

NEW
IMPROVED
FORMAT



- Technology Condition Survey Report
- Telecommunications Room Master Plan
- Comprehensive Technology Plan Roadmap

December 1, 2022

*Prepared for Anytown Central School District,
Anytown, NY*

Presented by Archi-Technology LLC



Connecting people, technology and buildings.

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The Preface (pp. 1 - 4) is educational content for non-technical audience members about the multitude of ways in which technology systems are used in today's K12 school buildings. Technical audience members may skip this section.

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RCDD Approval

As described in *Codes and Standards* (pg. 8), Archi-Technology follows all standards published by BICSI, the telecom industry trade association that certifies Registered Communication Distribution Designers (RCDDs).

Archi-Technology has two full-time staff RCDDs, one of which has reviewed this report for BICSI standards compliance and certifies that the content contained herein is accurate and compliant.

R.C. Deedee

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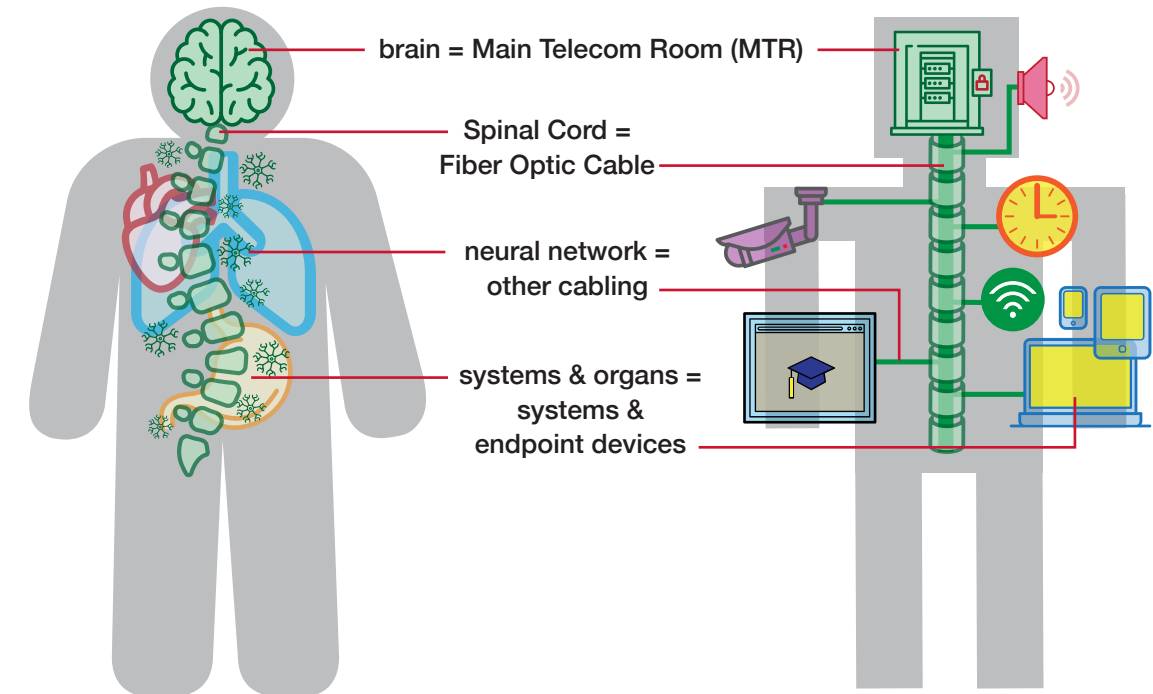


Preface: An Overview of K12 Technology Systems

Technology Infrastructure is a building's nervous system

If a building was a person, its technology infrastructure would be the nervous system. In the human body, the brain sits atop a complex neural network that passes data to and from the body's various systems such as respiratory, circulatory, digestive, etc.

In a building, the Main Telecom Room (MTR) sits atop a complex network of fiber and cables that pass data to and from the structure's various systems such as Communications, Instructional, Security, and Life Safety.



K12 Technology System Examples (Parent System)

-  Main Telecomm Room (MTR) (Infrastructure)
-  PA Speaker (Communications)
-  Master Clock (Communications)
-  Wireless Access (Connectivity)
-  Video Surveillance (Security)
-  Interactive Displays (Instructional)
-  Desktops, laptops, and tablets (Computing Devices)

Today's buildings run on data

In addition to inter-system connectivity, the body's neural network allows a seemingly endless stream of data to pass through the brain. The brain automatically filters extraneous data—"noise"—to allow the person to concentrate on complex task such as walking and chewing gum at the same time.

In much the same way, most all of a building's systems and devices pass data to and from the MTR via a district's Internet Protocol (IP)-based backbone. The MTR processes the data using hardware and software to make informed decisions that improve daily operations and extend the usable lives of building systems.

Like the human nervous system, a building's technology infrastructure (Telecom Rooms, cables, and networks) passes precisely controlled low-voltage electrical signals via the MTR (brain) to and from systems such as:

