VIRGINIA SCHOOL FACILITIES / PRACTITIONER RESOURCE

THE INVISIBLE INFRASTRUCTURE OF SCHOOL SAFETY

Radio spectrum, wireless systems, responder coverage, interoperability and regulatory change — through a Unified Layered School Safety lens.



PREPARED BY GUY M. GRACE • NOVEMBER 13, 2026

Independent Virginia-focused education for school facilities and public-safety partners. Offered for VSPMA member learning; not endorsed by a professional association or employer and not a code interpretation, engineering specification or FCC authorization.

00 / WHY THIS MATTERS

A night I have never forgotten

> ***"The first question is not which radio we should buy. It is what our people depend on — and whether we know it will work."***

On December 31, 1999, I spent the night walking schools with dozens of other school officials. The calendar was about to turn to the year 2000, and we were checking what might happen to systems that used dates, clocks or automated control. We looked at thousands of items. I remember one analog device that stood out during our synchronization checks. What stayed with me was not a dramatic technology failure. It was the responsibility of finding out, device by device, what our schools depended on.

Y2K was a date-handling problem, not a radio-spectrum problem. But the lesson travels well. Today a school district may depend on licensed radios, cellular services, wireless duress devices, hearing assistance, access-control gateways, sensors, GPS, Wi-Fi, fire-alarm communications and responder radio enhancement equipment. Those systems may be owned by different departments, vendors or public agencies. Many operate on different frequencies; others depend on wireless networks without being radio devices themselves.

We cannot manage every future change by sending staff to check thousands of boxes after a deadline is announced. We can do something better: know our systems, document their infrastructure, assign ownership, verify their actual performance, and watch the changes that are relevant to them.

WHY FACILITIES LEADERS SHOULD EXPLAIN RADIO SPECTRUM

A school does not need a radio engineer in every principal's office. It does need informed leadership, capable technical partners and a practical way to recognize when a communications dependency has changed.

This independent practitioner guide approaches spectrum change as an issue of education and stewardship. Modernization, reconfiguration and more efficient use of a limited band can produce real public benefits. Those benefits should be evaluated alongside the technical realities and transition needs of schools and other existing users. Virginia readers should use the state-specific code and school safety audit guidance in the front matter before applying the general frameworks.

Technical sources: [01], [02], [07]

READ / HOW TO USE IT

The route through this guide

Written for Virginia facilities professionals, superintendents, school boards, safety directors, technology and transportation leaders, educators, and public-safety partners. Begin with the Virginia-specific orientation pages; then follow the national science, operational examples, and practical tools. The method is practical: a recognizable story first, the equipment and science second, and an action to verify third.

Section	What the reader will gain
01 / The invisible river	Frequency, wavelength, channel width, propagation, licensing and why the numbers matter.
02 / One school day	Everyday wireless devices and the supporting infrastructure they rely upon.
03 / Wireless duress	Buttons, receivers, gateways, supervision, location and the full alert-to-action chain.
04 / ERCES, BDA and DAS	Responder radio coverage and building, code and frequency-license-holder responsibilities.
05 / Interoperability	How district radios, dispatch and emergency services exchange usable information.
06 / Codes and standards	Who governs spectrum, equipment, booster operation and in-building coverage.
07 / History and today	2013–14 changes, 800 MHz rebanding and a dated 2026 spectrum watch.
08 / ULSS action tools	Inventory, field verification, responsible ownership and a practical 90-day approach.
09 / Resource library	Clickable authoritative references and scannable QR codes.

INTERPRETATION KEY

“Adopted rule” means a rule has been issued; “proposal” means a request or idea under consideration; “company filing” is a party’s statement, not an FCC decision. Every example frequency is illustrative until matched to a specific equipment model, authorization and local system.

VIRGINIA EDITION / FACILITIES LEADERSHIP

The building is part of the response

"A signal is invisible. Its purpose is not. School leaders must understand what people depend on — and verify that it works."

Virginia school plant professionals keep schools operating long before an incident and long after the final bell. Facilities decisions influence where radio signals travel, where equipment is powered, which pathways are maintained, and whether people can communicate when normal operations are disrupted.

This Virginia edition connects national radio-spectrum fundamentals with the Commonwealth's school safety audit process, adopted building-code framework, local public-safety partnerships, and practical change-management questions. It is designed to be shared across facilities, technology, transportation, instruction, emergency planning, and local responder teams.

Three connected disciplines

UNDERSTAND	RECOGNIZE	VERIFY
Understand the infrastructure	Recognize changes in building use, materials, systems and operating hours	Verify coverage, alerts, message delivery, responder access and human handoffs
Inventory actual devices and owners	Identify where an ordinary renovation or outage changes dependencies	Record evidence, corrective actions, retests and responsible owners

How this supplement fits the larger guide

The next pages provide Virginia-specific context; the national science, device inventory, radio-interoperability examples, illustrations, and worksheets remain in the core guide. Where a national model code and a Virginia provision differ, use the adopted Virginia requirements and the interpretation of the appropriate authorities.

PUBLICATION BOUNDARY

Independently authored education for VSPMA members and other Virginia school practitioners. It is not an official VSPMA publication, engineering design, site assessment, legal opinion or adopted operational procedure. Association sharing does not imply review, approval or endorsement.

Virginia sources used here: [VA-01]–[VA-07]. See the Virginia source list near the end of this guide.

VIRGINIA EDITION / ADOPTED-CODE LENS

Section 918: Ask the right questions first

Virginia's 2021 Uniform Statewide Building Code (USBC) took effect January 18, 2024. The 2021 Virginia Construction Code (VCC), Virginia Existing Building Code (VEBC), and Virginia Property Maintenance Code serve different project contexts. A renovation does not automatically have the same requirements as new construction; establish scope, permits and applicable provisions with the building official. [VA-01] [VA-02]

Virginia Construction Code — in-building emergency communications

VCC Section 918, reflected in 13VAC5-63-240, addresses in-building emergency communications coverage in qualifying new buildings and structures in localities using public-safety wireless communications. It includes multiple exceptions, among them certain construction types, smaller single-story buildings, other specified occupancies, documented adequate signal conditions, and situations involving local equipment provision. The code authority must determine applicability for the particular project. [VA-03]

DO NOT ASSUME EVERY SCHOOL NEEDS A BOOSTER

Section 918 is not a blanket order to purchase a BDA or DAS. Start with the adopted code, building characteristics, authorized public-safety system, baseline coverage evidence, relevant exceptions and the building official's determination. Engineering and frequency-license-holder coordination precede equipment selection.

The code places different duties on different parties

SUBJECT	WHAT THE VIRGINIA PROVISIONS ADDRESS
Building owner	Provides required cabling and suitable access/operational space under Section 918.1.1 and 918.1.2.
Locality	Responsibilities for additional communications equipment and its operation/maintenance are specified in the state amendment; verify actual local agreements and implementations.
Inspection	Installation is subject to inspection before concealment under Section 918.1.3.
Acceptance field testing	Section 918.2 addresses testing by emergency public-safety personnel following appropriate notice, with deficiencies documented.
Technical execution	Relevant IFC 510.4 and 510.5 technical provisions are referenced; coordinate with AHJ, qualified designers and radio-license holders.

Primary authority: 13VAC5-63-240 / VCC Section 918. Reconfirm amendments and adopted editions before project design, permits or procurement. [VA-03]

VIRGINIA EDITION / RESPONSIBILITY + CODE HANDOFFS

Put ownership on the record

A school division, local government, fire authority, dispatch agency, radio-system licensee and technology vendor may each control a different part of the communications chain. An inventory alone cannot resolve those boundaries. Document where a responsibility begins, who can authorize changes and who receives proof of performance.

A practical coordination conversation

PARTNER	EVIDENCE TO REQUEST / DECISION TO RECORD
School division / facilities	Current building plans, owner of cabling and pathways, construction changes, approved access procedures.
Local building / fire officials	Applicable Virginia code, scope, exceptions, approved testing and inspection expectations.
Public-safety radio owner / licensee	Authorized frequencies, network changes, booster consent, design parameters and RF coordination.
Fire / law enforcement / EMS	Critical operating locations, dispatch practices, handoff methods and exercise objectives.
Qualified RF specialist	Measured site conditions, design basis, intelligibility criteria, supervision and acceptance documentation.
School technology / security teams	Duress gateways, wireless sensors, alarms, Wi-Fi, backup power, monitoring, escalation and maintenance.
Division safety / emergency manager	Integration with the school crisis plan, accessible messaging, alternate paths and recurring validation.

Distinguish four different decisions

1. Is in-building responder radio coverage subject to a specific Virginia code requirement? 2. Are school-owned wireless systems reliable even when no responder radio requirement applies? 3. Does the response plan explain how messages reach the right people? 4. Who verifies the result after installation and whenever conditions change?

RESPONDER ACCESS AND FREE EGRESS

Communications work must not create new obstacles to lawful egress, accessible evacuation, protected door function or authorized responder access. Coordinate with the safety team and the applicable authority instead of solving one hazard by creating another.

Relevant authority: Virginia Construction Code Section 918 and Virginia DHCD code resources. [VA-01] [VA-03]

VIRGINIA EDITION / SCHOOL SAFETY AUDITS

Connect facility evidence with the school safety process

Code of Virginia § 22.1-279.8 requires annual school safety audits for public schools. It expressly includes physical-security issues and evaluation of emergency telecommunications and related technology. It also calls for collaboration with local law enforcement and involvement of fire, EMS and emergency-management partners in crisis planning. This guide supports those existing responsibilities; it does not create a second audit program. [VA-04]

Use the DCJS materials, then add a communications conversation

The Virginia Department of Criminal Justice Services (DCJS) provides the School Safety Inspection Checklist and related guidance. Its current checklist page says 2026 updates are available, including a mobile form, and explains that certifications are collected annually as of August 2026. Other DCJS pages retain older cycle descriptions; verify current submission instructions directly with the Virginia Center for School and Campus Safety before treating a schedule as a compliance deadline. [VA-05] [VA-06]

EXISTING PROCESS	USEFUL COMPLEMENTARY QUESTION
School safety inspection	Which communications dependencies were changed by remodeling, added equipment or new occupancy patterns?
School emergency plan review	Who can issue messages, confirm receipt, choose alternates and account for students and staff?
Public safety collaboration	Can the school reliably exchange usable information with dispatch, police, fire and EMS?
Corrective action and follow-up	Is an issue assigned, corrected, retested and reviewed when systems or facilities change?

Protect sensitive information

Virginia law allows specified school safety plans, walk-through checklists and vulnerability details to be withheld or limited under § 2.2-3705.2. Retain actual radio coverage gaps, detailed floorplans, equipment coordinates, programming data, and vulnerabilities in the district's controlled records — not in a public website resource or conference handout. School leaders and counsel determine appropriate disclosure. [VA-04] [VA-07]

A PUBLIC GUIDE / A PRIVATE FINDINGS RECORD

Publish the principles and blank tools. Keep completed site assessments, radio maps, security details, passcodes, and responder information in approved district and agency systems with role-based access.

VIRGINIA EDITION / WHEN CONDITIONS CHANGE

A renovated school and an invisible dependency

This scenario is illustrative, not a report of an actual Virginia incident. A school division renovates a secondary school: new teaching spaces, metal framing, glass partitions, access-control infrastructure, updated network cabling and a community-use gym. The systems seem to function at turnover. Months later, the after-hours team discovers that a wireless alert path is intermittent in one occupied area.

The installation of Power over Ethernet (PoE) cabling does not by itself establish the source of a radio problem. The proper response is to investigate the real RF environment, equipment, receiver placement, building changes, power, network paths and supervision evidence — not assume a cause from the construction timeline.

Follow the conditions all the way through

DISCIPLINE	FIELD QUESTION / POSSIBLE ACTION
1 RECOGNIZE	A monitoring check-in is missing. Is the condition isolated, repeatable, and visible to the people responsible?
2 ACT INITIALLY	Follow approved maintenance and reporting procedures; use authorized alternative communications if indicated.
3 CHANGE	What changed in building layout, materials, infrastructure, occupancy or operating hours?
4 DEPENDENCY	Which receiver, gateway, power supply, cellular route, network switch or human acknowledgment is involved?
5 CASCADE	Could an alert be delayed, mislocated, or fail to reach responders during a second hazard or busy event?
6 VERIFY	Test the full device-to-person-to-action chain at relevant times; document correction and retest.

