



District of Columbia's Public Safety In-Building Radio Systems

Implementation and Operations Process
Effective on October 15, 2019

Version 3.1

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Office of Unified Communications, Washington, DC



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1 Introduction

For public safety, reliable two-way communications are essential throughout the whole geographical area of a jurisdiction including on-street, in tunnels and within buildings.

Effective January 2015, the District of Columbia has adopted a legislation mandating public safety radio coverage for newly constructed buildings as required by the International Fire Code (see <http://dcregs.dc.gov/Gateway/RuleHome.aspx?RuleNumber=12-H510>). This legislation therefore results into the deployment of numerous in-building radio systems repeating signals from the District public safety radio network (host network) into the depth of the city's buildings. While the Bi-Directional Amplifiers (BDA) and Distributed Antennas Systems (DAS) that make up in-building radio systems do effectively enhance coverage, they also have the potential to negatively affect both in-building and overall radio network coverage if not properly designed, installed, and maintained. Furthermore, without proper BDA/DAS records management, locating in-building systems that interfere with the network can be very challenging.

The code specifies that “emergency responder radio coverage systems and related equipment shall comply with all additional requirements, specifications and criteria established by the District of Columbia Office of Unified Communications to satisfy the operational needs of emergency responders and to prevent adverse impact on the District of Columbia’s public safety communications”. The set of documents that constitutes the additional requirements, specifications and criteria established by the District of Columbia Office of Unified Communications are available at <https://ouc.dc.gov/page/oucs-public-safety-building-radio-systems-requirements>. It includes:

- A presentation giving an overview of the process
- A document describing in detail the process for the District validation of public safety in-building repeater systems.
- A document describing the OUC technical requirements for those systems
- A document describing the OUC systems acceptance testing process
- A document describing the annual testing requirements
- Various forms supporting the process

The purpose of this set of documents is to serve as a reference guide to outline how in-building BDA and DAS Systems shall be designed and deployed to provide emergency responders radio coverage in buildings throughout the District of Columbia. The contents of these documents are made available to relevant organizations to facilitate the process of implementing and operating BDAs and DAS that will provide the required radio services and not adversely affect the mission critical radio network that the Office of Unified Communications (OUC) of the District of Columbia.



This specific document herein contains a description of the roles of the various District agencies involved in the process and a description of the overall process.

2 In-Building Radio System Implementation Process

2.1 Background

The entities involved in the implementation of an In-Building Radio System for newly constructed buildings are the Department of Consumer and Regulatory Affairs (DCRA), the District of Columbia Fire and Emergency Medical Services (FEMS) Department, the Office of Unified Communications (OUC), and the entity managing the design, implementation and operations of the in-building systems and facilities management (“the Building Owner Representative”).

The DCRA manages the construction permitting process associated with the building.

FEMS is responsible for ensuring that construction and installation of the building and all building components meet the requirements set forth by the International Fire Code. Additionally, the Fire Marshall works with the OUC to validate that the installed in-building radio system provides adequate levels of service.

The OUC is the operator of the public safety radio network and therefore will ensure that the in-building radio systems meet the radio performance criteria. The performance criteria include coverage requirements but also interference handling management protecting both the radio enhancement system and the host network. The requirements also include among other things visibility and access to the system for operations and maintenance purposes.

As required by the FCC, the owner and operator of the repeater system (e.g. the building owner/manager) needs to obtain an authorization to transmit on frequencies from the entity they are licensed to. The OUC is also the public safety frequencies licensee to the FCC. Once the in-building system has demonstrated it meets the performance criteria described in this document, and once the Fire Department has validated the system has met its requirements, the OUC will provide the building owner an authorization to transmit on the frequencies they are licensed to.

2.2 Process Overview

No in-building radio system capable of operating on frequencies licensed for Public Safety by the FCC shall be installed without prior coordination and approval of the fire code official and approval of the OUC.

Building owners’ representatives proposing in-building radios systems will apply for construction permits with DCRA. The Building Manager shall be responsible for providing DCRA with all documentation required to demonstrate that all requirements of the OUC and FEMS set forth in the “*District of Columbia Public Safety In-Building Radio Systems: Technical Requirements*” document have been met.



Building owners are responsible for all of the expenses associated with the design, permitting, installation, test, operations, maintenance and upgrade of in-building public safety repeater systems to support public safety as required by fire and building codes and OUC requirements.