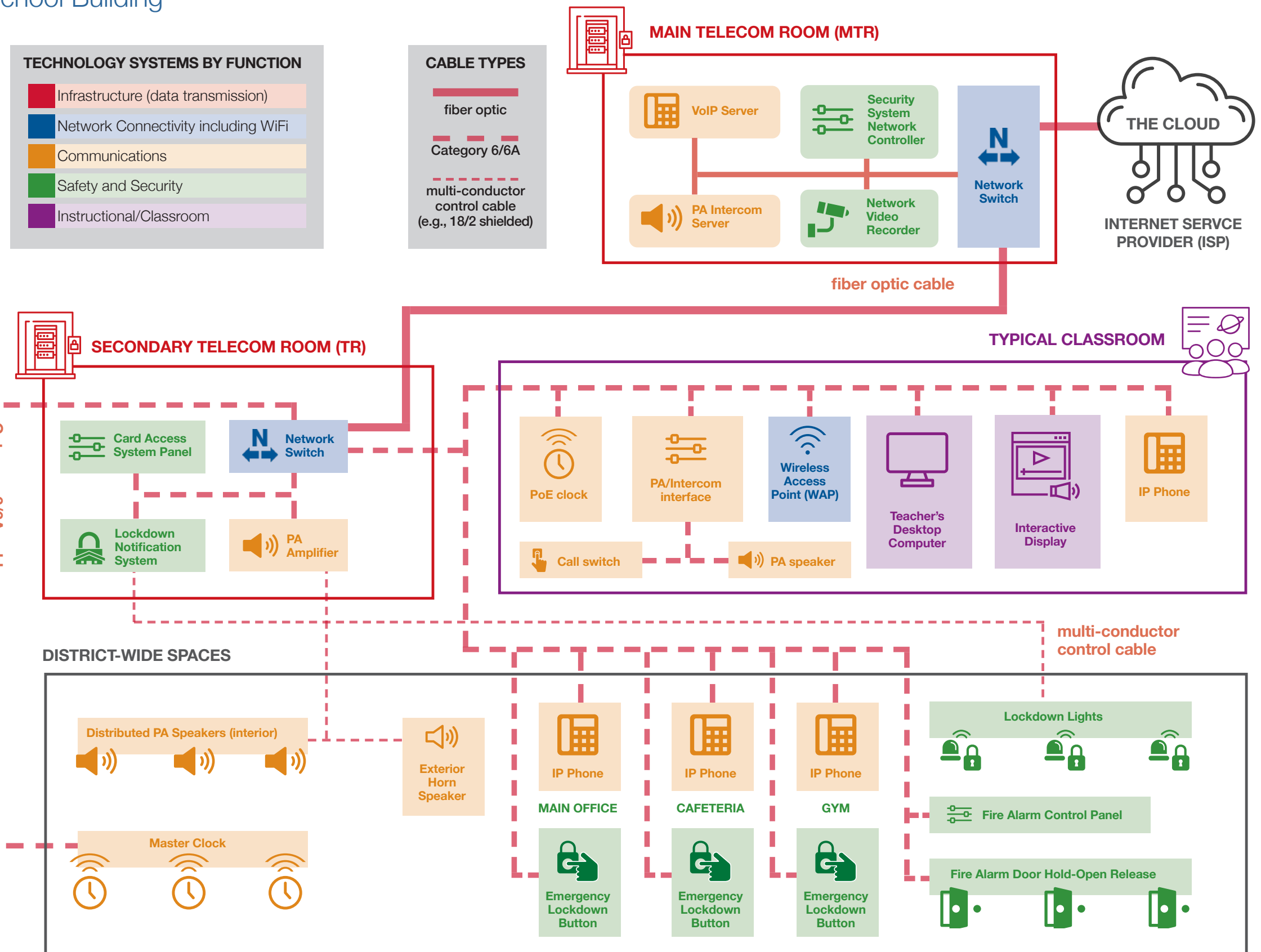
- Communications (public address, master clock)
- Instructional (interactive displays and classroom audio), and;
- Security (video surveillance, access control, emergency lockdown).

This allows the MTR of a building to monitor and control all its systems, and act according to real-time data.

The diagram on the next page shows the complexity and interconnectedness of major technology systems, subsystems, and end-point devices in a school building.

Preface: The Internet of Things (IoT) in a School Building

- Like your home and office, today's school buildings use data to meet many functions including classroom instruction, communications, security, and others as shown at right.
- This simplified diagram shows the complex technology systems that run across a school building's IP backbone. (A real school building would have a much higher density of systems and devices.)
- Different cable types (far right) are used to connect servers, switches, components, and end devices based on system needs.
- For every visible end-point device (e.g., PA speaker), there are lots of cables and controllers behind the scenes that are interconnected to other systems.



Preface: Telecom Rooms (TRs)

13 factors that influence Telecom Room performance

You may know them as MDFs, IDFs, or by some other acronym.

Whatever you call them, the spaces dedicated to housing IT equipment are among the most important in your district to maintain digital connectivity among and between IP-based systems including security, life safety, instructional, and wireless access.

If your district's Telecommunications Rooms (TRs) are in disarray, there's a good chance that critical infrastructure behind the ceilings and walls—cables and pathways—is in equally poor shape.

These conditions can also cause operational issues (e.g., intermittent errors) with existing and newly installed technology systems.

What makes a poor TR bad...

[2] Overhead utility pipes leave racks susceptible to damage from leaks/bursts.

[11] Poor room construction with no deck access and poor cable penetrations.

[3] Location lacks direct hallway access and the Serving Zone distance is greater than 300'.

[8] Lack of grounding infrastructure increases risk of electrical shortage and equipment damage.

[4] Unsecured, shared space creates a life safety and security risk as well as causing possible accidental damage.

[7] Lack of Uninterruptible Power Supply (UPS) or emergency power source creates life safety risks during power outages, and reduces equipment lifespan due to a lack of conditioned power.

[2] Dirty, dusty environment increases risk of operating issues with rack components and reduces equipment lifespan.



[13] Hard ceiling inhibits inspection and serviceability, and limits airflow while trapping heat.

[9] Overhead cable management is lacking putting cables at risk of damage.

[6] No dedicated and redundant power. Both a dedicated circuit and a power outlet from a building generator are needed.

[10] No cable management or correct termination at the rack can cause operational issues and makes troubleshooting difficult.

[1] Room size and inadequate rack clearances inhibit serviceability.

[5] No environmental controls increases risk of equipment overheating.

[12] Floor tile is not anti-static increasing risk of Electro-Static Discharge.

13-Point Checklist for IT Equipment Spaces

1. Size with 3' clear space front and back
2. No risks of water damage.
3. Environment/location/hallway access
4. Secure/dedicated space or locked cabinet
5. Environmental controls
6. Dedicated, redundant power
7. Uninterruptible Power Source (UPS)/ Emergency Management (EM) power
8. Grounding infrastructure
9. Overhead cable management and fire-retardant plywood
10. Cable termination and management at the rack
11. Room construction with walls extended to deck, and compliant, sealed cable penetrations
12. Vinyl-Coated Tile (VCT) flooring
13. Ceiling open to deck with minimum height of 10'

...and a good TR great.