Where Protective Actions enters the picture

If a new hazard appears while normal communication is impaired, staff must rely on their trained protective-action defaults and approved alternate communication methods, reassessing when conditions make the default unsafe. An alert is not an intervention: the system must support a timely, appropriate human response. No educational scenario replaces the local plan, code, or incident command.

THE FACILITIES LEADERSHIP QUESTION

“We accepted the renovation. Did we also verify the protective capabilities that depended on the building as it existed before — and as it operates now?”

VIRGINIA EDITION / ACTION PLAN

A practical 90-day communications review

This is a suggested sequence, not a Virginia reporting deadline or a substitute for formal code testing. A small school division can begin with existing staff and partners, and expand technical evaluation where the evidence calls for it.

PERIOD	LOW-BURDEN ACTION	EVIDENCE TO KEEP
DAYS 1–30	Name a facilities lead and safety lead. Identify radio and wireless systems; find licenses, owners, vendor support, existing tests and local responder contacts.	System inventory; owner/backup; approved contact pathway.
DAYS 31–60	Walk occupied and after-hours locations with approved staff. Review power, gateway health, coverage complaints, building changes and approved alternates. Consult AHJ and radio licensees where applicable.	Test plan; exceptions; operator acknowledgments; unresolved issues.
DAYS 61–90	Correct priority gaps through qualified teams, conduct end-to-end retests, update plans and training, and agree on recurring change triggers.	Closure record; retest result; next review date; approval.

Blank Virginia decision record

ENTRY	WORKING NOTE
School / project / date	_____
Building / system change	_____
Responsible school leader / partner	_____
Verified life-safety function	_____
Evidence / limitations / alternate	_____
Action owner / retest date	_____

Carry findings into the division's authorized safety review, construction commissioning, maintenance and emergency-plan workflows. Share only non-sensitive educational lessons publicly.

SUCCESS IS NOT A PURCHASE ORDER

Success is evidence that the school can recognize an issue, communicate it, take the right action, and sustain the capability over time.

01 / FOUNDATIONS

The invisible river school officials already use

A signal is invisible. Its purpose is not.

Imagine a bus driver near the edge of a district on a windy Wyoming morning. The driver presses a push-to-talk button, reports drifting snow, and waits for dispatch to acknowledge the message. The exchange feels simple. The equipment behind it is not: sound becomes an electrical signal; the transmitter encodes the information; an antenna radiates electromagnetic energy; another antenna and receiver recover the message. If the district uses a repeater, a high site may receive and retransmit it. If the district uses a trunked radio network, controllers coordinate access to shared radio channels.

Radio waves are electromagnetic energy. Frequency is how often a wave oscillates per second, measured in hertz (Hz). One megahertz (MHz) is one million cycles per second; one gigahertz (GHz) is one billion. In free space, a 30 MHz radio wave has a wavelength of about 10 meters; a 150 MHz wave about 2 meters; an 800 MHz wave about 0.38 meters. All travel at approximately the speed of light in vacuum, but practical coverage changes dramatically with terrain, buildings, antenna design, transmit power, bandwidth, interference and system design.

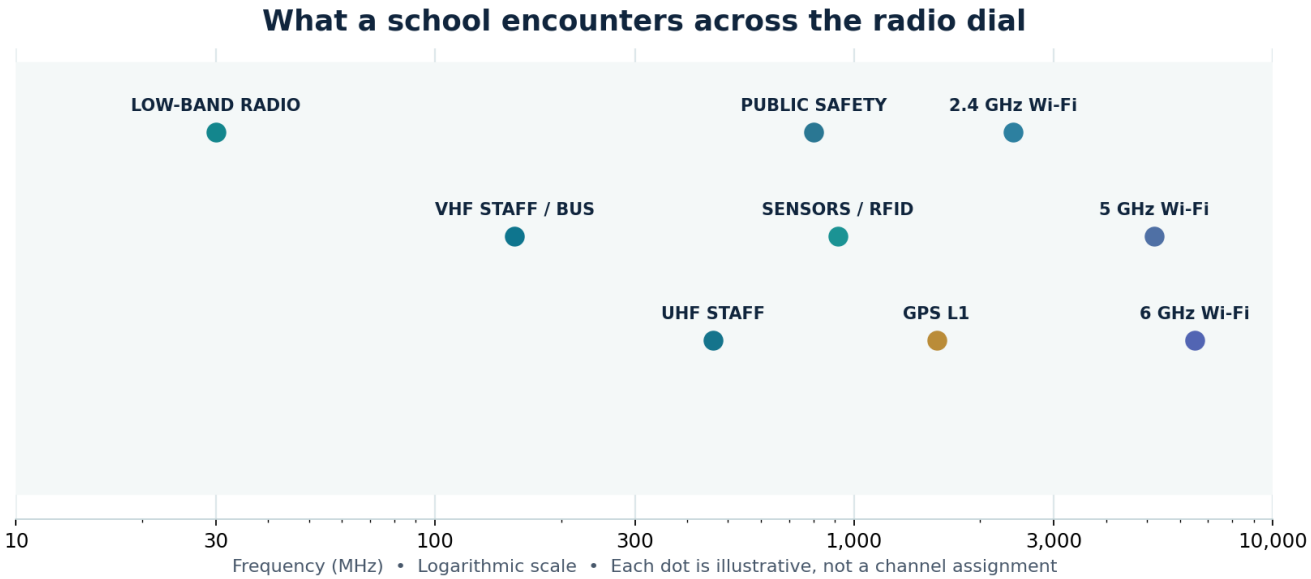

Figure 1. Illustrative school-related radio landmarks on a logarithmic frequency scale. These are not exhaustive U.S. allocations.

THE FREQUENCY IS NOT THE WHOLE SYSTEM

A number on a product label does not tell you whether a device is licensed, supervised, interoperable, protected from interference or reliable in a particular stairwell. Frequency, bandwidth, modulation, network architecture and operating rules answer different questions.

Technical sources: [01], [02], [04], [05]

Why a small band can carry a large responsibility

The electromagnetic spectrum is vast. But some of its most useful services operate within narrow, heavily managed portions. A conventional land-mobile voice channel can be only 12.5 kilohertz wide. By comparison, the 902–928 MHz band is 26 megahertz wide; within it, many types of equipment may share spectrum under different technical and legal conditions. Narrow relative widths do not make a band insignificant. They make careful use and coordination important.

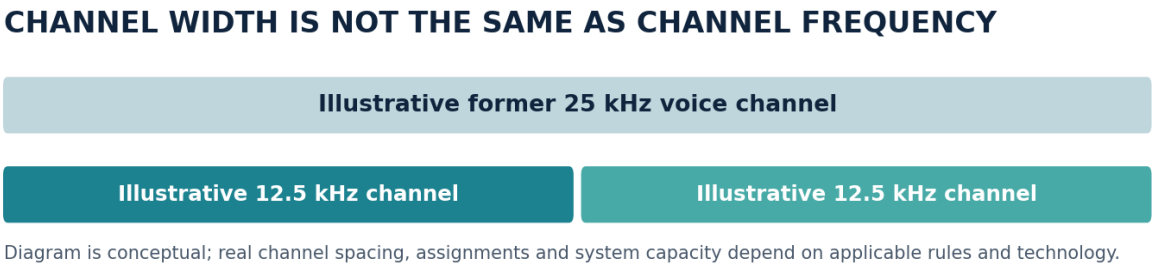

Figure 2. Conceptual illustration of narrowbanding: narrower channel widths can improve spectrum efficiency, but the actual results depend on allocation rules and equipment.

A channel is a defined communications path or frequency assignment. Bandwidth is the span of frequencies that a signal occupies. Modulation is how information is encoded onto a carrier. Protocol is the set of communication rules devices follow. Two radios tuned near the same MHz value are not guaranteed to understand one another. Nor does "digital" automatically mean "better coverage."

Why do different frequencies behave differently?

Lower frequencies have longer wavelengths. They can diffract around certain terrain and obstacles more effectively, and some can travel beyond the horizon through ionospheric effects. Higher bands often support wide data channels and compact antennas, but some paths become more sensitive to blockage and precise antenna placement. These are tendencies, never guarantees: an engineered 800 MHz network can outperform a poorly designed lower-frequency network in the places a school needs service.

The question	Why it matters for a school
Does the signal reach?	Terrain, repeaters, base-station height, antenna placement and walls all affect coverage.
Can it be understood?	Signal strength alone does not prove voice intelligibility or a valid packet/alert.
Can the network handle demand?	Channel width, modulation, user traffic and network design all affect capacity.
Will it work tomorrow?	Maintenance, licensing, power, batteries, vendor support and repeat testing sustain performance.

THE OPERATING TEST

Do not ask simply whether a portable radio reaches across the campus. Ask whether the right user can reliably exchange understandable information in the actual places and conditions that matter.

02 / ULSS DEVICE GUIDE

One school day, many wireless systems

5:45 a.m. — Transportation is already at work

The transportation supervisor reviews road conditions. Drivers start routes, radios connect vehicles with dispatch, and GPS receivers derive position from satellite signals. A fleet system may send that location to a mapping application over a cellular network. The GPS receiver usually listens to satellites; it does not transmit the bus location back to them. Two different communications functions are often hidden behind one screen.

8:20 a.m. — A student needs to hear the lesson

A teacher wears a microphone so a student using an assistive listening receiver can hear the lesson more clearly. Nearby, laptops exchange data over Wi-Fi and a wireless microphone feeds the auditorium sound system. A device's purpose matters: an assistive listening link is not "just another Wi-Fi gadget." It may be essential for access to instruction and needs its own support, documentation and testing.

11:10 a.m. — The building sends a message

An HVAC sensor reports a condition. A door-position sensor indicates an opening has remained unsecured. An access-control reader processes a credential. Some segments may be wired; others may use radio links to a receiver or gateway. A central workstation then relies on switches, power, software, permissions, and network paths. If those later components fail, the sensor may be functioning while the warning never reaches the right person.

7:20 p.m. — The campus is still a community resource

Athletes, families, coaches, custodians and community groups remain in the buildings. Staff may be spread far apart with fewer supervisors and different communications devices than during the regular school day. A radio test at 10 a.m. does not prove the evening crew can summon help from a remote gym or exterior field.

THE ULSS LESSON

Inventory should follow the whole school experience: instruction and accessibility; climate and prevention; transportation; facilities; protective actions; emergency management; technology and cybersecurity; operations after hours; and governance. A radio network is one layer among many, not a substitute for the rest.

The actual devices: What is commonly on campus?

The bands shown below are examples only. Some products have multiple frequency variants or use a network with both wired and wireless links. Schools must verify exact device models, FCC IDs where applicable, license records and local configurations.

School function / device	Possible RF use and infrastructure	Questions for the district
Bus / dispatch portable radios	VHF low-band, VHF, UHF or 700/800 MHz; repeaters, towers, dispatch consoles	Can drivers be heard along real routes? Who holds the license and maintains sites?
School staff / SRO radios	Licensed land-mobile systems or cellular push-to-talk; talkgroups, gateways, coverage	Do SRO, office, facilities and responders share approved interoperability paths?
Wireless duress pendants	Sub-GHz, BLE, Wi-Fi, cellular or proprietary RF; receivers, gateways, monitoring	Are devices supervised? Can activations be located and independently verified?
Fixed duress / panic devices	May be hardwired or RF; security panels and monitoring backhaul	What is the end-to-end delivery/acknowledgment process?
Wireless intrusion / door contacts	Vendor-specific ISM/Part 15 bands; alarm receivers, panels and batteries	Who sees a receiver outage, low battery or lost sensor?
RFID / NFC readers and credentials	Common examples: 125 kHz, 13.56 MHz or UHF RFID; readers/controllers	Which credential technologies and security controls are actually deployed?
Wireless locks and door hardware	Bluetooth/2.4 GHz, sub-GHz or vendor-specific links; gateways/controllers	What happens to authorized access and free egress during outage?
Wi-Fi access points	2.4, 5 or 6 GHz; controllers, switches, power, fiber/backhaul	Is coverage engineered for instruction, accessibility and device density?
FM / DM hearing assistance	Model-specific RF bands; microphone, transmitter, student receiver	Can the student participate throughout the intended classroom/venue?
Wireless microphones / events	Model/authorization-specific UHF/VHF and digital bands	Is spectrum coordinated to avoid dropouts in assemblies and athletics?

