

Proposed Content Outlines
Certified In-Building Emergency Responder Communication Enhancement
System Professional (IB-ERCES)

Proposed Content Outlines			Level I	Level II	Level III	Design
	3	Terminate cable	x			
	4	Test cable		x		
	5	Install passive equipment	x			
	6	Validate passive equipment installation		x		
	7	Verify electrical and grounding requirements		x		
E	Performing Finish and Trim Out Installation Activities					
	1	Install donor antenna	x			
	2	Validate electrical and grounding installation		x		
	3	Install active equipment	x			
	4	Install dedicated annunciator	x			
	5	Interface with fire alarm system		x		
	6	Install battery backup (BBU)	x			
F	Performing Commission, Acceptance Test, and Maintenance Activities					
	1	Adjust headend and remote amplification equipment		x		
	2	Test system alarms		x		
	3	Test battery backup (BBU)		x		
	4	Complete acceptance process			x	

Updated DACUM Chart for Certified In-Building Emergency Responder Communication Enhancement System Professional (IB-ERCES)

Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
				Safety Technical Report 11-480 • Voice Radio Communications Guide for the Fire Service
3	Review and interpret project drawings (Level II) Review and interpret project drawings and site survey report (Design)			
		<ul style="list-style-type: none"> • Basic construction knowledge • Knowledge of floor plan characteristics • Knowledge of RF applications • Knowledge of types and formats of floorplans 	<ul style="list-style-type: none"> • Ability to evaluate quality (e.g., detail and clarity) of floor plans 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • NFPA 70 • NFPA 72 • NFPA 170 • NFPA 1221 • UL 2524
4	Understand and comply with project schedule (Level II)			
		<ul style="list-style-type: none"> • Knowledge of equipment lead time • Knowledge of local and municipality requirements • Knowledge of RF applications • Understanding of construction timelines 	<ul style="list-style-type: none"> • Communication skills • Project management skills • Salesmanship 	<ul style="list-style-type: none"> • RF modeling software (e.g., iBwave, Ranplan) • Project management references • Project Management Body of Knowledge
5	Understand requirements and obtain authorization to proceed from the AHJ (Level III)			

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
		<ul style="list-style-type: none"> Knowledge of federal, state, and local requirements 	<ul style="list-style-type: none"> Ability to identify necessary authorities Ability to interpret how various codes and standards work together 	<ul style="list-style-type: none"> FCC Title 47 Part 20 FCC Title 47 Part 90 IFC NFPA 1 NFPA 70 NFPA 72 NFPA 1221
B	Evaluating RF Signal Strength and Quality			
	1 Determine and obtain test equipment (Level II)			
		<ul style="list-style-type: none"> Knowledge of AHJ testing requirements Knowledge of available equipment Knowledge of frequency that will be tested 	<ul style="list-style-type: none"> Ability to determine if equipment meets required audibility Ability to evaluate equipment Ability to evaluate manufacturer's installation manual 	<ul style="list-style-type: none"> Equipment manufacturer's websites FCC Title 47 Part 20 FCC Title 47 Part 90 NPSTC LMR 101 NPSTC Best Practices for In-Building Communications
	2 Identify sources of potential RF interference (Level III) Understand potential RF interference (Design)			

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
	<ul style="list-style-type: none"> • Knowledge of active and passive sources of RF interference • Knowledge of how construction building materials, furniture, fixtures and equipment (FFE) affect RF propagation • Knowledge of how surrounding buildings, other outside sources, and the system being installed can affect RF propagation and/or cause interference • Knowledge of noise floor effect on LMR systems in uplink and downlink • Knowledge of RF propagation principles 	<ul style="list-style-type: none"> • Ability to evaluate surrounding building structures • Ability to operate RF evaluation equipment • Ability to recognize potential sources of RF interference 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • NPSTC Best Practices for In-Building Communications • NPSTC LMR 101 • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver)
3	Consider all field observations in design <i>(Design)</i>		
	<ul style="list-style-type: none"> • Knowledge of infrastructure construction 	<ul style="list-style-type: none"> • Familiarity with architecture and employment of radio used within jurisdiction 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • NPSTC Best Practices for In-Building Communications • NPSTC LMR 101 • TIA-568.1-D • TIA-569-D • TIA-607-D