[1] Room size allows rack front and back clearances.

[2] Water risk. No nearby utility pipes, drains, or custodial slop sinks.

[3] Location provides direct hallway access and is centrally located in the Serving Zone.

[4] Security. Secure or dedicated space, or locked cabinet, with IP camera coverage and access control.

[5] Environmental control. AC and exhaust fan with independent controls in same room.

[8] Grounding infrastructure including a Telecommunications Grounding Busbar (TGB) is installed.

[7] UPS/EM Power. Uninterruptible Power Supply and/or Emergency Power source.



[13] Ceiling. Open to deck with 10' minimum height

[9] Overhead cable management and fire-resistant plywood wall are installed. Overhead ladder racks reduce strain on cabling and improve performance.

[10] Cable Termination and Management. Adequate racks/cabinets and cable management. Horizontal and vertical management systems are in the rack to reduce strain on cabling and improve performance.

[11] Room construction. Walls extend to deck. Cable penetrations are compliant and sealed (fire stopped).

[6] Power. Dedicated circuit with circuit ID labels from two different panels.

[12] VCT flooring. Anti-static tile.

Preface: Items of Note

Services vs. Systems

While most of the items surveyed in this report are physical components or devices, there are occasional references to the **services** that use technology systems such as telephone signal and internet service.

Cables, Pathways and Supports

Poke your head above just about any ceiling panel in a school building corridor and chances are you'll see some of the cabling infrastructure through which data is transmitted.

In addition to the type and condition of the cable itself, how the cables are supported within a space is an important component of the survey. Proper supporting structures includes:

- Cable tray for long runs such as down corridors.
- Ladder racking for overhead cable support.
- J hooks to support cable as it exits the tray and runs to its designated space.
- Conduit used to support cable as it passes through a wall. (See below for more on conduit, penetrations, and firestopping.)

Note that approval from the NYS Education Department's Facilities Planning commission is required just about any time an architectural wall is modified.

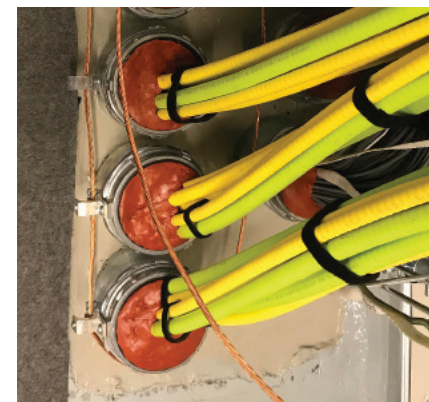
Cable management systems in a TR should accommodate both overhead (right) and vertical (far right) cables.



Conduits, Penetrations and Firestop

While conduit is used to properly support cables as they pass through walls, this report also references:

- **Penetrations** which are breaks in an architectural wall that have not been properly finished. Penetrations can range from a few inches square to several feet in area.
- **Firestop** is a sealant that is applied around the circumference of a conduit and around cables in the conduit. As its name implies, this special sealant keeps smoke and flames from spreading between rooms via conduits. Firestop should be installed correctly for every conduit in a building.



Conduit with proper fill ratio and properly installed firestop. Photo©BICSI. All rights acknowledged.

Best Practices vs. Cost Effectiveness

While all the recommended improvements in this report are based on strict adherence to industry standards, not all recommendations may be economically feasible at a particular time for the District.

Definitions

Term	Acronym	Description
Americans With Disabilities Act	ADA	1990 U.S. civil rights law prohibiting discrimination based on disabilities.
Architectural/Electrical/Mechanical/Plumbing	AMEP or AMEPT	The four traditional systems that are required for functional buildings. The ubiquity of building IP-based Technology system has led to the newer acronym AMEPT.
Building Distribution Frame	BDF	A legacy Bell Telephone term for the point where all cabling terminates.
Communications Equipment Room	CER	A room that supports communications systems cabling and equipment.
Division 27		The section of the MasterFormat CSI specifications that applies to telecomm equipment.
Entrance Facility	ER	The room where the service provider enters a building and the point of demarcation is established.
Electronic Industries Alliance/Telecommunications Industry Association	EIA/TIA	A Telecommunications Standards Organization
Full-Time Employee	FTE	Employment with 36 hours or more per week reporting directly to the District (vs. a contractor).
Gigabit Interface Converter	GBIC	Converts and extends various types of data signals for data centers, enterprises, and ISP.
Global Positioning System	GPS	
Intermediate Distribution Frame	IDF	A legacy Bell Telephone term for a room that supports communications cabling and equipment located between the MDF and end device.
Intermediate Telecommunications Room	ITR	The secondary IT spaces with their own Serving Zones fed from the Main TR.
Inter-building		Between two or more separate buildings.
Intra-building		Within a building.
Internet Service Provider	ISP	An organization that provides the District with access to the Internet.
Main Distribution Frame	MDF	A legacy Bell Telephone term for the main room that supports communications cabling and equipment.
Main Telecommunications Room	MTR	The primary IT space that feeds the Intermediate TRs as well as its own Serving Zone .
Multi-Mode	MM	A transmission performance category for fiber optic cabling.
National Electrical Code	NEC	Electrical wiring standard.
Network Interface Card	NIC	The interface between a network-connected device and communications cabling.
Network Time Protocol	NTP	Used to synchronize computer clock times in a network.
Network Video Recorder	NVR	A digital video recording device primarily used to capture video surveillance camera feeds.
Public Address System	PA	An electronic system for amplifying sound.
Personal Computer	PC	A computer intended for use by an individual which could be a desktop, laptop, tablet or smartphone.
Power Over Ethernet	PoE	A standard to provide data and power to network connected devices over a 4 twisted-pair Ethernet cable.
Plain Old Telephone Service	POTs	Analog voice-grade telephone service.
Prime Rate Interface	PRI	A digital telecommunications interface.
Redundant Array of Independent Disks	RAID	A data storage virtualization technology used for data redundancy.
Rough Order of Magnitude	ROM	A ballpark cost estimate based on data from site surveys and as provided by the District.
Session Initiated Protocol	SIP	A communications protocol for signaling and controlling multimedia communications sessions.
Security Management System	SMS	Network based system that integrates video surveillance, access control under a single user platform
Service Set Identifier	SSID	A sequence of characters that names a wireless local area network.
Serving Zone	SZ	The area of a building for which a CER supports the cabling and equipment.
Technology Conditions Survey	TCS	The onsite survey of a District's buildings' current conditions of technology infrastructure, network connectivity, Communications, Security, and Audio/Visual (including Instructional) systems, as well as computing devices. This report is the final TCS deliverable to the client.
Telecommunications Ground Bar	TGB	A component of the Telecommunications Bonding and Grounding system that connects the telecommunications bonding backbone conductor to the TMGB to improve the performance of network cabling and equipment.
Telecommunications Main Ground Bar	TMGB	A component of the Telecommunications Bonding and Grounding system that connects the telecommunications bonding conductor to the electrical entrance facility to improve the performance of network cabling and equipment.
Uninterruptible Power Supply	UPS	Equipment that maintains power to network equipment in the event of a power outage.
Vinyl Composition Tile	VCT	The anti-static version of these tiles are used in CERs to reduce the risk of static discharge and potential damage to network equipment.
Video Graphics Array Connector	VGA	An analog connector that transmits a video signal from a source to a display.
Virtual Local Area Network	VLAN	A method of partitioning network traffic on a common network.
Voice Over Internet Protocol	VoIP	Methods for delivering voice communications and multimedia over IP networks.
Wireless Access Point	WAP	A device that allows wireless devices to connect to a wired network. Note that each WAP is connected to a building's network via cables (i.e., hard wired).