Beyond the classroom: systems that make the school work

Device / service	What may depend on RF	ULSS / operational concern
GPS bus or asset receivers	Satellite GNSS L1 and other bands; position computed locally	GPS location and its cellular reporting path are two different dependencies.
Fleet location reporting	Cellular, Wi-Fi, or district RF data over vehicle modems	Location on a screen may become stale during network loss.
Weather radios / hazard broadcasts	NOAA Weather Radio at 162.400–162.550 MHz	Reception and staff procedures must be verified, including backup alerts.
Wireless HVAC / refrigeration sensors	Wi-Fi, 900 MHz, Zigbee/802.15.4 or proprietary RF	Detection is not the same as staff acknowledgment and work completion.
Fire alarm systems / signaling	May be wired, IP, cellular or listed RF arrangements	Apply the actual fire-code and listing requirements; do not assume Wi-Fi.
Nurse or patient monitoring	Purpose-specific wired/wireless health devices	Equipment reliability and authorized use matter for student care.
Access/visitor software	Often software over Wi-Fi/cellular or wired networks	Software is not itself a frequency; trace its network and identity dependencies.
Video surveillance backhaul	Primarily wired IP; sometimes point-to-point RF and cloud links	Cameras may record locally while remote viewing is unavailable.
Public safety responder radios	Local authorized public safety bands; radio towers, dispatch	In-building responder signal may require a separate assessment / ERCES.
Athletics / external grounds	Portables, microphones, Wi-Fi, venue radios, PA integration	Check actual event staffing, extended areas and nighttime use.
Community emergency partners	Dispatch, PSAP, telephones, authorized bridges	Plan handoffs; direct cross-agency RF compatibility is not automatic.

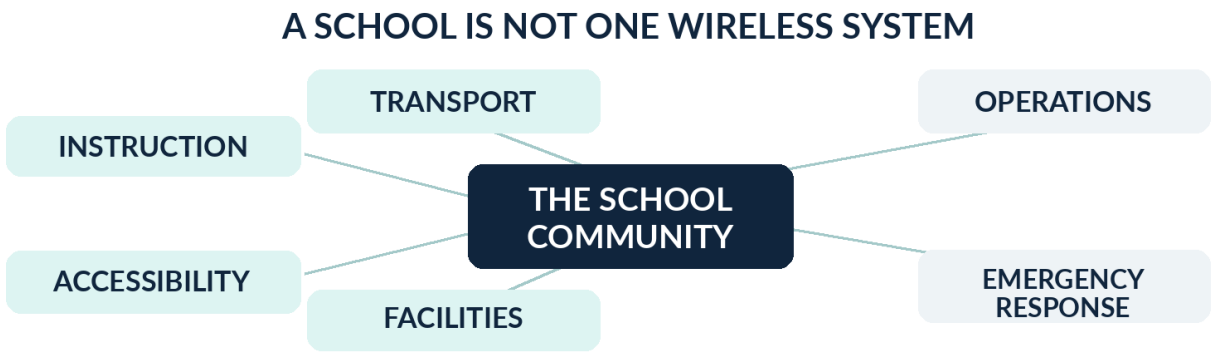

Figure 3. ULSS view: people and school functions sit at the center; different systems reach them through different pathways.

03 / FROM SIGNAL TO SERVICE

The infrastructure behind the device

Trace one message all the way through

If a principal sees a radio, an access-control reader or a wearable duress pendant, it is tempting to treat that item as the system. It is usually only the visible endpoint. Depending on the architecture, useful information may have to pass through a transmitter, antenna, receiver, repeater, gateway, controller, network switch, internet or private backhaul, monitoring software, dispatcher and finally a person who can act.

Each link has a different owner and failure mode. Antenna location influences coverage. Power failure can disable a repeater or gateway. A license or authorization defines where and how equipment can operate. A firewall configuration can block a valid alarm. A monitoring application might show a device offline, but that information helps only if someone is responsible for responding to it.

ASK FOR A SYSTEM DRAWING, NOT MERELY A DEVICE LIST

Every essential wireless system should have a current architecture diagram identifying devices, frequencies, receivers, gateways, controllers, backhaul, backup power, supervision and the people accountable for each handoff.

Four different questions school leaders can ask

1. Coverage: Can the device communicate where people actually use it — on buses, in stairwells, on fields and inside mechanical spaces?
2. Continuity: What continues to operate when Wi-Fi, power, cellular service, the cloud or a gateway becomes unavailable?
3. Supervision: How does the district learn that a device, receiver, repeater or network link is no longer healthy?
4. Human response: Who receives the message, verifies what it means, chooses an action, and confirms that action took place?

The most sophisticated device may not be the most suitable one. The goal is dependable service that supports the person and mission, not an impressive specification sheet.

04 / HIGH-PRIORITY ULSS APPLICATION

Wireless duress is a system — not a button

A teacher presses for help. What really happens?

In an illustrative school scenario, a teacher observes a developing situation and activates an approved wearable duress device. The device transmits a short radio message. A nearby receiver hears it and passes the activation through a gateway. Monitoring software associates the event with a device and, if supported, its location. Designated people receive the alert. They must distinguish an immediate protective-action threat from a request for assistance, contact the right responders, and confirm what happened. A student or staff member may be moving at the same time; location, clarity and speed matter.

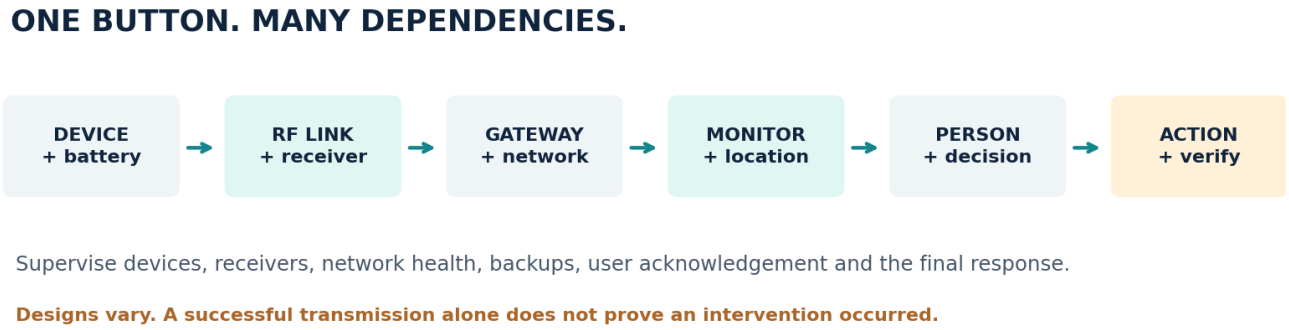

Figure 4. A conceptual duress chain. Real systems can use different networks and may include additional redundancy, location and monitoring functions.

> ***"An alert is not an intervention. It must reach the right people, in time, and result in an appropriate action."***

The spectrum may be a dedicated sub-GHz radio link, 2.4 GHz technology, cellular connectivity, Wi-Fi or another authorized design. Never infer a frequency from a brand name or the word "wireless." In particular, not every panic-button system uses 902–928 MHz. Specific equipment documentation is essential when considering spectrum proposals.

Technical sources: [04], [07], [08]

What supervision and redundancy mean in practice

A supervised system periodically reports equipment health. It may identify low batteries, missing check-ins, receiver faults, tampering, a failed gateway or impaired communication paths. Redundancy can include overlapping receiver coverage, alternate communications links or fault-tolerant services. A backup that has never been exercised is only an assumption.

PASS's Duress Systems Recommendations paper specifically emphasizes supervised wireless infrastructure, location, monitoring, integration and fit-for-purpose selection. These are practitioner recommendations, not a universal FCC requirement or a guarantee that interference cannot occur. School leaders should verify that the chosen design matches their operating conditions and governing state/local requirements.

A field lesson from an altered building: device check-ins are evidence

I saw this firsthand after a school bond project introduced substantially more Power over Ethernet (PoE) cabling and related infrastructure. Some of our Inovonics EchoStream devices were no longer reporting consistently. We had to investigate the changed operating environment and add repeaters to restore dependable communications pathways. The devices had not become unimportant; the environment around them had changed. This is a practitioner recollection, not a controlled finding that PoE cable itself blocked 900 MHz signals.

PoE carries data and electric power over Ethernet cable; it is not itself a 900 MHz radio service. The post-construction diagnosis should consider equipment and antenna placement, metal and building changes, electromagnetic noise, network connections, gateway status, repeater architecture, and other conditions. EchoStream systems in North America commonly operate in 902–928 MHz and support engineered repeater networks. Manufacturer site-survey guidance is designed for exactly this kind of verification. [31–33]

Wireless duress: Practical evaluation and acceptance questions

What to verify	Evidence school officials should ask for
Purpose and activation	Clear distinction among lockdown/immediate-threat, assistance and medical functions, where supported; understandable activation training.
Device RF band	Model, FCC ID/certification where applicable, exact operating band, wireless protocol and channel management.
Coverage	Documented tests in occupied classrooms, special-purpose rooms, stairs, athletics, grounds and after-hours spaces.
Location accuracy	Demonstration that dispatch/response personnel receive useful building, floor and room/location information.
Health supervision	Automatic low-battery, missing check-in, receiver/gateway/network fault alarms, with an assigned responder.
Redundancy and power	Backup strategies, loss-of-network behavior, UPS/battery duration, and supervised recovery.
False activation	Procedures for mistakes, confirmation where appropriate, and avoiding unwarranted emergency actions.
Recipient and response	Who is notified, through what paths, who acknowledges, and what happens when there is no acknowledgment.
Testing and records	Documented acceptance/recurring tests including activation-to-acknowledgment-to-action; training and maintenance.
Governance	District policy, public safety/PSAP coordination, privacy and records expectations, cyber segmentation.

A USEFUL DISTINCTION

An app-only solution can be appropriate for certain functions, but a smartphone notification path may depend on device permissions, carrier/Wi-Fi connectivity and background application behavior. It is not equivalent to a supervised, purpose-built duress architecture without evidence demonstrating comparable performance for the intended use.

Technical sources: [08], [07]

05 / LIFE SAFETY / BUILDING RADIO

ERCES, BDA and DAS: Can responders communicate inside?

The firefighter at the bottom of the stairwell

Outside the building, a firefighter's portable radio is loud and clear. Inside a concrete stairwell, the same transmission becomes broken or unreadable. Walls, steel, glazing, underground spaces, antenna design and other radio effects can change the path. An operational radio that powers on does not prove it has a usable path to command, and receiving command does not prove command can hear the responder.

An Emergency Responder Communications Enhancement System (ERCES) is an engineered solution used where required to improve public safety radio coverage inside a building. Some jurisdictions also use the term ERRCS, Emergency Responder Radio Communication System. A bi-directional amplifier (BDA) can amplify signals in both directions; a distributed antenna system (DAS) distributes them through interior antennas. Not all ERCES installations use identical architectures.

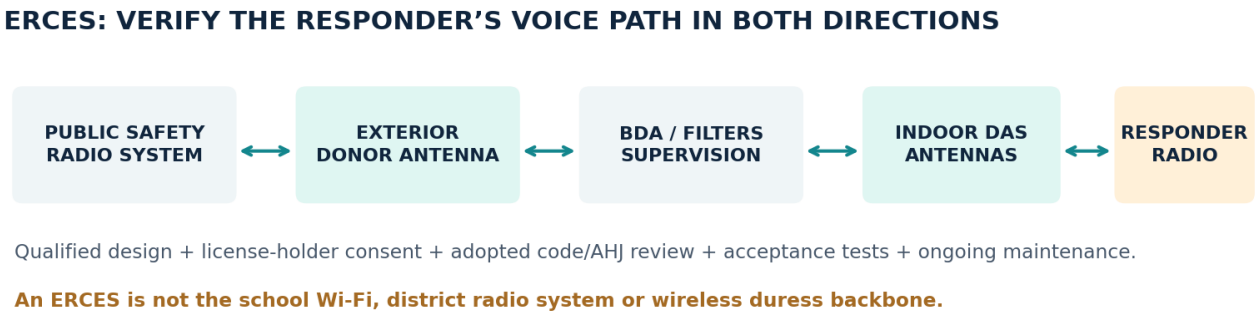

Figure 5. Simplified example; actual design may include filtering, multiple donor connections, remote units, approved supervisory alarms and specific public safety frequencies.