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
4	Measure RF signal strength and quality (Level II) Interpret RF signal strength and quality results (Design)	<ul style="list-style-type: none"> • Knowledge of AHJ test requirements for approval (e.g., approval for live voice testing, RF frequencies, radio communication protocols) • Knowledge of delivered audio quality (DAQ) scale • Knowledge of local code standards • Knowledge of national codes and standards • Knowledge of RF applications • Knowledge of signal source location 	<ul style="list-style-type: none"> • Ability to interpret DAQ scale • Ability to operate handheld radio • Ability to operate RF evaluation equipment 	<ul style="list-style-type: none"> • Distributed Antenna Systems • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • Indoor Radio Planning: A Practical Guide • NFPA 72 • NFPA 1221 • NTIA Technical Report TR-11-480 • Practical Radio Frequency Test and Measurement: A Technician's Handbook • Public safety handheld radio • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver)

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
5	Grade and document RF signal strength and quality test results <i>(Level III)</i>			
		<ul style="list-style-type: none"> • Knowledge of AHJ test requirements for approval (e.g., approval for live voice testing, RF frequencies, radio communication protocols) • Knowledge of delivered audio quality (DAQ) scale • Knowledge of local code standards • Knowledge of national codes and standards • Knowledge of RF applications 	<ul style="list-style-type: none"> • Ability to conduct full RF analysis of the building and how to enhance ERRC coverage • Ability to determine pass-fail • Ability to grade RF measurements based on code • Ability to interpret DAQ scale • Ability to operate RF evaluation equipment 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • NFPA 72 • NFPA 1221 • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver) • RF software
6	Troubleshoot issues that impact RF performance <i>(Level II)</i>			
		<ul style="list-style-type: none"> • Knowledge of building materials that impact RF propagation • Knowledge of RF principles 	<ul style="list-style-type: none"> • Ability to interpret test results • Ability to operate test equipment 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • NPSTC Best Practices for In-Building Communications • NPSTC LMR 101
C	System Design and Layout (Level III) Designing the System (Design)			
1	Provide parameters for system design applications (Level III) Enter parameters into system design application (Design)			

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
		<ul style="list-style-type: none"> • Knowledge of AHJ test requirements for approval (e.g., approval for live voice testing, RF frequencies, radio communication protocols) • Knowledge of correct donor sites and frequencies • Knowledge of delivered audio quality (DAQ) scale • Knowledge of donor antenna azimuth and power • Knowledge of license holder requirements • Knowledge of local code standards • Knowledge of national codes and standards • Knowledge of RF applications • Knowledge of signal source location 	<ul style="list-style-type: none"> • Ability to calculate link budget • Ability to confirm design aligns the with donor site and frequencies • Ability to interpret codes, regulations, and specifications • Ability to interpret site survey results • Ability to translate site survey results into design documentation 	<ul style="list-style-type: none"> • Business software (e.g., calculator, spreadsheet) • Equipment manufacturer's specifications • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • In-building design system software • Local codes and regulations • NFPA 72 • NFPA 1221
2	Validate selected system equipment (BDA and non-BDA solutions) (Level III) Select system equipment (Design)			

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
		<ul style="list-style-type: none"> • Knowledge of local codes and regulations • Knowledge of RF principles • Knowledge of system equipment • Knowledge of system requirements and project specifications 	<ul style="list-style-type: none"> • Ability to determine appropriate equipment for application • Ability to evaluate manufacturer's equipment for compliance with RF principles and local codes and regulations 	<ul style="list-style-type: none"> • Equipment manufacturer's specifications • FCC Public Notice DA 19-1255 • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • NFPA 72 • NFPA 1221
3	Plan headend (e.g., physical layout, structural and architectural construction considerations) (Level III) Plan headend (e.g., equipment selection, cabling) (Design)			
		<ul style="list-style-type: none"> • Knowledge of building construction documents • Knowledge of equipment power requirements • Knowledge of levels of survivability • Knowledge of local codes and regulations • Knowledge of RF principles 	<ul style="list-style-type: none"> • Ability to layout equipment (e.g., spacing) • Ability to perform BTU calculations • Ability to perform power calculations 	<ul style="list-style-type: none"> • IFC • NFPA 70 • NFPA 72 • NFPA 1221 • FCC Title 47 Part 20 • FCC Title 47 Part 90 • Equipment manufacturer's specifications
4	Review and finalize system layout (Level III) Determine system layout (Design)			