Codes and Standards

Unlike the construction industry’s state-mandated codes, the telecommunications industry is primarily governed by trade association-developed standards. These standards are voluntary on the part of the building owner to develop facilities that move and consume data to improve operations and systems’ usable lives.

As noted below, Archi-Technology follows all standards published by BICSI, the telecom industry trade association that certifies Registered Communication Distribution Designers (RCDDs). Archi-Technology has two full-time staff RCDDs.

The following is a list of codes and standards that apply to the scope of this document.

1. ANSI/TIA/EIA-568-C, Commercial Building Telecommunications Wiring Standard
 - a. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, published 2009
 - b. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, published 2009
 - c. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, published 2009
 - d. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard , published 2008, errata issued in October, 2008
2. ANSI/TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces.
3. ANSI/TIA-606-A Administration Standard for Commercial Telecommunications Infrastructure
4. ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
5. ANSI/TIA-758-A, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
6. BICSI: Comply with the most current editions of the following BICSI manuals:
 - a. BICSI - Telecommunications Distribution Methods Manual
 - b. BICSI – Installation Transport Systems Information Manual
 - c. BICSI – Network Design Reference Design Manual
 - d. BICSI – Outside Plant Design Reference Manual
 - e. BICSI – Wireless Design Reference Manual
 - f. BICSI -Electronic Safety and Security Design Reference Manual
 - g. Infocomm/BICSI – AV Design Reference Manual
7. New York State Uniform Fire Prevention and Building Code
8. New York State Department of Labor Rules and Regulations
9. New York State Department of Health
10. Federal Occupational Safety and Health Administration (OSHA)
11. National Life Safety Code, NFPA 101
12. National Electrical Code, NFPA 70
13. Underwriters Laboratory (UL)
14. IEEE Standards
15. Federal Communications Commission
16. National Electrical Manufacturers’ Association (NEMA)
17. Americans with Disabilities Act (ADA)

1. Executive Summary

On October 17, 2022, Archi-Technology LLC completed a comprehensive Technology Conditions Survey (TCS) for Anytown Central School District (ACSD) in Anytown, NY.

The TCS is intended to provide the District with an objective evaluation of the current state of the technology systems and infrastructure that support the daily educational and business operations within the district.

The survey included a review of these district-wide technology systems as well as its overall technology plan:

Technology Infrastructure	1. Horizontal Cabling 2. Backbone Cabling	3. Communications Pathways 4. Spaces including Telecommunications Rooms (TRs)
Network Hardware	1. Wired Network 2. Wireless Network	3. Security and Monitoring 4. Telecommunications Services
Communications Systems	1. Public Address (PA) 2. Telephone	3. Local PA/Sound Reinforcement 4. Master Clock
Security Systems	1. Access Control 2. Intrusion Alarm System	3. Visitor Entry System 4. Video Surveillance
Instructional Technology	1. Integrated AV Systems 2. PCs/Laptops/Tablets	3. Copiers and Printers

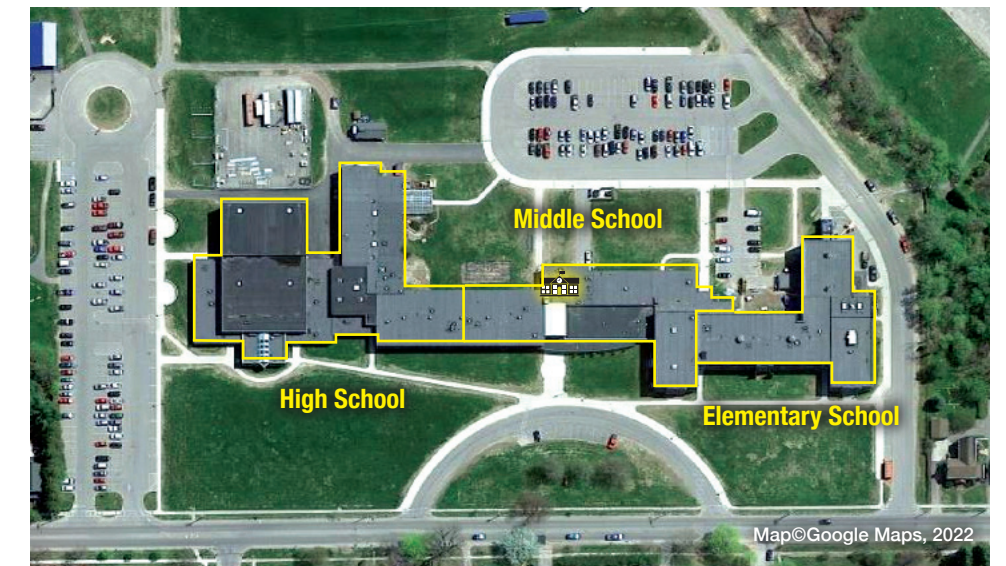
About the District

Anytown Central School District (ACSD) is located in the Town of Anytown in Empire County, NY.