WHAT ERCES DOES NOT PROVE

A code-compliant ERCES for responders does not by itself improve district staff radio coverage, wireless duress, Wi-Fi or commercial cellular service. Conversely, a commercial cellular DAS is not automatically an approved emergency responder radio system.

Technical sources: [05], [06], [09], [10]

What equipment is actually inside an ERCES?

Component	Purpose / field considerations
Donor antenna	Communicates with the authorized public safety radio network; location/orientation require engineering and agency coordination.
BDA / filter equipment	Amplifies approved frequency paths and suppresses unwanted signals; poor design can create harmful interference.
DAS antennas/cabling	Carries RF into building areas; cable loss, routing and survivability matter.
Controller and alarm supervision	Reports device faults, power faults and other required system conditions to the monitoring arrangement.
Backup power	Supports operation for the duration specified by the adopted code/design and approval authority.

Component	Purpose / field considerations
Responder portables/network	The real devices, authorized channels and talkgroups to be served; acceptance should verify usable talk/listen performance.

Codes, consent and the order of decisions

The order matters. First, coordinate with the authority having jurisdiction (AHJ) and relevant public safety frequency-license holder(s). Determine which adopted fire/building code edition applies. Assess actual in-building coverage and quality on the required authorized channels. Where an ERCES is required, use qualified designers/installers and compliant equipment. Obtain frequency-license-holder consent for applicable boosters, perform acceptance testing with the agencies involved, and establish monitoring, maintenance and re-testing responsibilities.

Model fire-code provisions include International Fire Code Section 510. The 2024 IFC edition references NFPA 1225-2022 for applicable emergency-services communications requirements; NFPA 1 and NFPA 1225 provide related provisions. UL 2524 addresses listed ERCES equipment. FCC Part 90 §90.219 governs certain private land-mobile signal boosters, including express license-holder consent for non-licensee operation, Class B registration and interference obligations. Adoptions and local amendments vary; a code edition is not automatically law in every jurisdiction.

DO NOT SKIP THE RADIO LICENSE-HOLDER

An incorrectly engineered booster may interfere with public safety systems beyond the building. The school's approval to spend money is not a substitute for applicable frequency-license-holder consent or authorization.

An ERCES field-verification discussion with the fire department

1. Which public safety agencies, bands, channels and network sites are to be supported?
2. What adopted code and test criteria apply? What existing indoor/outdoor RF evaluation is documented?
3. Who owns the radio frequencies? What written consent or coordination is required?
4. Are both uplink and downlink intelligibility, relevant critical areas and acceptance test plans addressed?
5. Who monitors trouble conditions, maintains batteries, and schedules periodic tests?
6. How will renovations, a new tower, a changed public safety radio system or altered building materials trigger reassessment?

This publication is educational; the building official, fire code official, frequency-license holder(s), qualified RF designer and relevant authority determine applicable compliance.

Technical sources: [05], [06], [09], [10], [11], [23]

06 / PEOPLE + SYSTEMS

Interoperability: The ability to exchange usable information

An emergency call brings three radio networks to one school

School personnel know the campus, where students are located and which areas can be accessed. Police and firefighters arrive with different radio networks, talkgroups and command procedures. EMS may use another communications service. Direct radio-to-radio contact cannot be assumed, even when systems operate in nearby frequencies. An approved dispatch bridge, common authorized channel, interoperable cache radio, gateway or an established human coordination procedure may be what makes the exchange work.



Figure 6. Interoperability can involve radio connections and agreed human communication routes; it does not mean all participants share a frequency.

CISA SAFECOM identifies five interdependent parts of interoperability: governance; standard operating procedures; technology; training and exercises; and routine use. A shared channel without governance or trained users may be a weak solution. The school's role is to know whom to contact, how information is relayed, who has authority and how the process is practiced.

Operability versus interoperability

Operability asks whether our own radios can communicate within our mission area. Interoperability asks whether information can cross organizational and technical boundaries when needed. Both can fail for different reasons. School leaders should avoid assuming a radio with a familiar label or a talkgroup name can reach neighboring public safety networks.

ULSS ILLUSTRATION

The school's daily operations radio, a supervised wireless duress system, the police network and an ERCES may be four different technologies. A school safety plan must show where they exchange information and where people must bridge the gap.

Technical sources: [07], [05]

07 / REGULATORY FOUNDATION

Who makes the rules? Codes, authorizations and standards

Frequency allocation, radio licensing, device authorization, building safety and emergency response are related but not identical. The FCC manages nonfederal U.S. spectrum use and equipment under federal communications law; NTIA handles federal government spectrum management. State/local authorities adopt and enforce relevant building and fire codes. Standards bodies and listing organizations develop technical benchmarks that may be referenced by those codes.

Instrument / organization	What it addresses	School leadership takeaway
NTIA / FCC frequency allocations (47 CFR Part 2)	Which services may occupy a given band, relative priorities, sharing	Start with an allocation lookup; it does not tell you the band a specific device uses.
FCC Part 15	Many unlicensed RF devices; equipment limits and interference obligations	License-exempt is not interference-free; approved devices still need system testing.
FCC Part 90	Private land-mobile and public safety radio services, licensing and operation	Check district licenses, frequencies, emission designators, renewals and approved use.
FCC §90.219	Part 90 signal booster consent, deployment, registration and interference	Coordinate ERCES boosters with frequency-license holders and authorized experts.
FCC Parts 20, 27, 74, 101 (as applicable)	Cellular/commercial, broadband, certain microphone, fixed microwave services	A vendor may rely on several services; confirm which rules apply to its actual design.
IFC Section 510 / locally adopted fire code	When and how emergency responder radio coverage is required	Verify edition, local changes and AHJ/fire official expectations.
NFPA 1225 / NFPA 72 (as applicable)	Emergency services communications and fire/emergency signaling requirements	Do not equate the ERCES to a school PA/fire alarm; verify system-specific standards.
UL 2524 / approved listings	Performance and safety of applicable ERCES products	Check listings and actual equipment configuration, not marketing assertions.
State laws and local policy (e.g., Alyssa's Law variants)	Possible silent panic alarm and notification obligations	Requirements differ by jurisdiction; legal and operational review needed.

How to look up a school radio license

Use FCC Universal Licensing System (ULS) search by district/legal licensee name or call sign. Confirm the licensee, radio service, frequencies, emission designators, authorized locations, expiration date and operating conditions. The district may instead use a service provider or a shared public safety network; those relationships need documentation, too. Do not assume an equipment inventory is a license inventory.

A CRUCIAL REGULATORY DISTINCTION

A petition, draft, public notice, notice of proposed rulemaking and adopted final rule are different procedural stages. A company's SEC disclosure may accurately describe its strategy but is not an FCC order. Always label the status and date.

Technical sources: [01], [02], [03], [04], [05], [06], [09], [10]

08 / SPECTRUM HISTORY

What changed in 2013–14 — and why history matters

School officials sometimes remember several radio changes around 2013 and 2014 as “the consolidation.” They were distinct actions, with different bands and objectives. A useful history separates them rather than combining them into one event. The broader principle is that more efficient spectrum use and improved interoperability can offer substantial public benefits while requiring advance work from incumbent users.

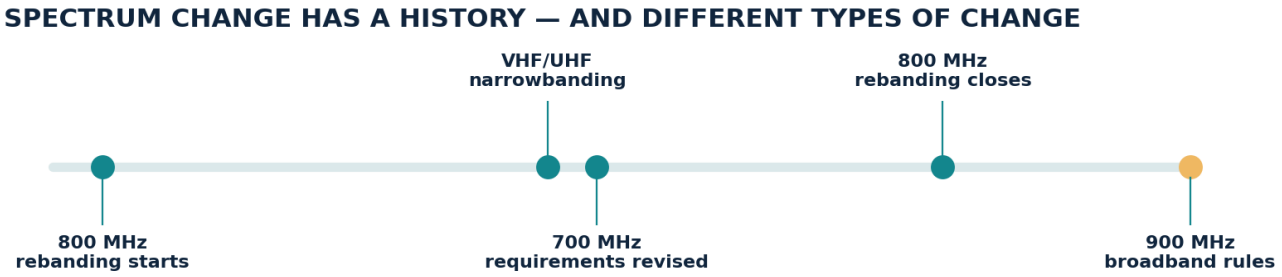

Figure 7. Selected historical and recent spectrum milestones; dates refer to adopted changes or program milestones, not a single nationwide school-radio conversion.

When	What changed	Why school officials might remember it
2004–2021	FCC 800 MHz rebanding program moved many public-safety and other licensees to address harmful interference. Closed April 2021 after >2,100 licensees had relocated.	Public safety frequencies, equipment, programming and coordination changed over many years.
January 1, 2013	Affected VHF/UHF private land-mobile operations in 150–174 and 421–470 MHz transitioned to 12.5 kHz or equivalent efficiency, subject to exceptions/waivers.	Radio programming and equipment, license emissions and planning could need updates.
October 2013	FCC consolidated rules for 700 MHz public safety broadband spectrum associated with FirstNet.	Part of the transition toward nationwide broadband public-safety interoperability.
November 2014	FCC revised planned 700 MHz narrowband 6.25 kHz efficiency deadlines (FCC 14-172).	A reminder that deadlines can be adjusted as technology and operational realities evolve.
2026	New 896–901/935–940 MHz broadband options adopted; separate 902–928 MHz proposal still being evaluated.	“900 MHz” can refer to entirely different bands, authorizations and stages of change.

Technical sources: [12], [13], [14], [15], [17]

09 / REGULATORY WATCH

Where we are now

A current-spectrum section needs a date on every edition. Changes may benefit the broader community through efficiency, public safety, expanded connectivity or improved resilient positioning and timing. The school-safety question is not whether change is good or bad in the abstract; it is which real school systems are involved, what transition is proposed or adopted, and who is responsible for verification.

STATUS SNAPSHOT / Reviewed November 13, 2026. The FCC proceeding and technical information may change; consult the official docket before taking action.

What is NextNav — and why is it in a school facilities guide?

NextNav is a U.S. technology company developing a ground-based positioning, navigation and timing (PNT) system to complement GPS. Think of it as a potential additional source of location and precise time information when satellite GPS signals are difficult to receive or disrupted — not as a school security device, a public agency or a new rule for schools. In April 2024, NextNav asked the Federal Communications Commission (FCC) to consider reconfiguring the shared 902–928 MHz radio band to support a proposed 5G-capable terrestrial PNT network and related broadband uses. Its proponents point to the value of a resilient GPS complement; existing users of the band have raised questions about coexistence, technical effects and possible transition costs. [16] [20] [22]

WHAT VIRGINIA FACILITIES TEAMS SHOULD KNOW / Some existing sensors, identification systems and wireless alarms use portions of 902–928 MHz, but many school technologies use other frequencies. A proposal does not mean the FCC has changed the rules or that a school needs to replace equipment. Confirm the actual devices and frequencies, track official actions, and seek manufacturer or qualified RF advice before making decisions.

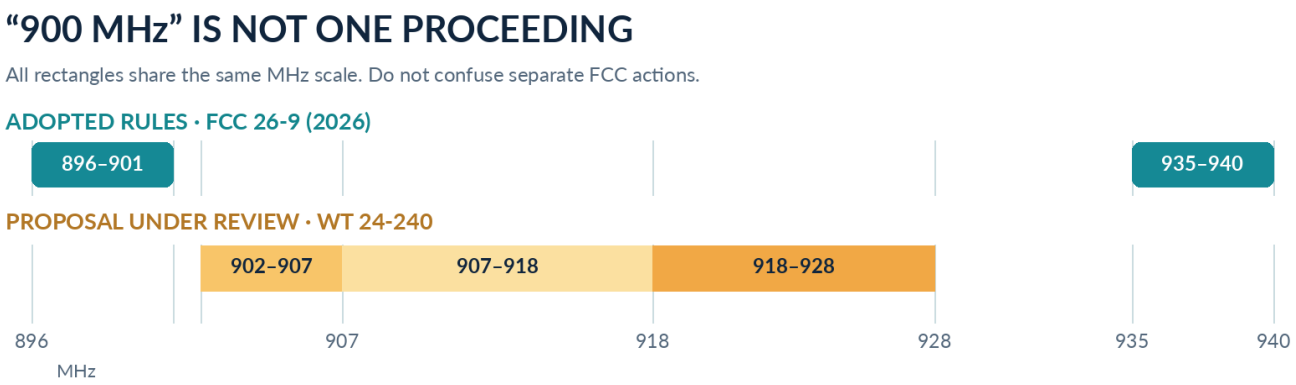

Figure 8. The adopted paired 896–901/935–940 MHz order is distinct from the proposed 902–928 MHz plan. Within the latter, the 2024 petition proposed 902–907 MHz uplink, 907–918 MHz for relocated non-M-LMS users, and 918–928 MHz downlink. All boundaries are to scale, but this is not a complete regulatory band plan.