2.3 Design Review

Once DCRA has issued a building permit, the building owner needs to apply for a OUC frequencies transmission application through the OUC BDA Transmission Form Request (see form 6.1 OUCBDATransmissionRequestForm.xlsx on the OUC public safety in-building systems requirements web page). This form will be sent to das.ouc@dc.gov. The OUC will respond to the building owner or its representative and assign a site code. ***In all further correspondence, the building owner will refer to that site code to facilitate the exchange of information.***

The building manager will forward the in-building radio system design to the OUC for review and written approval ***prior to installation***. The purpose of OUC review of the design will be to confirm that the proposal made by the building manager will meet the radio performance criteria listed in the “3.0 District of Columbia’s Public Safety In-Building Radio Systems-Technical Requirements” located on the OUC public safety in-building systems requirements web page. This review is not an evaluation of the compliance to the Fire Code or any other construction or installation regulation, as that is the responsibility of the Fire Department and other agencies.

A non-exhaustive list of the information required includes the following:

- The name of the building and its address
- The room number the BDA and DAS Head-end equipment are located in.
- The name of the personnel designing the system and a copy of professional certifications
- The name of the personnel installing/integrating the BDA and DAS and the corresponding vendor certifications, the vendors being those whose equipment are deployed.
- A softcopy of the floorplans indicating:
 - o the location of the donor antennas,
 - o the name of the donor site,
 - o the location of the distributed antennas,
 - o the location of the headend and room number, the location of remote units as applicable,
 - o the cable path;
 - o Each floor will also include a ruler that will allow to scale the plan.
- A layout of the DAS architecture (riser diagram),
- A Bill of Materials (BDA, cables, surge arrestor, connectors, splitters, antennas) along with their technical specifications,
- A soft copy of the design file using the format .ibx (Ranplan) or .ibwc (IBWAVE)
- The identification of the donor site(s) selected by the vendor on the plan ,



- If the building is already existing (not a building in construction), the radio signal strength indicator measurements (RSSI) that demonstrate that an in-building radio system is necessary (color code described in the design checklist that can be found on the OUC web page).
- All submitted plans and drawings will clearly show in-building client antennas with accurate antenna labels.
- The link budgets and technical information listed in here: including
 - o The OUC uplink evaluation spreadsheet attached to the “*District of Columbia’s Public Safety In-Building Radio Systems-Technical Requirements*” document.
 - o The calculations showing that the battery back-up selected solution configuration meets the OUC requirements,
 - o Written commitment from the building representative that an IP connectivity shall be provided to support OUC monitoring and remote access requirements.
 - o Coverage plots for all floors of the building (not only those where antennas are installed) and using the color code described in the design checklist on the OUC Web page.
 - o If other radio systems DAS are present, intermodulation studies
 - o Demonstration that the bandpass filters will protect the public safety DAS from adjacent cellular carriers

For a complete list of required documents in the design package (please check the 6.4 DesignChecklist.xlsx on the OUC public safety in-building radio system requirements web page.

The whole design package shall be sent to das.ouc@dc.gov

The OUC will provide a critical design review (CDR) of the system design package and notify the Building Manager of approval or of modification required design.

All expenses for performing the CDR are borne by the Building Owner and or its representatives.

The minimum qualifications of the system designer and lead installation personnel shall include certification of in-building system design training issued by the proposed radio system manufacturer.

The OUC will communicate via email when the design is validated. Construction of the public safety DAS shall not start before that validation.

2.4 Radio System Acceptance Testing

After the building construction is complete and the in-building radio system installation is complete, the building owner representative will contact the OUC to request and schedule acceptance testing. The Building owner representative will complete acceptance testing contracting an OUC approved vendor. The list of those vendors is given in the document 6.0 Approved Testing Vendors List that can be found on the OUC requirements web page. Those vendors will follow the test procedures described in the document “*District of Columbia Public Safety In-Building Radio Systems: Acceptance Test Procedure*”.



Before scheduling a site acceptance test with the OUC or its approved vendor, the building owner technical representative will ensure that the following prerequisites are completed. The vendor shall provide the information below ahead of the scheduling of the testing. The list of required information is detailed in the Acceptance Testing document.

In particular a site acceptance shall not be scheduled if the building representative did not submit a written commitment to provide the OUC an IP connectivity to support OUC remote access and monitoring requirements.

The Acceptance Test Procedure lists the submittals required before the Acceptance Testing is scheduled, and the submittals required upon completion of the test procedure. The execution of the test procedure requires coordination with the OUC as measurements need to be taken at the host radio sites. It also requires the use of radios operating on the District of Columbia public safety radio system.

For the purpose of this test, the selected vendor must use radios meeting OUC specifications. The acceptance test includes radio functions, radio communications, interference analysis and host site receiver noise levels assessment.

An overview of the deliverables of the acceptance testing phase are listed in the document 6.6 OUC BDA Acceptance Checklist that can be found on the OUC requirements web page. The deliverables include proof that the building owner purchased a maintenance contract for the equipment installed. The system shall remain "off" and not transmitting until completed Transmission Authorization is provided by the OUC. During the acceptance testing, the vendor shall fill in a check list (attached to the acceptance procedure).

Any changes to the approved system design that occur shall be documented and that document must be provided to the OUC for approval. Approval for system design changes must be received by the OUC prior to the implementation of the design changes.