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
		<ul style="list-style-type: none"> • Knowledge of active and passive sources of RF interference • Knowledge of antenna placement • Knowledge of cable/fiber optic run characteristics • Knowledge of fiber optic principles and their application • Knowledge of how construction building materials, furniture, fixtures and equipment (FFE) affect RF propagation • Knowledge of levels of survivability • Knowledge of local codes and regulations • Knowledge of near/far effect • Knowledge of passive equipment characteristics • Knowledge of the application and deployment of optical communications in IB-ERCES systems 	<ul style="list-style-type: none"> • Ability to adjust system layout • Ability to document modifications for final as-built drawings • Ability to perform coverage needs analysis • Ability to perform link budget analysis • Ability to perform propagation analysis • Ability to use fiber optic testing equipment • Drafting/drawing skills 	<ul style="list-style-type: none"> • Business software (e.g., calculator, spreadsheet) • Equipment manufacturer's specifications • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • NFPA 70 • NFPA 72 • NFPA 1221 • RF modeling software (e.g., iBwave, Ranplan)
5	Validate bill of materials (BOM) (Level III) Create bill of materials (BOM) (Design)			
		<ul style="list-style-type: none"> • Knowledge of basic RF system components • Knowledge of national codes and regulations 	<ul style="list-style-type: none"> • Ability to read design drawings • Ability to identify components of a system 	<ul style="list-style-type: none"> • Business software (e.g., calculator, spreadsheet)

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
				<ul style="list-style-type: none"> • Distributed Antenna Systems • IFC • Indoor Radio Planning: A Practical Guide • NFPA 70 • NFPA 72 • NFPA 1221
6	Execute permit process (Level III) Generate submittal package (Design)			
		<ul style="list-style-type: none"> • Knowledge of AHJ requirements for approval • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to interpret codes, regulations, and specifications 	<ul style="list-style-type: none"> • Business software (e.g., calculator, spreadsheet) • Distributed Antenna Systems • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • Indoor Radio Planning: A Practical Guide • NFPA 70 • NFPA 72 • NFPA 1221
D	Performing Rough Installation Activities			

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
1	Read and follow RF system installation documentation <i>(Level I)</i>	<ul style="list-style-type: none"> • Knowledge of AHJ requirements for approval • Knowledge of building construction • Knowledge of local codes and regulations • Knowledge of manufacturer's equipment • Knowledge of national codes and regulations 	<ul style="list-style-type: none"> • Ability to interpret design documents 	<ul style="list-style-type: none"> • Equipment manufacturer's specifications • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • NFPA 70 • NFPA 72 • NFPA 1221
2	Install cable (e.g., support, fire stopping, grounding) <i>(Level I)</i>	<ul style="list-style-type: none"> • Knowledge of AHJ requirements for approval (e.g., firestopping) • Knowledge of cable/fiber optic characteristics (e.g., bend radius) • Knowledge of cable/fiber optic support solutions • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of national codes and regulations 	<ul style="list-style-type: none"> • Ability to comply with job site safety requirements 	<ul style="list-style-type: none"> • NFPA 70 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers)
3	Terminate cable <i>(Level I)</i>			