Five developments worth understanding

Development / status	What it means / what schools should watch
902–928 MHz — NextNav petition (proposal)	FCC sought comment in WT Docket 24-240 on a proposed terrestrial PNT network. Potential public benefit: a GPS complement. Questions include coexistence, technical effects and incumbent transition. No adoption should be inferred from the petition.
Company update, Nov. 12, 2026 (party statement)	NextNav's SEC Form 10-Q reports interagency review of a draft NPRM. This is not confirmation of a released FCC NPRM or final rule; follow official FCC docket for changes.
896–901 / 935–940 MHz (adopted 2026)	FCC 26-9 adopted options for expanded paired broadband use, with narrowband and other pathways. A distinct frequency range from 902–928 MHz.
4.9 GHz public safety (selection work underway)	An October 2026 Federal Register notice announced plans for a committee advising the FCC on Band Manager selection. Relevant mainly through public safety partners, not generic school Wi-Fi.
6 GHz unlicensed device rules (adopted 2026)	New geofenced variable-power rules illustrate spectrum-sharing innovation; relevant to planning wireless infrastructure and interference protection, not a warning that existing Wi-Fi is obsolete.

Technical sources: [16], [17], [18], [19], [20], [22]

What to watch for without creating unnecessary alarm

Schools should use a screening approach rather than anticipating damage to every wireless device. Start with a credible change (final rule, official notice, manufacturer bulletin, local public safety radio upgrade). Map that change to the actual frequencies and dependencies in the district. Then assess whether an operational decision is needed.

Watch item	Evidence / potential school action
Actual band and incumbent rights	Confirm device model, FCC equipment ID, frequencies, whether Part 15 or licensed; note different legal protections.
Rulemaking stage	Review FCC docket, adopted text, effective dates and compliance provisions. Do not treat a petition as a mandate.
Public safety system changes	Ask local PSAP/fire/radio administrators whether channels, talkgroups, sites, encryption or ERCES test expectations will change.
Supplier support and compatibility	Request written product impacts and tested alternatives, not speculative replacement recommendations.
Building/renovation changes	Check new glazing, concrete, expansions, antenna placement, shielding and communications tests.
Reliability and cybersecurity	Watch tower/power/backhaul outages, unpatched gateways, monitoring failures, battery and device status.
Procurement/change control	Require current architecture, spectrum details, service ownership and future migration/documentation provisions.

POSITIVE FRAMING

Spectrum reconfiguration, sharing and new wireless standards are often undertaken to improve the use of limited bandwidth and produce public benefits. The goal for school districts is informed participation and orderly planning — not opposition by default or premature replacement of equipment.

In the case of NextNav, practitioner organizations and school leaders can monitor technical evidence and public filings, ask whether any school device actually occupies the specific affected frequencies, and consult manufacturers and qualified RF experts. Schools should not assume that all devices marketed as “900 MHz” would be affected, or that any predicted interference has already occurred.

10 / LEADERSHIP, NOT GUESSWORK

The ULSS spectrum dependency map

A school safety assessment should not end with “we have radios.” Nor should it end with “the vendor says the button works.” The right assessment connects the system’s physical devices to the people, routines, decisions and governance that make them useful. This is a practical application of ULSS: instruction, accessibility, daily operations, prevention, protective actions, facilities, cybersecurity, life safety, emergency response and community interoperability must be considered together.

> ***“Unify information for purpose, not perceptions. Verification beats assumption.”***

Who should own what?

Role	Practical responsibilities
District leadership / board	Policy, priorities, sustainment resources and assignment of accountable ownership.
Safety / emergency management	Protective-action criteria, alert-to-action procedures, responder coordination, exercises.
IT / cybersecurity	Networks, segmentation, gateways, identity, logs, backups, resilience and vendor access.
Facilities / construction	Building changes, pathways, power, equipment rooms, in-building coverage coordination.
Transportation / operations	Real routes, daily staff radio usage, after-hours staffing and dispatch readiness.
Special education / student services	Accessible communications and the experience of students depending on assistive devices.
Public safety partners / AHJ	Radio system authorizations, interoperability pathways, ERCES acceptance and code review.
Vendors / RF specialists	Accurate RF design, licensing support, installation, testing, documentation and maintenance.

A workable 90-day starting plan

7. Days 1–30: appoint a cross-functional owner; collect licenses, equipment lists, system diagrams, maintenance contracts, device frequencies and responder contacts. Identify wireless duress and responder coverage separately.
8. Days 31–60: test priority communication paths with actual users; verify bus routes, basement/field coverage, after-hours staffing, duress supervision and written interagency handoffs. Document faults and action owners.
9. Days 61–90: close urgent gaps, assign lifecycle and regulatory-watch responsibilities, update emergency plans, schedule recurring tests and build documentation into procurement/renovations.

10A / FIELD ASSURANCE + CHANGE CONTROL

What changed after the bond? A lesson in the living campus

A school building is never a frozen radio environment. New ceilings, metal shelving, cameras, wiring, PoE-powered network devices, door hardware, access-control upgrades, equipment racks, furniture, additions and changes in usage all alter the conditions under which communications were originally installed. Some changes influence the radio path; others affect the gateway, network, power supply or monitoring service rather than the RF transmission itself.

In one Littleton bond project, we added extensive PoE cabling and related systems. EchoStream wireless devices that previously reported reliably began missing reports. We investigated and installed additional repeaters to restore usable coverage. The takeaway is not that PoE cabling automatically weakens radio signals. It is that renovation changed the total operating environment and exposed dependencies our original installation had not anticipated. We needed field observations, appropriate measurements, and a correction we could verify. [31–33]

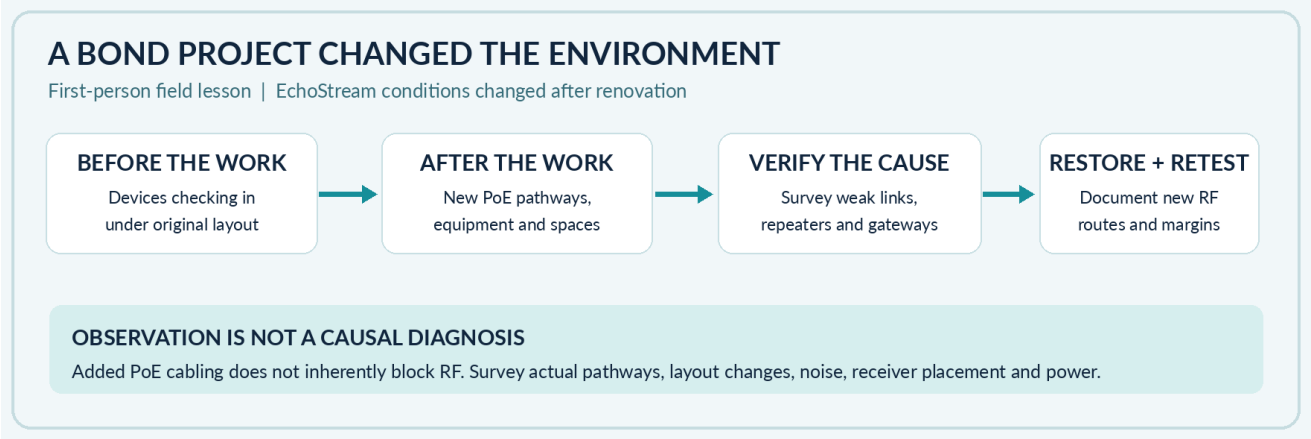

Figure 9. An author recollection illustrating a post-renovation investigation; the graphic shows an operational sequence, not a proven mechanism of interference.

A district should add radio and wireless-system review to the construction closeout process: request updated device and repeater locations, verify network and power dependencies, retest areas affected by construction, record the new baseline, and assign responsibility for recurring supervision. A technology added under a bond should not leave the existing safety technology less dependable than it was before work began.

The ULSS lesson

Document the full chain: field sensor or radio → RF path → receiver / repeater → gateway → IP network or dispatch path → monitoring or users → action. A missing report may result from several different links. Replacing the end-device without finding the failed link may not solve the problem.

Technical references: [31], [32], [33]; case details are the author's recollection.

10A / FIELD ASSURANCE + CHANGE CONTROL

Coverage walks: test the school that is occupied

It is tempting to test a portable radio in an empty building on a Saturday, hear a clear response and check the box. That establishes only how the link performed at that location and time. I have observed school communications weaken when more people were moving through certain areas. At particular frequencies and geometries, bodies and moving objects can influence a signal through obstruction, absorption and multipath; engineers should measure the local effect rather than assuming crowding always produces failure. [35]

A better assessment involves the people who actually use the system. Walk a school while it is quiet, during class changes, at arrival and dismissal, and during after-hours activities. Include different body orientations, antenna positions, floor levels, corridors, athletic spaces and exterior grounds. For transportation, verify actual routes and remote parking/staging locations. Log the device, time, location, building occupancy, route/channel, observed result and the second person confirming the transmission.

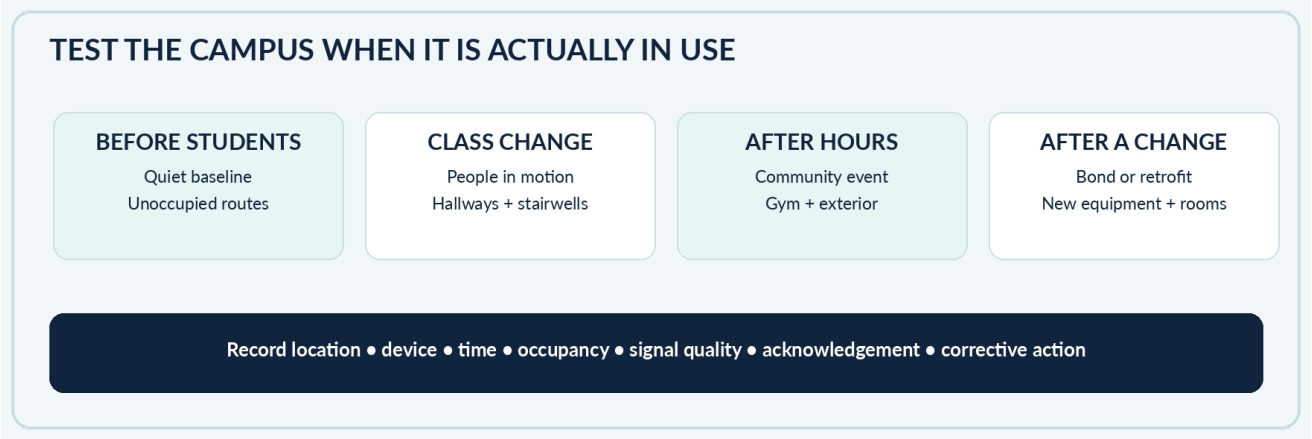

Figure 10. Four complementary test conditions. Suggested practice, not a universal code testing interval or a measured site survey.

Environment	What the walk should include	Why it matters
Empty-building baseline	Representative classrooms, hallways, basement, stairwells	Makes changes visible later; insufficient on its own.
Arrival / class transition	Busy hallways, cafeteria queue, vehicle loop and playground	Tests real occupancy, moving bodies and traffic patterns.
After-school / community	Gym, auditorium, parking and custodial/maintenance areas	Finds places staffed differently after classes.
Post-project / post-incident	New doors, cameras, PoE/network racks, glazing, ceilings, repeater changes	Revalidates the service after a change.

For wireless duress, door contacts, motion detectors, and supervisory transmitters, schedule authorized functional tests with recipients/monitoring centers notified in advance. Do not trigger live public-safety dispatch inadvertently. Public-safety in-building radio systems require separate coordinated testing by qualified personnel under the adopted code and authority having jurisdiction. [07, 08, 09, 31–33, 35]

10A / FIELD ASSURANCE + CHANGE CONTROL

A living spectrum inventory, not a one-time spreadsheet

A useful inventory follows three perspectives at once. First, what devices exist? Second, what fixed equipment and networks make them work? Third, what operational action depends upon the signal? A small wireless door contact may have a more consequential dependency than a sophisticated display if its trouble indication is never reviewed. The inventory should be managed jointly by transportation, IT, facilities, student support, safety and the radio/communications specialists who know the licensing obligations.