There is (1) Central School Building that houses an elementary, middle, and high school with a total interior space of approximately 220,000 sq. ft.

Central School	1. Anytown Central School Building
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Anytown Central School Building surveyed for Technology Conditions



continued

1. Executive Summary (cont.): Technology Infrastructure

GRADING ►

Grades are based on the current conditions of the district’s Technology Infrastructure—cable, pathways, and spaces—observed during Archi-Technology’s on-site surveys as detailed in this Report.

- 4 = Excellent.** Meets/exceeds district’s current and expected needs.
- 3 = Good.** Meets district’s current needs but upgrades are needed.
- 2 = Fair.** Minimally meets current needs. Major upgrades are needed.
- 1 = Poor.** System is nearing/at end-of-life. Immediate upgrades needed.
- 0 = Fail.** System is not installed/implemented at the district.

SYSTEMS AND DISTRICT GOALS ▼

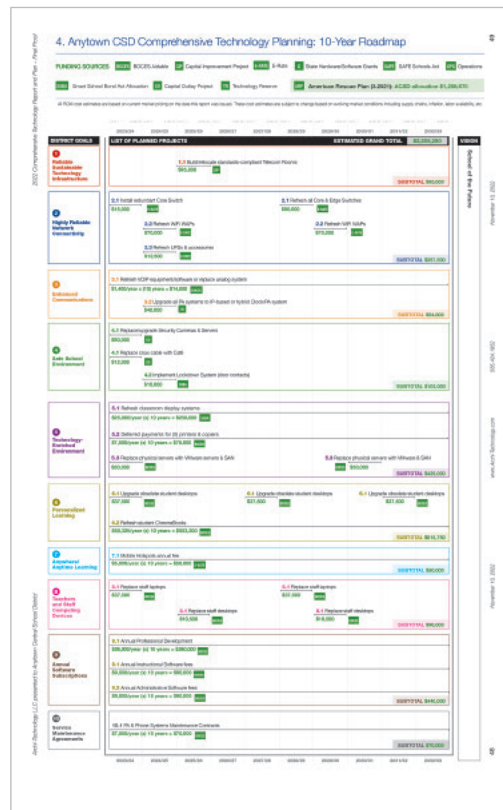
- Each major technology system is color coded to align with the district goal it supports as listed below.
- Technology projects are aligned with these goals in the *10-Year Comprehensive Technology Roadmap* on page 48.

MAJOR DISTRICT TECHNOLOGY GOALS

1. Scalable Infrastructure
2. Reliable Network
3. Enhanced Communications
4. Safe School Environment
5. Tech-Enriched Environment
6. Personalized Learning
7. Anywhere/Anytime Learning
8. Teachers & Staff Computing

Technology systems are color-coded based on the district goal they support as shown in the *10-Year Comprehensive Technology Roadmap* at the end of this report.

ED LAW 2D indicates a potential NYS Ed Law 2D compliance issue.



1. SCALABLE TECHNOLOGY INFRASTRUCTURE				
SUBSYSTEM	SUMMARY OF CURRENT CONDITIONS	SUBSYSTEM GRADE	SYSTEM GRADE	RECOMMENDED IMPROVEMENT SUMMARY
1. CABLES AND PATHWAYS				
Horizontal Cable	Cat6 and 6A cabling is installed throughout the building which meets district needs. Analog video cameras are wired with coax cable and abandoned cabling is installed throughout the building.	2.2	2.2	1. Upgrade video system cables to Cat6 with the Security System surveillance upgrade. 2. Remove abandoned cables from the building as per code.
Backbone Cable	50 micron Multi Mode (MM) and Single Mode (SM) fiber is installed throughout the building.	4.0		No recommendations at this time.
Communications Pathways	The building lacks cable tray, cable supports, and firestopped conduits.	1.0		Install cable tray, cable supports and firestopped conduits throughout the building.
2. SPACES (TELECOM ROOMS)				
		ED LAW 2D indicates a potential NYS Ed Law 2D compliance issue.		
MTR, Server Room (MS 154)	The space is in good condition and requires moderate upgrades to meet industry standards.	3.6	2.5	Install video camera, properly label electrical outlets, and install treated plywood and firestop.
ITR-2, Storage Room (HS 104)	The space is in poor condition and requires significant upgrades to meet industry standards.	1.7		1. Dedicate the space to IT equipment. 2. Install card access, video surveillance, AC, temperature monitoring, UPS, cable management systems, firestop and treated plywood. 3. Move IT equipment from ITR-3, Basement (B 028A) to this space. Recable the equipment in the racks.
ITR-3, Basement (B 048A)	The space is in poor condition and is not worth the investment to upgrade it to industry standards.	0.9		Abandon the space. Move equipment to ITR-2 (HS 104).
ITR-4, District Office (DO 010)	The space is in good condition and requires nominal upgrades to meet industry standards.	3.2		Install video surveillance, horizontal cable management, plywood, firestopped conduit, and VCT tile flooring.

Examples of Technology Infrastructure in Anytown CSD Central School Building

Horizontal Cable

The installed Cat 6 and 6A (pictured) cable meets district needs. However, it is not used for existing analog video cameras.