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
	<ul style="list-style-type: none"> • Knowledge cable/fiber optic preparation and termination tools • Knowledge of cable/fiber optic termination techniques • Knowledge of job site safety requirements • Knowledge of manufacturer's equipment 	<ul style="list-style-type: none"> • Ability to identify cable/fiber optic termination requirements 	<ul style="list-style-type: none"> • Equipment manufacturer's specifications • Cable/fiber optic preparation tools • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • American Red Cross AED First Aid Participant's Manual • TIA-606-B • Indoor Radio Planning: A Practical Guide
4	Test cable <i>(Level II)</i>		
	<ul style="list-style-type: none"> • Knowledge of equipment calibration process • Knowledge of job site safety requirements • Knowledge of RF principles • Knowledge of sweep test equipment 	<ul style="list-style-type: none"> • Ability to identify distance to fault (DTF) • Ability to identify voltage standing wave ratio (VSWR) sweep • Ability to keep accurate records (e.g., test results) • Skill in sweep testing 	<ul style="list-style-type: none"> • American Red Cross AED First Aid Participant's Manual • Distributed Antenna Systems • IEC 62037-1:2012

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
			<ul style="list-style-type: none"> • Indoor Radio Planning: A Practical Guide • Open-short-load test device • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • Practical Radio Frequency Test and Measurement: A Technician's Handbook • Sweep test equipment
5	Install passive equipment <i>(Level I)</i>		
	<ul style="list-style-type: none"> • Knowledge of job site safety requirements • Knowledge of manufacturer's equipment • Knowledge of RF filter requirements • Knowledge of system design parameters 	<ul style="list-style-type: none"> • Ability to install passive equipment according to system design • Ability to interpret system design 	<ul style="list-style-type: none"> • American Red Cross AED First Aid Participant's Manual • Distributed Antenna Systems • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • Indoor Radio Planning: A Practical Guide

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
			<ul style="list-style-type: none"> • Manufacturer's installation instructions • NFPA 70 • NFPA 72 • NFPA 1221 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • Torque wrench
6	Validate passive equipment installation <i>(Level II)</i>		
	<ul style="list-style-type: none"> • Knowledge of isolation testing • Knowledge of RF principles • Knowledge of transmit-receive isolation principles 	<ul style="list-style-type: none"> • Ability to evaluate continuous wave (CW) test results against design • Ability to interpret system design • Ability to measure transmit-receive isolation • Ability to perform a continuous wave (CW) test 	<ul style="list-style-type: none"> • American Red Cross AED First Aid Participant's Manual • Distributed Antenna Systems • FCC Title 47 Part 20 • FCC Title 47 Part 90 • IFC • Indoor Radio Planning: A Practical Guide • NFPA 70 • NFPA 72 • NFPA 1221 • OSHA 29 CFR 1910

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
				<ul style="list-style-type: none"> • OSHA 29 CFR 1926 • Practical Radio Frequency Test and Measurement: A Technician's Handbook • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver) • Signal generator • TIA-606-B
7	Verify electrical and grounding requirements <i>(Level II)</i>			
		<ul style="list-style-type: none"> • Knowledge of electrical requirements • Knowledge of equipment grounding requirements • Knowledge of manufacturer's equipment power requirements • Knowledge of national electrical code requirements 	<ul style="list-style-type: none"> • Ability to interpret design documents 	<ul style="list-style-type: none"> • Manufacturer's installation instructions • NFPA 70 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926
E	Performing Finish and Trim Out Installation Activities			
1	Install donor antenna <i>(Level I)</i>			
		<ul style="list-style-type: none"> • Knowledge of donor source azimuth • Knowledge of job site safety requirements 	<ul style="list-style-type: none"> • Ability to determine directional measurements (e.g., compass, GPS) • Ability to install lightning protection equipment 	<ul style="list-style-type: none"> • Directional measurement tools (e.g., compass, GPS)