Inventory layer	Minimum evidence to retain	Ownership / trigger
Endpoint	Model, serial/ID, building and room, purpose, battery, actual band and supervision status	Program owner; deployment/replacement
Radio / RF infrastructure	Site map, antenna positions, repeater and receiver locations, RF survey, channel/talkgroup plan	Radio lead; any renovation or RF complaint
Wired / hosted infrastructure	Power, PoE/network switch, VLAN, backhaul, IP gateway, monitoring, cloud and backup	IT/facilities; any network or system change
Authorization	FCC call sign (if applicable), licensee, expiration, assigned frequencies/sites/power/emission	License custodian; renewal or reprogramming
Operational path	Dispatch/monitoring destination, acknowledgement, user procedure, fallback and responder liaison	Safety/operations; personnel or response-plan changes
Test baseline	Survey date, conditions, measured margin or readable voice, exception log, retest acceptance	System owner + qualified technician

Start with a representative campus; build a credible baseline before expanding district-wide. Automated supervision can identify certain faults, but it does not replace a human-directed coverage walk or prove end-to-end response. For each record, store who will be notified when something stops checking in, who approves an operational workaround, and how long the issue has remained open.

A simple lifecycle trigger

When a bond project, ceiling replacement, changed floor plan, new access-control system, new antenna, network switch migration, cellular provider change, public safety radio-system migration, or new occupancy pattern is planned, include the wireless-system owner in the preconstruction review and the postconstruction acceptance test. No new equipment should be accepted as complete until the communications systems it may affect have been considered.

10A / FIELD ASSURANCE + CHANGE CONTROL

When a device stops reporting: diagnose before replacing

Suppose the office receives repeated missed check-in notices from several wireless door contacts. One can replace batteries, but that will not help if a repeater has lost power or the receiver was moved behind a metal enclosure. Conversely, moving a receiver will not repair a downstream network outage. The practical task is to narrow the problem systematically rather than make an expensive guess.

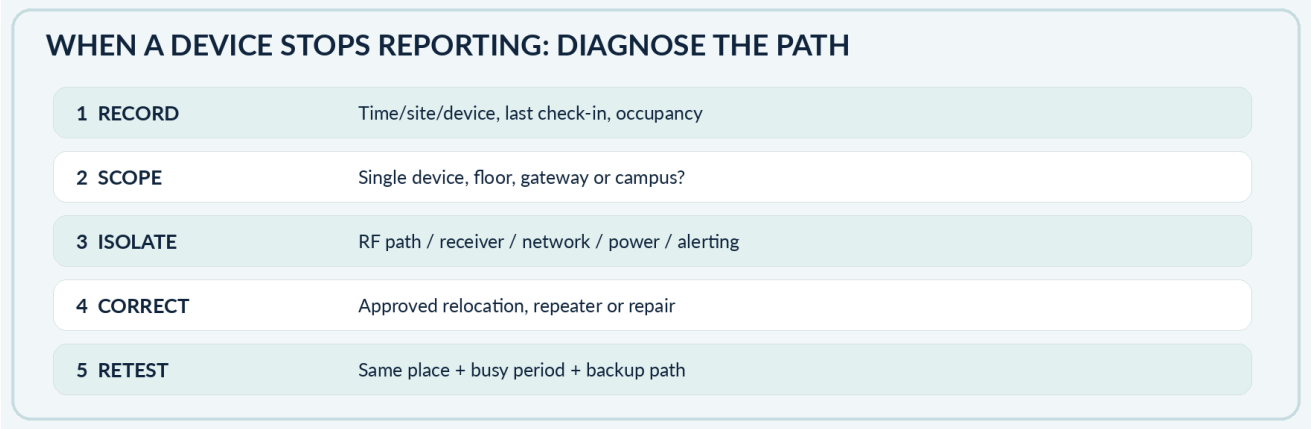

Figure 11. An ordinary troubleshooting sequence for school-owned wireless systems. Only authorized personnel should change radio programming, alarm routing or life-safety equipment.

What staff observe	Plausible classes of cause	A sensible first check
One sensor / pendant fails	Battery, local obstacle, device damage, enrollment/configuration	Known-good device at same location; supervised status log
Many endpoints in one wing fail	Repeater, receiver path, new partitions/metal, power	Site map; repeater power and supervisory trouble records
Several sites fail together	Shared gateway, WAN, server, cloud, notification routing	Network and monitoring service health; backups
Voice radios weak during busy periods	Coverage margin, body blocking, multipath, congestion, changed transmit location	Repeatable tests at busy/quiet times with qualified RF staff
Unknown users heard on channel	Shared license, nearby business, unauthorized station, programming error	Record time, location, channel, call sign if heard; confirm license and coordinate

Use the system's own event logs, signal margin/received-signal readings where supported, spectrum analysis when needed, and manufacturer survey tools rather than making a diagnosis solely from symptom descriptions. Document the correction and retest the original failure location in comparable conditions. If the issue involved a duress or intrusion pathway, test the reporting and acknowledgement chain, not merely the battery or RF hop. [31–33]

10B / LICENSING + CHANNEL STEWARDSHIP

Radio licensing: The “Hello Kitty” conversation

Many school employees have seen inexpensive walkie-talkies purchased online or from a local store. I sometimes call them “Hello Kitty radios” to make a point: buying something that transmits does not automatically create an authorized district radio system. On the other hand, a genuine FCC-compliant Family Radio Service (FRS) radio may legally be used for qualifying business or group communication without an individual station license. The answer depends on the service and device, not its price or appearance. [25–27]

Common radio service	Authorization basics	School limitation / planning consequence
FRS / compliant handheld	Generally licensed by rule under FCC Part 95; no individual station license	Shared low-power channels; limited coverage and no guarantee of priority or exclusivity.
GMRS	Ordinary new licenses are issued to individuals; family use defined in Part 95; limited grandfathered organizational licenses	Not a substitute for obtaining a new district-wide business radio authorization. Confirm specific lawful use.
MURS	Licensed by rule for compliant Part 95 radios; shared VHF channels and power limits	Possible small-area business use; no general protection from other users; repeaters restricted.
District Part 90 PLMR	FCC license and usually frequency coordination for school/educational operations; license conditions govern	Suitable for engineered dispatch operations; retain call sign, sites, emission, output power and renewal dates.
Public-safety trunked network	System and frequencies operated under authorizations, eligibility and sharing agreements	School access must be coordinated/authorized, programmed and governed with host agency.
Part 15 device	Generally operates under equipment and interference rules without a station license	A duress sensor, Wi-Fi AP or wireless lock is not automatically protected from lawful interference.

A district should check the FCC Universal Licensing System (ULS) for its actual license records; retain a copy with dispatch and IT documentation; designate a renewal owner; and review whether the frequencies, equipment emission characteristics, transmitter sites and operational area match what the district is doing. Changes in power, sites, frequencies or other licensed parameters may require modification and coordinator input. An integrator can assist, but the licensee remains responsible. [03, 05, 27–30]

Do not tell districts that every portable radio requires an individual FCC license, and do not tell them that any store-bought two-way radio is appropriate for campus operations. Explain the actual FCC service, operating restrictions, and school’s operational requirements. [25, 26]

10B / LICENSING + CHANNEL STEWARDSHIP

School-to-school coordination, outside users and alternate channels

A district may operate multiple schools, transportation yards and maintenance sites across one region. If separate sites reuse the same channel and transmit over overlapping areas, users may block one another or hear co-channel traffic. Nearby contractors or businesses may also legally share some Part 90 channels; the FCC generally does not grant exclusive use of ordinary land-mobile frequencies. A collision, therefore, does not by itself prove another user broke the rules. Licensees are expected to cooperate to reduce interference. [27, 28]

I remember business and construction users suddenly appearing on what seemed to be our operational channel. Having additional, coordinated channel groups already authorized and programmed provided a practical way to continue operations while the issue was investigated. I also reported situations I believed involved unauthorized operation to the FCC. The principle is sound: a district needs a lawful channel plan and a documented interference-response procedure, not a technician improvising frequencies in the middle of an incident.

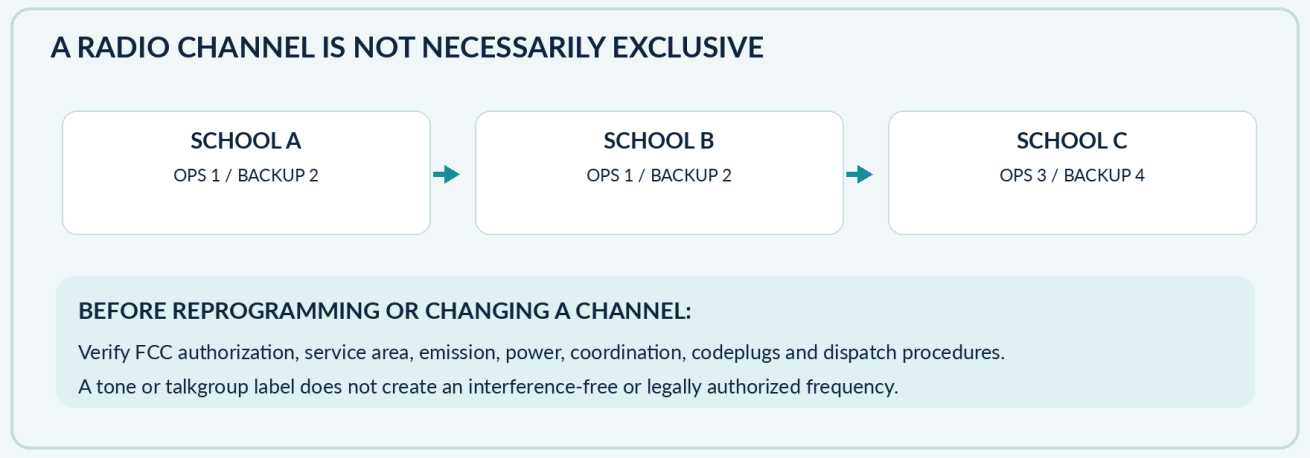

Figure 12. Conceptual channel plan: labels are examples, not frequencies or authorization to transmit. Changes must conform to the relevant FCC license, service rules and approved programming.

What should a school district coordinate?

Have a qualified radio specialist review coverage and channel reuse across campuses; antenna/repeater geometry; power and occupied bandwidth; frequency coordination and neighboring assignments; licensed backup channels; and the codeplug or programming template issued to every radio. Confirm all equipment has current, consistent channel labels and that users know which group to select for ordinary operations, special events, interference and emergency coordination. Some trunked talkgroups are logical user groups on shared RF infrastructure; switching talkgroups does not by itself resolve an underlying RF site or interference problem.

If new traffic appears, record the time, location, channel/frequency, signal behavior, any identifier heard and operational effects; verify the district's own equipment and license; contact the coordinator or communications service provider; and escalate suspected harmful or unauthorized interference through appropriate FCC channels if warranted. Never jam another transmitter or transmit on a frequency merely because it is in the radio. [27–29, 34]

10C / VENDOR-NEUTRAL INTEROPERABILITY

Many paths to one goal: let responders and schools communicate

Picture an ordinary afternoon: a student becomes ill during a community event. A staff member uses the school operations radio to summon the nurse while another adult calls 9-1-1. Arriving medical responders need a clear entrance route and accurate information. Their radios may use a regional trunked network while the district uses a separate conventional system. There is no reason to assume those radios talk directly — but there are several ways to create an approved information path.