Backbone Cable

The district’s Single-Mode fiber (yellow cable) meets needs although it lacks adequate supports.

Communications Pathways

Cable resting on non-compliant building steel due to lack of cable pathways down hallways and corridors.

Telecom Room (TR)

Only one of the district’s TRs needs to be abandoned but equipment can be consolidated into another current space.

1. Executive Summary (cont.): Other District-wide Systems

GRADING ▶ 4 = Excellent 3 = Good 2 = Fair 1 = Poor 0 = Fail.

SYSTEM/SUBSYSTEM	SUMMARY OF CURRENT CONDITIONS	SUBSYSTEM GRADE	SYSTEM GRADE	RECOMMENDED IMPROVEMENT SUMMARY
2. NETWORK CONNECTIVITY				
Network Hardware	The district lacks core switch redundancy and an adequate network switch refresh cycle.	3	3.8	Install a second core data switch and update switches every 6 years per the <i>10-Year Roadmap</i> .
Wireless Network	The system and its components meet district needs.	4		No recommendations at this time.
Network Security and Monitoring	RIC-provided services meet district needs.	4		
Telephone Service	Frontier analog services meet district needs.	4		
Internet Service	Spectrum internet services meet district needs.	4		
3. COMMUNICATIONS SYSTEMS				
Public Address (PA)	The district's analog PA systems are at End-Of-Life.	2	2.7	Replace the PA system with a full IP or IP/analog system per the <i>10-Year Roadmap</i> .
Phone	The Cisco system and its components meet district needs.	4		No recommendations at this time.
Master Clock	District needs are nominally met by the current mix of wireless Primex and wired Simplex clocks. However important Security Systems integrations are not possible.	2		Upgrade the Master Clock system per the <i>10-Year Roadmap</i> and leverage Phone and Security Systems integrations.
Lockdown Automated Messaging	The district lacks this capability.	0		Upgrade the phone system to include emergency notification software and integrate with the new PA system.
Performance Sound Reinforcement	ADA compliant devices and auto-muting are not available district wide.	0		Procure appropriate equipment and install with PA auto-mute capabilities.
4. SECURITY SYSTEMS				
Access Control	Main entrance doors are controlled but perimeter doors are not monitored. Card readers are lacking or non-operational in some locations.	3	2.2	Install door monitoring with notifications and install/replace card readers as needed.
Video Surveillance	The current coax-based system does not meet district needs.	1		Upgrade video surveillance system to an IP-based controller and cameras per the <i>10-Year Roadmap</i> .
Lockdown Initiation	The current system and components meet district needs.	3		Consider a mobile application for designated district staff.
Intrusion Alarm	Door perimeter intrusion system and security motion detectors are not installed.	0		Install door perimeter intrusion system and security motion detectors as needed.
Visitor Entry	The system and its components meet district needs.	4		No recommendations at this time.
5. INSTRUCTIONAL TECHNOLOGY				
Displays	The districts has upgraded ≈70% of its displays to Dell 70 Interactive Flat Panels (IFPs).	3	2.3	Continue with the current initiative to refresh some IFPs each year
Classroom Audio Reinforcement	No classroom audio reinforcement systems are installed.	0		Further the use of audio reinforcement in the classroom and establish, maintain refresh cycles.
Document Cameras	The current system and components meet district needs.	4		No recommendations at this time.
6. STUDENT DEVICES				
PCs/Laptops/Tablets	Student laptops and tablets meet district needs but desktops do not.	2.8	2.8	Upgrade student desktops and maintain all refresh cycles per the <i>10-Year Roadmap</i> .
7. TEACHER & ADMIN TECHNOLOGY				
Teacher Computing Devices	Current iMac desktops and outdated laptops are in use.	2	2.7	Laptops are scheduled to be upgraded in the summer of 2022. Maintain all refresh cycles per the <i>10-Year Roadmap</i> .
Admin Computing Devices	≈50% of admin desktops are obsolete.	2		
Copiers and Printers	The current RIC-leased equipment meets district needs.	4		

2. Existing Conditions and Recommended Improvements

The 10-Year Roadmap in section 4 includes Rough Order of Magnitude cost estimates to implement these recommendations.

GRADING ▶ 4 = Excellent 3 = Good 2 = Fair 1 = Poor 0 = Fail.

TELECOMMUNICATIONS INFRASTRUCTURE

TELECOMMUNICATIONS INFRASTRUCTURE

CURRENT GRADE

2.4 out of 4.0

RECOMMENDATIONS

1. Remove abandoned cabling and equipment.
2. Implement consistent cable labeling standards.
3. Install cable tray down all corridors.
4. Install additional conduit. Firestop all conduits.
5. Ground cable tray and conduit.

Unlike other technology systems that are consistent district wide, Telecommunications Infrastructure tends to vary by building or sections upgraded during capital projects.

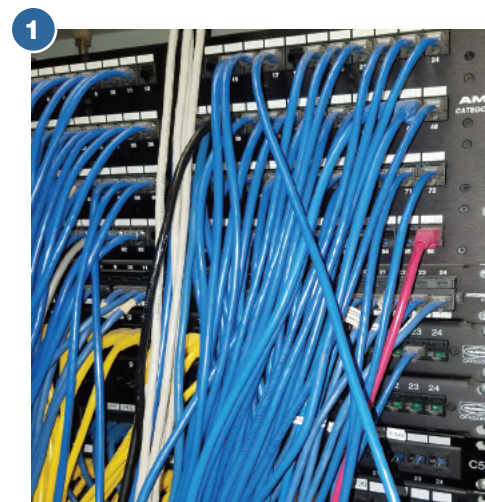
The Current Conditions and Recommended Improvements noted below apply to Anytown CSD Central School building.

SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
Horizontal Cabling	3	Horizontal UTP Cabling	<ul style="list-style-type: none"> Category 6 (Cat6) cable was installed throughout the building as part of the 19/20 Capital Improvement Project. Analog video cameras are still wired with coax cable. There are large quantities of abandoned cabling throughout the building. 	<ol style="list-style-type: none"> 1. Replace the video surveillance system coax cable with Cat6 when the cameras are upgraded to IP-based versions. 2. Remove all abandoned cable and outdated legacy equipment. 3. Standardize all TR designations per the <i>TR Master Plan</i> included in this Report. 4. Implement a consistent district-wide cable labeling program from TRs through cable drops in classrooms and all other spaces that conforms with industry standards. 5. Make new district Serving Zone drawings developed with this report available to pertinent staff and contractors.
	4	Cable Counts	Generally, cable counts are adequate for current District needs.	
	2	Cable Labeling	The district lacks cable labeling conventions resulting in inconsistent and inadequate cable labels throughout the district.	
	0	Serving Zones	Serving Zones for each floor are not documented.	
	4	Wireless Access Point (WAP) Cabling	(2) Cat6A cables are installed for each WAP.	
Backbone Cabling	4	Intra-building Fiber Optic Backbone (within a building)	50-micron Multi Mode (MM) and Single Mode (SM) fiber are installed throughout the building.	No recommendations at this time.
	N/A	Inter-building Fiber Optic Backbone (between buildings)	The district has a single Central School building with no inter-building connections.	
Communications Pathways	2	Cable Tray	Except for the Main Telecom Room (MTR), there is minimal use of cable tray throughout the District.	<ol style="list-style-type: none"> 1. Install new/add cable tray down all corridors and in other areas of the building. 2. Correctly install all existing and new cable into the tray.
	1	Cable Supports	The district lacks cable supports such as J-hooks.	Install new/additional cable supports as per industry standards.
	2	Conduit	<ul style="list-style-type: none"> Cables are installed at or beyond the capacity of conduits. Conduits lack firestop. 	<ol style="list-style-type: none"> 1. Install additional conduit sleeves as needed. 2. Apply firestopping in and around conduit sleeves.
	0	Bonding & Grounding	Conduits are not connected to a grounding/bonding infrastructure.	<ol style="list-style-type: none"> 1. Connect conduits to a grounding/bonding infrastructure. 2. Connect any newly installed pathways including cable tray to a grounding/bonding infrastructure.

Examples of cable and cable support installations throughout the district:

1. ES and MS non-compliant horizontal cable management.
2. Typical ES and MS cabling with non-compliant labeling.
3. Improperly supported horizontal cable in the High School.
4. Ladder racking correctly installed and deployed in the MTR - Server Room 154.

Additional district infrastructure photos appear on pp. 10 – 11.



2. Existing Conditions and Recommended Improvements - Telecommunications Infrastructure, Spaces (cont.)

Anytown Central School

The 10-Year Roadmap on pg. 48 includes Rough Order of Magnitude cost estimates to implement these recommendations.

TELECOMMUNICATIONS INFRASTRUCTURE - SPACES: MTR, Server Room (MS 154)

Anytown Central School - MTR, SERVER ROOM (MS 154)

CURRENT GRADE
3.6 out of 4.0

CURRENT CONDITION
The space is in **good** condition and requires moderate upgrades to meet industry standards.

RECOMMENDATION
Upgrade the current space.

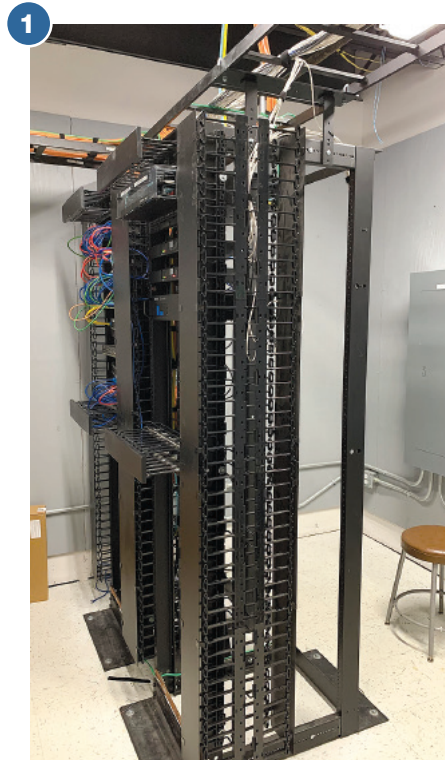
ROM COST ESTIMATE
\$

Summary of Recommendations

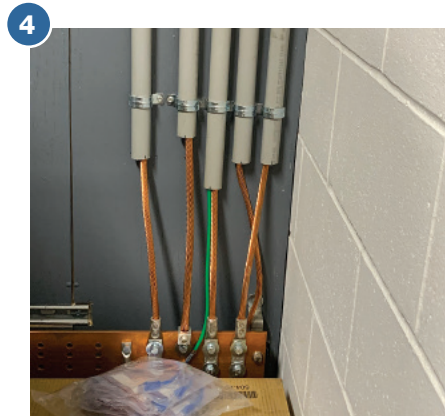
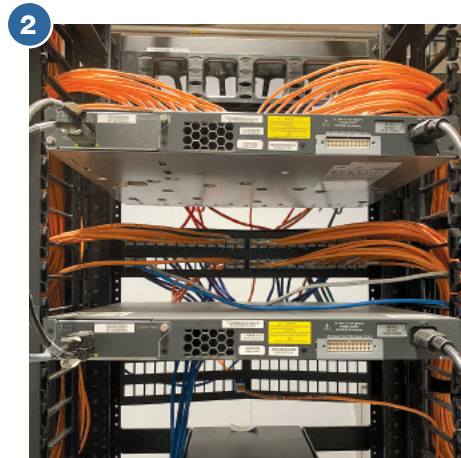
1. Install video surveillance coverage of the door.
2. Properly label all electrical outlets.
3. Install treated plywood and firestop.