A significantly number of buildings are built to be occupied by offices or for commercial use. It might take a few months, sometimes years to rent all floors out. Meanwhile, some of the building interiors might not be completed when coming to perform a Public safety DAS test (floors without interior walls, no ceilings, etc.). Such building features can dramatically impact radio coverage. In the case the building is not complete, the whole building still needs to be tested since an emergency could lead first responders anywhere in the building. The testing staff shall note which floors are not complete.

The transmission authorization letter sent by the OUC will specifically include which floors were complete when testing occurred and which floors were not. The letter will also explain that when significant modifications will be made to the building affecting radio waves propagation and/or levels of interference, the building owner shall perform again a public safety BDA/DAS test at his cost using one of the OUC approved vendors. A non-exhaustive list of modifications affecting radio propagation includes:



- adding interior/exterior walls, ceiling, partitions,
- extending the Distributed Antennas System
- implementing additional wireless systems (internal systems or cellular systems for instance)

The extent of the test will depend on the modifications made to the building. It will be determined in a per case basis. All expenses for performing the acceptance testing are borne by the Building owner including the fees required by the approved OUC vendor and the licenses necessary to integrate the BDA/DAS monitoring into the District of Columbia centralized network monitoring system.

At acceptance testing the building owner representative shall demonstrate he bought from the vendor of the BDA and DAS manufacturers the appropriate maintenance services.

2.5 Transmission Authorization

After the OUC technical test is successfully completed, the Fire Department will perform their test. Once the Fire Department validates the installed system meets its requirements, the OUC will issue a transmission authorization. The building manager shall then turn the system on.

2.6 Documentation

Installation vendors shall provide all necessary design and installation documentation to the OUC. Please refer to the checklists on this page: <https://ouc.dc.gov/page/oucs-public-safety-building-radio-systems-requirements>. for a list of required DAS System Documentation. All documentation shall refer the site code.

3 Operations Process

Building owners are responsible for all of the expenses associated with operations, maintenance and upgrade of in-building public safety repeater systems to support public safety as required by fire and building codes and OUC requirements.

This is an on-going responsibility and persists beyond any initial installation and testing. Building owners are also responsible for:

- Monitoring and remote access
- System Maintenance
- Annual Testing

3.1 Monitoring

The building owner will provide 24x7 emergency contact information.

To mitigate operational issues encountered due to BDAs generating interference into its network and disabling host sites, the OUC requires the equipment installed to be monitored by the DC NOC. The DCNOC



is using a centralized monitoring center for all BDA/DAS operating in DC owned buildings or operating DC licensed frequencies including public safety frequencies.

The alarms shall be sent to the DCNOC .

Additionally, if at any time the BDA/DAS system causes degradation to the District's radio system, the OUC needs the capability to immediately remotely shut down the system through the remote monitoring system if the equipment allows for it or through separated IP connectivity (VPN). To this end, the building owner will provide all the necessary information for the OUC to remotely access the BDA (IP address, credentials, etc.). In case of equipment failure or performance degradation, the building owner representative shall provide plans for a fix within 24 hours.

In legacy systems where such a remote access does not exist, in case a BDA/DAS system causes degradation to the District's radio system, the building owner representative shall shut down the BDA immediately. The building owner representative shall provide plans for a fix within 24 hours.

Lack of responsiveness from the building owner might dramatically impact public safety operations and put lives in danger. The OUC might also charge the building owner for the costs that the building owner tardiness might have generated.

The required data connectivity costs (including modem if necessary) shall be supported by the building owner.

3.2 System Maintenance

The Building Manager shall be responsible for preventive maintenance measures to ensure continuous operation of the in-building radio system.

The Building manager will procure maintenance services from the manufacturers, or their resellers, of the BDA and DAS equipment.

Additionally, every year the Building Manager will schedule a test that will verify that the system still meets the OUC requirements. The execution of the test requires coordination with the OUC as measurements need to be taken at the host sites. The Building Manager shall have Annual In-Building Test performed by an OUC authorized vendor (see document 6.0 Approved Testing Vendors List on the OUC Requirements web page) on or about the annual anniversary of the OUC provided Authorization for Transmission. The tests will be performed according to the guidelines provided by the OUC in the "*District of Columbia's Public Safety In-Building Radio Systems- Periodic Testing Procedure*" document you can find on the OUC Requirements web page .

If the in-building radio system pass the test, the vendor performing the test shall send a test report that the system still meets the requirements (see the document 6.8 Annual Testing Check list on the OUC Web page).



If the requirements are not met, the building owner will need to take corrective actions as per a plan agreed with the OUC and FEMS. This plan might include the shutdown of the in-building system. All issues identified in the annual inspection must be corrected within a 30 day period.

A maintenance log shall be present on site next to the BDA at all times.