Some communities authorize school users on a shared regional trunked radio system. Others use a planned interoperability gateway, a dispatcher-controlled radio bridge, properly coordinated common channels, an authorized cache of responder-compatible radios, or a combination of radio, telephone and dispatch procedures. All can be legitimate approaches. No single product, architecture or frequency is right for every district. [07, 34, 37]

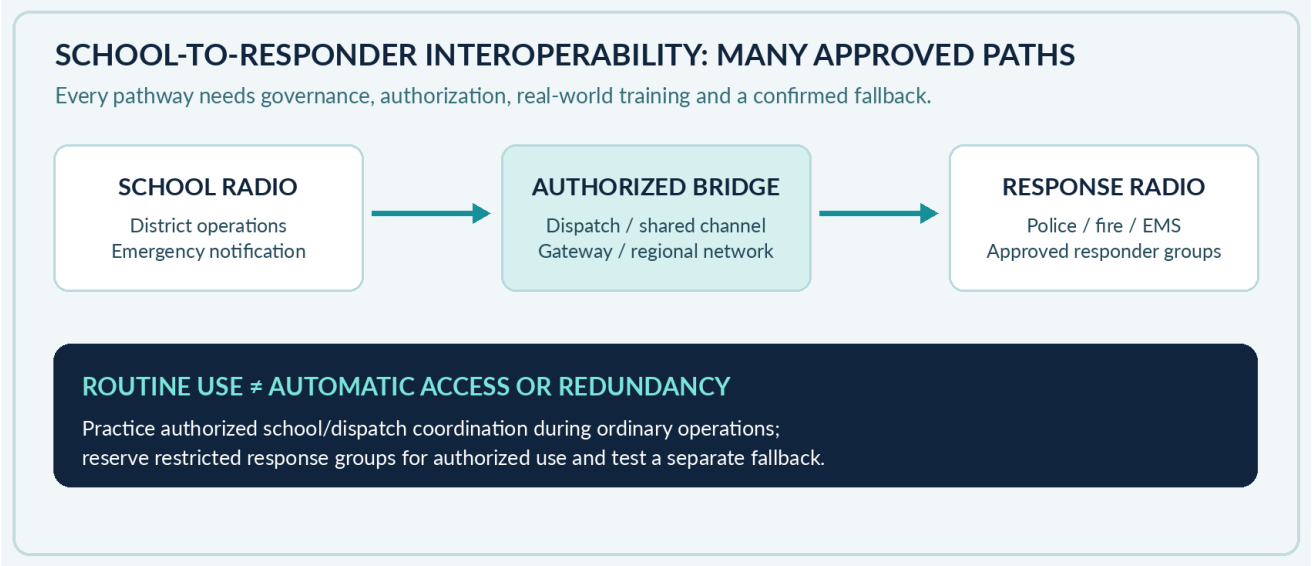

Figure 14. A conceptual emergency communications bridge; exact links and access permissions are determined by the radio-system owner, dispatcher and public-safety partners.

Learning from a working example, without endorsing a vendor

SchoolSAFE is one documented example of a dispatcher-managed school–public safety radio bridge. Its published description explains how, after a 9-1-1 call, authorized dispatch personnel can connect trained school radio users with designated responders through agreed procedures. In its January 2023 board report, Colorado School District 27J described monthly districtwide radio-bridging tests and interoperable radios at its schools and departments. That district-reported operating practice is a valuable example of verification and partnership — not an organizational endorsement of SchoolSAFE or any particular vendor. Different architectures can achieve similar goals. [38, 39]

WHAT MATTERS MORE THAN A BRAND

Before procuring or bridging anything, the district and responders must agree on lawful permissions, who controls activation, which radio groups connect, which groups remain restricted, who monitors the patch, how it is disconnected, privacy, training and the fallback if the bridge fails.

10C / VENDOR-NEUTRAL INTEROPERABILITY

How communities make interoperability practical

The state of Massachusetts offers a helpful recent example of public-sector guidance. Its January 2026 school/public safety interoperability bulletin explicitly states that there is no one-size-fits-all solution, encourages school–public safety consultation before purchases, and calls for training and ongoing maintenance. It also discusses why different digital radio formats and encryption settings may complicate interoperability. The transferable lesson is a planning process — not a mandate to copy any particular state's radio channels. [37]

Possible pathway	How it can help	What schools must verify
Shared regional / county trunked network	Authorized school subscribers use routine operational talkgroups; dispatch can coordinate approved responder talkgroups.	Host permission; eligibility; programming; channel/talkgroup governance; coverage; costs; system capacity.
Dispatcher-controlled bridge / gateway	Connects different radio networks for a defined event under approved dispatch procedures.	Activation authority; compatible interfaces; patch supervision; logging; separation of restricted traffic; fail-safe disconnection.
Authorized common channel / direct radio	Participating agencies preprogram an approved interoperable channel where legal and practical.	Frequency authorization; actual coverage; mutual-aid rules; channel naming; encryption/format compatibility.
Managed cache / exchange radios	Trained school liaison can use an authorized responder-compatible radio when assigned.	Custody; battery health; programming; access policy; user training; accountability.
Dispatch / telephone / cellular fallback	A person or service relays time-sensitive information if radio paths do not directly connect.	Named contacts; congestion/power dependence; dispatch procedures; fallback testing; accessibility.

Practice where schools really live

Routine use is the difference between a capability people recognize and a menu nobody remembers. School employees can use their authorized daily groups for transportation, facilities, supervision and event operations. They can practice the approved handoff to dispatch during planned drills, school events and appropriate nonemergency coordination. Emergency bridges and restricted law enforcement/fire talkgroups should activate only under the agreement and direction of the system owner and response partners. [07, 37]

Routine familiarity is not technical redundancy. If the shared regional network fails, an entirely separate fallback may be needed. Treat routine practice, interoperability and redundancy as three complementary goals; test each for its intended purpose. School leaders should involve the county/regional communications manager, public safety answering point, local fire/police/EMS representatives, the Statewide Interoperability Coordinator (SWIC) and qualified COMU/COML professionals where available.

A USEFUL PARTNERSHIP QUESTION

Could our district and responders demonstrate one ordinary coordination exchange, one controlled emergency bridge and one independent fallback — with the right personnel and radios, in the locations where each would actually be used?

Field references: CISA SAFECOM [07], the January 2026 Massachusetts bulletin [37], a vendor-disclosed solution example [38], and an official district board report [39].

10D / RESPONDER PARTNERSHIPS + ROUTINE PRACTICE

The radio partnership we practice before a crisis

A shared regional or county trunked radio network can offer schools a path toward stronger daily operations and planned coordination with responders. But joining a trunked system is not just buying compatible handhelds. The district and system owner need a lawful operational and funding agreement, agreed user eligibility, subscriber programming, governance, talkgroup access, dispatch procedures, training, infrastructure coverage and maintenance arrangements. Public safety communications should be protected from accidental congestion or inappropriate disclosure. [07, 29, 34]



Figure 13. Regional coordination model. A school may use authorized routine talkgroups and planned interagency pathways; direct access to restricted police/fire groups is not presumed.

The real opportunity is to build relationships that operate every day. Transportation can coordinate with public works on travel conditions through approved dispatch pathways. School security can work with its SRO agency on planned event traffic. Emergency managers can involve school facility, transportation and safety staff in regional communications exercises. A district may be an authorized subscriber on a regional system, or coordination may instead use a dispatcher, telephone or gateway. Each option requires an agreed procedure.

CISA's SAFECOM framework is helpful: governance, procedures, technology, training and exercises, and routine use all matter. Using authorized pathways routinely builds familiarity and confidence. That is NOT the same thing as redundancy: redundancy means a separately usable fallback if a repeater, trunked site, network, or communications center is lost. The district should design and test both. [07, 34]

Partner / participant	Useful shared work before an incident	Agreement or proof to retain
District leadership + transportation	Normal bus-route communication, weather and road reports, planned events	District channel plan, dispatch contact tree, school authorization
Sheriff / police / SRO	Ordinary school liaison, scheduled exercises, response channel decision tree	Governance MOU, permissions, privacy, radio templates
Fire / EMS / communications center	Coverage acceptance, event plans, coordinated messaging	ERCES/coverage records, dispatch and handoff SOP
Emergency management / SWIC / radio system owner	Regional interoperability, statewide planning, NIFOG/SCIP alignment	System-use agreement, talkgroup matrix, frequency authority
IT / facilities / vendor	Repeater and site support, batteries, monitoring, life-cycle planning	Service contract, configuration backups, outage response

10D / RESPONDER PARTNERSHIPS + ROUTINE PRACTICE

What to evaluate, when to test, and what to keep

The district does not need to buy specialized spectrum analyzers for every principal. It needs a repeatable process that connects everyday users with qualified technicians when measurements are needed. Supervised devices can be checked electronically; radio coverage and school-to-school interoperability require actual transmission and acknowledgement in the relevant environment. A completed form alone is not proof of operability.

Suggested review rhythm	Example field activity	Evidence / action
Daily / automated as designed	Review alerts, missing device check-ins and gateway/repeater faults	Exception queue with owner, last seen and escalation
Weekly / operational	Ask transportation, custodial and safety staff about dead spots or channel confusion	Short issue log with site and radio ID
Monthly / sampled	Approved functional check of selected sensors, duress and voice pathways	Timestamp, location, acknowledgement, corrective ticket
Quarterly / varying occupancy	Coverage walks in busy hallways, school-to-school radio checks and after-hours areas	Map of weak spots, time/occupancy notes and retest plan
Annually / qualified review	License and code review; complete system and responder coordination as applicable	License status, survey, maintenance, approved SOP
Immediately after change or complaint	Repeat impact assessment after renovations, repeaters, network changes, interference	Comparison to original baseline and acceptance results

The intervals above are educational examples, not a replacement for manufacturer instructions, adopted building code, applicable FCC rules, collective agreements or local policies. Code-required ERCES inspections and critical system tests must follow the appropriate authority and technical standard. Involve dispatch and monitoring professionals before any exercise that could initiate a real alarm.

Three basic outputs every district should maintain: (1) a living wireless and license register, (2) a site-and-time coverage map with known limitations, and (3) an issue-to-resolution log with corrective action and retest evidence. Those records help administrators budget, plan renovations, communicate with responders, and explain why a system is dependable—not merely that it was purchased.

Technical references: [07], [25–35]; examples and operational cadence are suggested practitioner practices, not mandates.

11 / PRACTICAL WORKSHEETS

Field tools for school divisions and facilities teams

Worksheet A — wireless systems register

Start with one school or a representative campus. Expand only after the information is usable. Complete a row for every distinct essential device or infrastructure family; add additional sheets as needed.

System / purpose	Model + band/license	Infrastructure + owner	Coverage / supervision / backup
Two-way radios / buses	_____	_____	_____
Wireless duress	_____	_____	_____
ERCES / responder network	_____	_____	_____
Wi-Fi / accessibility	_____	_____	_____
Access / intrusion	_____	_____	_____
Other / _____	_____	_____	_____

Worksheet B — life-safety communication chain

Checkpoint	What to write down
Observed condition / initiating device	Who or what notices a condition? Where?
Actual radio frequency / network path	Which frequency, channel or cellular/Wi-Fi service is involved?
Receiver / gateway / monitor	What must be powered and connected? What health alarms exist?
Intended human recipient	Who receives and acknowledges the message, including backups?
Decision / protective action	Who decides and acts? What if conditions change before an alert arrives?
Verification / after-action record	How is response confirmed, faults documented and retested?

Worksheet C — a short field verification script

For a selected system, write the name and responsible owner. Conduct authorized tests only with the appropriate notice, public safety coordination and established safety protocols. Do not conduct unannounced panic-button or responder radio tests.

Test date, site, device identification, tester and approval contact: _____

Test location and operating conditions (inside/outside, floor, weather, time): _____

What was transmitted and on which documented channel or service? _____

Was useful information received and acknowledged? By whom and when? _____

Were location, meaning and authorized next actions understood? _____

Was the backup path verified? What was lost when a component was intentionally isolated? _____

Any failure/limitation, owner, corrective action, retest date: _____

Worksheet D — six questions for a purchase or renovation

- What frequency bands does each device use, and where is proof in the manufacturer documentation?
- What fixed infrastructure, licensing, software, networks and power are required to make the solution work?
- How does the system report degraded conditions — batteries, receivers, backhaul or unacknowledged alarms?
- Who is responsible for code review and FCC authorization, including any public safety license-holder consent?
- What happens when technology changes, a supplier exits, or a carrier network becomes unavailable?
- What acceptance tests, annual/periodic maintenance and training will the school receive in writing?

DELIVERABLE, NOT A RITUAL

The finished inventory should help a district answer: what do we own, what do we rely upon, how will we know something changed, and who will act? If it only becomes another spreadsheet without clear owners, it has not achieved its purpose.

11 / PRACTICAL WORKSHEETS — CONTINUED

Worksheet E — coverage walk at different times

Record exact equipment and known purpose. For emergency communications, notify dispatch/monitoring partners, use approved test procedures and document who confirmed the message. Do not use live emergency activation for an uncoordinated demonstration.