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
	<ul style="list-style-type: none"> • Knowledge of lightning protection requirements • Knowledge of local codes and regulations • Knowledge of mounting applications • Knowledge of RF principles 	<ul style="list-style-type: none"> • Ability to interpret design documents • Ability to operate RF evaluation equipment • Ability to validate antenna alignment 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • Manufacturer's installation instructions • NFPA 70 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver)
2	Validate electrical and grounding installation <i>(Level II)</i>		
	<ul style="list-style-type: none"> • Knowledge of electrical requirements • Knowledge of equipment grounding requirements • Knowledge of manufacturer's equipment power requirements • Knowledge of national electrical code requirements 	<ul style="list-style-type: none"> • Ability to interpret design documents • Ability to utilize electrical voltage meter 	<ul style="list-style-type: none"> • Electrical voltage meter • Manufacturer's installation instructions • NFPA 70 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
3	Install active equipment <i>(Level I)</i>	<ul style="list-style-type: none"> • Knowledge of electrical requirements • Knowledge of equipment mounting requirements • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of RF principles 	<ul style="list-style-type: none"> • Ability to install active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • Manufacturer's installation instructions • NFPA 70 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • Torque wrench
4	Install dedicated annunciator <i>(Level I)</i>	<ul style="list-style-type: none"> • Knowledge of equipment mounting requirements • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to install active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's installation instructions • NFPA 70 • NFPA 1221 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
5	Interface with fire alarm system <i>(Level II)</i>	<ul style="list-style-type: none"> • Knowledge of fire alarm integration • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to install active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's installation instructions • NFPA 70 • NFPA 72 • NFPA 1221 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926
6	Install battery backup (BBU) <i>(Level I)</i>	<ul style="list-style-type: none"> • Knowledge of battery enclosure requirements • Knowledge of date coding • Knowledge of electrical requirements • Knowledge of equipment mounting requirements • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to install active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's installation instructions • NFPA 70 • NFPA 72 • NFPA 1221 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926

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Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
F	Performing Commission, Acceptance Test, and Maintenance Activities			
	1 Adjust headend and remote amplification equipment <i>(Level II)</i>			
		<ul style="list-style-type: none"> • Knowledge of electrical requirements • Knowledge of job site safety requirements • Knowledge of jurisdictional frequencies • Knowledge of manufacturer's configuration requirements • Knowledge of RF principles 	<ul style="list-style-type: none"> • Ability to configure active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • FCC Title 47 Part 20 • FCC Title 47 Part 90 • Manufacturer's certification • Manufacturer's installation instructions • NFPA 70 • NPSTC Best Practices for In-Building Communications • NPSTC LMR 101 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926 • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver)
	2 Test system alarms <i>(Level II)</i>			

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
	<ul style="list-style-type: none"> • Knowledge of basic electrical theory • Knowledge of fire alarm integration • Knowledge of local codes and regulations • Knowledge of manufacturer's equipment reporting • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to simulate alarm conditions • Ability to utilize electrical voltage meter 	<ul style="list-style-type: none"> • Electrical voltage meter • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's instructions • NFPA 70 • NFPA 72 • NFPA 1221
3 Test battery backup (BBU) <i>(Level II)</i>			
	<ul style="list-style-type: none"> • Knowledge of battery enclosure requirements • Knowledge of date coding • Knowledge of electrical requirements • Knowledge of equipment mounting requirements • Knowledge of job site safety requirements • Knowledge of local codes and regulations • Knowledge of national codes and standards 	<ul style="list-style-type: none"> • Ability to install active equipment according to system design • Ability to interpret design documents 	<ul style="list-style-type: none"> • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's installation instructions • NFPA 70 • NFPA 72 • NFPA 1221 • OSHA 29 CFR 1910 • OSHA 29 CFR 1926
4 Complete acceptance process <i>(Level IV)</i>			

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Duties, Tasks, and Steps	Knowledge	Skills, Abilities, and Attributes	Tools, Equipment and Resources
	<ul style="list-style-type: none"> • Knowledge of AHJ test requirements for approval (e.g., approval for live voice testing, RF frequencies, radio communication protocols) • Knowledge of closeout documentation components • Knowledge of fire alarm integration • Knowledge of local codes and regulations • Knowledge of national codes and standards • Knowledge of RF principles • Knowledge of system design 	<ul style="list-style-type: none"> • Ability to assemble closeout documentation package according to AHJ requirements • Ability to conduct RF signal strength and quality tests • Ability to configure active equipment according to system design • Ability to test alarm system integration • Ability to test annunciator • Ability to test battery back up • Communication skills 	<ul style="list-style-type: none"> • Electrical voltage meter • Hand tools (e.g., drill, screwdriver, socket set, saw, pliers) • IFC • Manufacturer's instructions • NFPA 70 • NFPA 72 • NFPA 1221 • RF evaluation equipment (e.g., spectrum analyzer, directional antenna, scanning receiver)