/Repeater Failure Monitoring

Description	Test Results
Low Transmit Power	
Over Temperature	
High VSWR	
Loss of Alternating Current (AC) or primary power source on the base-station/repeater	
Low Batter Capacity	
Antenna Failure	
Signal Amplification failure	
Tamper Switch	

7.4 Active Components *(Please supply the results of this test for all active components in the system)*

7.4.1 Component Overview

Description	Test Results
Lamps/LEDs/LCDs	
Fuses	
Ground-fault monitoring	
Panel supervision	
Amplifier/Tone Generator	
Other (specify)	

7.4.2 Component Power Supplies

Description	Comments
Primary Power Supply	
Secondary Power Supply	
Battery condition	
Load voltage	
Voltage Recorded	
Discharge test	
Charger test	
Other (specify)	

8. NOTIFICATIONS THAT TESTING IS COMPLETE

Building management	Contact:	Time:
Building occupants	Contact:	Time:
FDNY	Contact:	Time:
Other, if required	Contact:	Time:

Date:

9. SYSTEM RESTORED TO NORMAL OPERATION

10. ARC SYSTEM CERTIFICATION

C of F Name:		Company Name:	
Company Address:			
C of F No:		Date of expiration:	
Telephone No:	E-mail:		
<input type="checkbox"/> New Installation I hereby certify the following: I, or qualified employees under my direct supervision, have prepared this form and conducted the testing procedure and determined that the ARC System complies with all applicable testing requirements of TM-ARCS-2 – Supplement #1 (Visual and Functional Testing Form), NYC Building Code, NYC Fire Code, NYC Fire Department Rule 3 RCNY 511-01, NYC Fire Department Technical Criteria, NYC Electrical Code, and any other applicable rules and regulations. _____ Signature of Certificate of Fitness Holder			
<input type="checkbox"/> Annual Certification I hereby certify the following: I, or qualified employees under my direct supervision, have inspected and tested the ARC System with applicable testing requirements of TM-ARCS2-Supplement #1 (Visual and Functional Testing Form) and in accordance with Fire Department Rule 3 RCNY 511-01, and found that the ARC System is in good working order and complies with the standards and requirements set forth in this rule. _____ Signature of Certificate of Fitness Holder			
<input type="checkbox"/> Five Year Recertification I hereby certify the following: I, or qualified employees under my direct supervision, have conducted the five year recertification of the ARC System with applicable testing requirements of TM-ARCS2-Supplement #1 (Visual and Functional Testing Form) and in accordance with Fire Department Rule 3 RCNY 511-01, and found that the ARC System is in good working order and a radio coverage survey conducted in the same manner as the commissioning test complies with all the applicable standards and requirements. _____ Signature of Certificate of Fitness Holder			