Site / location	Time + occupancy	Device / group	Result / confirmed by	Correction + retest
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Prompts: Were doors closed or open? Was it a transition period or public event? Where were people standing? Did users speak and receive in both directions? Was the received message intelligible and acknowledged? Was the correct response or ticket generated?

Worksheet F — radio license and channel register

Licensee / call sign	Radio service / channel	Area/site + authorized settings	Expires / responsible owner
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Include approved alternate groups and codeplug version; review with the frequency coordinator before changing licensed channel assignments or technical parameters. Record regional system agreements and authorized talkgroup access separately from conventional FCC frequencies.

11 / PRACTICAL WORKSHEETS — CONTINUED

Worksheet G — wireless trouble and corrective-action record

Date / device / site	Reported condition + occupancy	Probable path / measured evidence	Action + owner + retest
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Worksheet H — regional communications partnership checklist

- ☐ Host agency/system owner and district executive contacts identified; school eligibility and written authority confirmed.
- ☐ Licensed network access, subscriber template/codeplug, talkgroups and restricted channels reviewed by communications manager.
- ☐ Ordinary school coordination routes and dispatch handoffs exercised with actual users; staff know the correct group.
- ☐ School-to-school and responder coverage reviewed at bus loops, gyms, stairwells, basements and exterior areas.
- ☐ Backup path documented separately: direct radio, alternate site, telephone, cellular, dispatcher or approved fallback.
- ☐ Reprogramming, renewals, replacement, training, maintenance, records and funding assigned to named people.
- ☐ After-action findings and recurring issues drive remediation; partners return to retest.

A dependable partnership is a shared routine, not a radio left in a drawer for the day nobody wants to imagine.

12 / CLOSING PERSPECTIVE

A school that understands its own river

On New Year's Eve 1999, checking thousands of devices was the responsible thing to do with the information available to us. The goal today is not to mock that effort or romanticize older technologies. It is to recognize that the world has become more connected, and that responsible governance must become more deliberate as a result.

A district radio, a supervised duress pendant, a school Wi-Fi network, a bus GPS receiver and an ERCES all use or depend upon electromagnetic communications, but they are not one system. Spectrum changes may help society. Building changes may affect coverage. A radio may be well engineered but poorly supported. An alert may arrive without producing an intervention. These are reasons to understand the relationships, not reasons to fear new technology.

> ***"Understand the frequency. Know the technology. Recognize the dependencies. Verify the communications. Prepare for change."***

The work is achievable: identify the actual devices; ask for the infrastructure map; check radio licenses and locally adopted codes; practice the human handoffs; watch credible regulatory developments; and treat improvements as opportunities to make the systems serving students and communities more dependable.

The most effective communications program is not necessarily the most sophisticated one. It is the one that reliably helps people recognize conditions, communicate usable information and take appropriate action — when and where it matters.

PUBLICATION AND REVIEW NOTE | Independent practitioner education resource; it does not replace adopted codes, authorized radio engineering, FCC licenses, or organizational endorsement.

VIRGINIA EDITION / AUTHORITATIVE SOURCES

State-specific source library and update notes

Prepared November 13, 2026. This Virginia addendum is a contextual interpretation for practitioners. The official materials below control over any summary in this guide. Confirm adopted code edition, amendments, project permits, DCJS deadlines, and local conditions at the time of use.

The resource labels [VA-01] to [VA-07] refer to the directly linked official sources below. They are different from the national references numbered [01]–[39] later in the guide.

[VA-01] Virginia DHCD — Codes and adoption dates ↗
2021 Virginia codes effective January 18, 2024; access current code collections.

[VA-02] Virginia DHCD — Uniform Statewide Building Code ↗
Explain VCC, VEBC and enforcement pathways.

[VA-03] Virginia Administrative Code — 13VAC5-63-240, Section 918 ↗
In-building emergency communications, exceptions, ownership, testing and inspection.

[VA-04] Code of Virginia — § 22.1-279.8 ↗
School safety audits, emergency telecommunications, law enforcement and emergency-planning coordination.

[VA-05] Virginia DCJS — School Safety Inspection Checklist ↗
Current checklist, app, and certification instructions as published by DCJS.

[VA-06] Virginia DCJS — School Safety Audit Program ↗
Broader audit framework; compare with updated checklist page for deadlines.

[VA-07] Code of Virginia — § 2.2-3705.2 ↗
Disclosure limitations relevant to school safety and public-safety communications information.

SOURCE / EDITION CONTROL

The 2024 code-development cycle and other amendments may change implementation after this publication. Official adopted law and the building and fire authorities having jurisdiction always take precedence. The FCC spectrum discussion in this guide is dated November 13, 2026 and must be rechecked before operational decisions.

RESOURCES / QR AND AUTHORITATIVE LINKS

Scan, verify and keep learning

QR codes lead to the public resource or regulatory record indicated. Text URLs remain clickable in the editable document and PDF. Official dockets and the adopted local code edition should be revisited before operational decisions. Source numbers in the chapters point to the expanded references that follow.

[01] NTIA
U.S. Frequency Allocations Chart
Official visual overview of the U.S. radio spectrum.

[02] NTIA
Online Table of Frequency Allocations
Frequency service and allocation lookup; updated 2026.

[03] FCC
Universal Licensing System
Search school/district radio licenses and service records.

[07] CISA
SAFECOM Interoperability Continuum
Five dimensions of operational interoperability.

[08] PASS
Duress Systems Recommendations
School-focused, vendor-neutral duress selection guidance.

[09] NFPA
When ERCES Are Needed
Accessible explanation of in-building radio coverage.

[16] FCC
902–928 MHz NextNav Petition Notice
WT Docket 24-240; proposed reconfiguration, not adopted rules.

[17] FCC
896–901 / 935–940 MHz Order (2026)
Adopted 2026 flexible broadband options in a separate band.

[22] FCC
ECFS Docket WT 24-240
Follow filings, notices and procedural developments.

REFERENCES / SELECTED VERIFIED SOURCES

Source library — spectrum, devices and codes

References are included for follow-up and education, not as organizational endorsement. The additional [VA-01]–[VA-07] sources appear before this national resource library. The FCC and other authorities may revise information after the cover date; check the official links before use.

[01] NTIA • U.S. Frequency Allocations Chart — Official visual overview of the U.S. radio spectrum. Open source ↗

[02] NTIA • Online Table of Frequency Allocations — Frequency service and allocation lookup; updated 2026. Open source ↗

[03] FCC • Universal Licensing System — Search school/district radio licenses and service records. Open source ↗

[04] FCC • 47 CFR Part 15 — Rules for many unlicensed devices, including interference conditions. Open source ↗

[05] FCC • 47 CFR Part 90 — Land-mobile radio rules; licenses and operations. Open source ↗

[06] FCC • Signal Boosters, §90.219 — Consent, deployment and Class B registration obligations. Open source ↗

[07] CISA • SAFECOM Interoperability Continuum — Five dimensions of operational interoperability. Open source ↗

[08] PASS • Duress Systems Recommendations — School-focused, vendor-neutral duress selection guidance. Open source ↗

[09] NFPA • When ERCES Are Needed — Accessible explanation of in-building radio coverage. Open source ↗

[10] UL Solutions • ERCES / UL 2524 — System elements and product listing background. Open source ↗

[11] ICC • 2024 IFC / Emergency Responder Coverage — Model code family; verify adopted text locally. Open source ↗

[12] FCC • 2013 Narrowbanding Public Notice — Historical transition affecting VHF/UHF PLMR radio users. Open source ↗

Regulatory history and current watch

[13] FCC • 800 MHz Rebanding Conclusion (2021) — Historical multi-year relocation and interference resolution. Open source ↗

[14] FCC • 700 MHz Consolidated Service Rules (2013) — Public safety broadband / FirstNet spectrum rules. Open source ↗

[15] FCC • 700 MHz Narrowband Revision (2014) — Historical revision to 6.25 kHz transition deadlines. Open source ↗

[16] FCC • 902–928 MHz NextNav Petition Notice — WT Docket 24-240; proposed reconfiguration, not adopted rules. Open source ↗

[17] FCC • 896–901 / 935–940 MHz Order (2026) — Adopted 2026 flexible broadband options in a separate band. Open source ↗

[18] Federal Register • 4.9 GHz Committee (2026) — October 2026 notice of committee establishment. Open source ↗

[19] FCC • 6 GHz Geofenced Device Rules (2026) — 2026 rules facilitating new shared-band device operations. Open source ↗

[20] SEC • NextNav Form 10-Q, Nov. 12, 2026 — Company report of draft NPRM review; not an FCC decision. Open source ↗

[21] NOAA • Weather Radio — Weather broadcast frequencies and public information. Open source ↗

[22] FCC • ECFS Docket WT 24-240 — Follow filings, notices and procedural developments. Open source ↗

[23] Safer Buildings Coalition • Code Reference — Edition comparison (secondary reference; consult adopted codes). Open source ↗

[24] FCC • Part 2 Frequency Allocations — Formal allocation rules, equipment authorization context. Open source ↗

RESOURCES / LICENSING, FIELD TESTING + PARTNERSHIPS

Additional authoritative sources

The links below add practical technical references to the 24 sources already provided. QR codes open the linked resource; printed source titles remain available if a QR code cannot be read.

[25] FCC • FRS, GMRS and license-by-rule distinctions | Open official/technical source ↗

[26] 47 CFR • GMRS individual licensing and grandfathered entities, §95.1705 | Open official/technical source ↗

[27] 47 CFR • Part 90 shared channel obligations, §90.173 | Open official/technical source ↗

[28] 47 CFR • Part 90 frequency coordinator rules, §90.175 | Open official/technical source ↗

[29] 47 CFR • Part 90 shared radio facilities, §90.179 | Open official/technical source ↗

[30] FCC • ULS license renewals and email notifications | Open official/technical source ↗

[31] Inovonics • EchoStream system design and repeater planning | Open official/technical source ↗

[32] Inovonics • EchoStream device installation recommendations | Open official/technical source ↗

[33] Inovonics • EchoStream survey kit and app | Open official/technical source ↗

[34] CISA • National Interoperability Field Operations Guide, v2.02 | Open official/technical source ↗

[35] ITU-R • P.1238 indoor radio propagation guidance, human movement | Open official/technical source ↗

[36] FCC • Filing a complaint including radio interference | Open official/technical source ↗

RESOURCES / SCANNABLE LINKS

Scan to inspect licensing and RF references

These resources support the educational material, but neither the manufacturer sources nor nonfederal summaries replace current FCC authorizations, adopted local codes, or competent engineering review.

[25] FCC | FRS, GMRS and license-by-rule distinctions
Open resource

[27] 47 CFR | Part 90 shared channel obligations, §90.173
Open resource

[28] 47 CFR | Part 90 frequency coordinator rules, §90.175
Open resource

[30] FCC | ULS license renewals and email notifications
Open resource

[31] Inovonics | EchoStream system design and repeater planning
Open resource

[33] Inovonics | EchoStream survey kit and app
Open resource

[34] CISA | National Interoperability Field Operations Guide, v2.02
Open resource

[36] FCC | Filing a complaint including radio interference
Open resource

RESOURCES / SCHOOL + PUBLIC SAFETY PARTNERSHIPS

Real-world interoperability learning library

These resources illustrate multiple paths and public-sector expectations. Vendor descriptions are labeled; district-reported practices are sourced independently. None should be interpreted as an organizational endorsement or a substitute for local authority, licensing or engineered verification.

[37] Massachusetts / Office of the SWIC: Statewide interoperability resources; see School/Public Safety Technical Bulletin #26-1 (January 2026) | Open source ↗

[38] SchoolSAFE / vendor example: How SchoolSAFE describes dispatcher-managed bridging between school and responder radio networks | Open source ↗

[39] 27J Schools / official district report: Board report (January 2023) documenting monthly districtwide radio-bridging tests, p. 17 | Open source ↗

Resource QR codes — scan or use the links above

[37] Massachusetts / Office of the SWIC

Open resource

[38] SchoolSAFE / vendor example

Open resource

[39] 27J Schools / official district report

Open resource

The January 2026 Massachusetts guidance is a useful practitioner example, but it does not establish regulatory requirements for other states. Written local agreements and applicable FCC authorizations control actual radio operations.