CATEGORY	CATEGORY GRADE	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
1. Room Size & Rack Access	4	<ul style="list-style-type: none"> The room size meets industry standards. The space has a swing-in door that does not impede rack access. 	No recommendations at this time.
2. Water Risk	4	No potential direct water threats were observed.	No recommendations at this time.
3. Location	4	The space has direct hallway access and is centrally located in its serving zone.	No recommendations at this time.
4. Security	3	<ul style="list-style-type: none"> The door to the space has a card reader installed with access limited to IT staff. The space lacks video surveillance coverage. 	Install a dedicated video surveillance camera focused on the door to the space.
5. Environmental Control	4	The space has a dedicated AC system and a temperature monitoring system connected to the network.	No recommendations at this time.
6. Dedicated and Redundant Power	3	<ul style="list-style-type: none"> The circuit is dedicated. (1) unlabeled duplex outlet is installed and an outlet is available. 	Properly label all electrical outlets.
7. UPS & Emergency Power	4	<ul style="list-style-type: none"> A UPS is installed in the rack and all equipment is properly connected. The building is equipped with a generator for emergency power and properly labeled outlets are installed in the space. 	Review equipment load to ensure the UPS will provide adequate capacity and run times.
8. Grounding Infrastructure	4	A proper bonding/grounding infrastructure is installed and IT equipment is connected.	No recommendations at this time.
9. Overhead Cable Management	4	Proper overhead cable management with correctly installed cable and room for additional capacity is installed.	No recommendations at this time.
10. Cable Termination and Management	3	<ul style="list-style-type: none"> Patch panels are properly labeled but cable jackets are not. The rack has sufficient cable management. 	Properly label cable jackets.
11. Room Construction	3	<ul style="list-style-type: none"> Walls do not extend to the deck but plywood is installed on at least one wall. Cables enter the space in compliant firestopped pathways. 	Extend the walls to the deck.
12. VCT Flooring	3	VCT flooring is installed but is not bonded.	No recommendations at this time.
13. Ceiling	4	The ceiling is open to the deck more than 10' Above Finished Floor.	No recommendations at this time.

4 **Excellent.** Meets/exceeds district's current and expected needs. 2 **Fair.** Minimally meets current needs. Major upgrades are needed. 0 **Fail.** System is not installed/implemented at the district.
 3 **Good.** Meets district's current needs but upgrades are needed. 1 **Poor.** System is nearing/at end-of-life. Immediate upgrades needed.



Photos, clockwise from top left:
 1. The dedicated secure space includes (3) newer equipment racks.
 2. The racks include properly installed cable lengths and management.
 3. A properly labeled electrical outlet from the building's emergency generator.
 4. A properly installed grounding bar with all components correctly connected.



2. Existing Conditions and Recommended Improvements - Telecommunications Infrastructure, Spaces (cont.)

Anytown Central School (cont.)

The 10-Year Roadmap on pg. 48 includes Rough Order of Magnitude cost estimates to implement these recommendations.

TELECOMMUNICATIONS INFRASTRUCTURE - SPACES: ITR-2, Storage Room (HS 104)

Anytown Central School - ITR-2, STORAGE ROOM (HS 104)

CURRENT GRADE

1.7 out of 4.0

CURRENT CONDITION

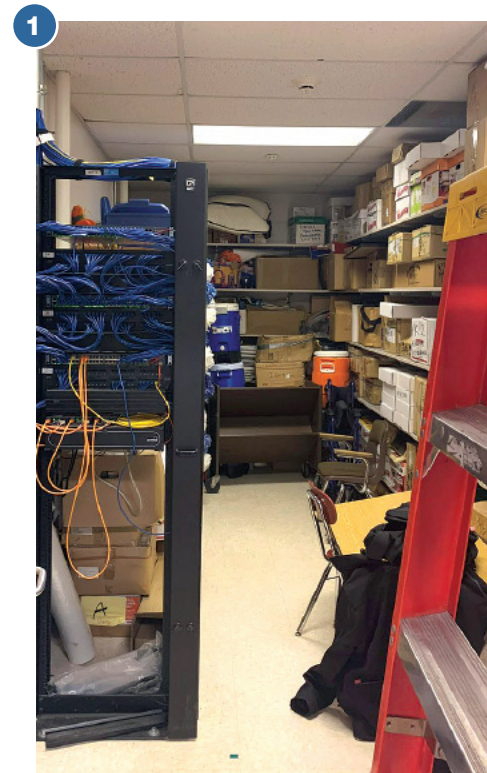
The space is in **poor** condition and requires **significant** upgrades to meet industry standards.

RECOMMENDATION
Dedicate and upgrade the current space.

ROM COST ESTIMATE
\$\$\$

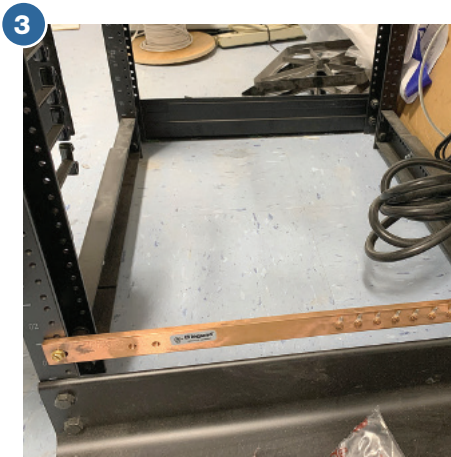
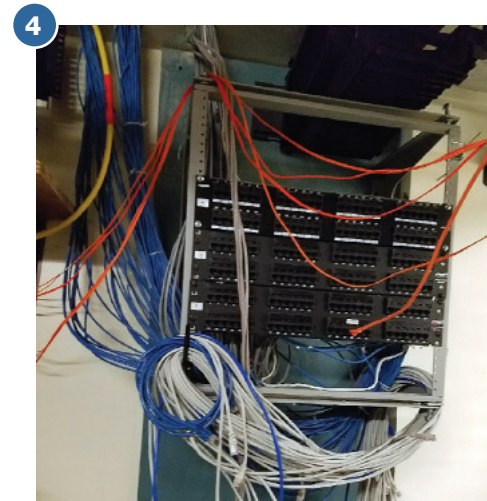
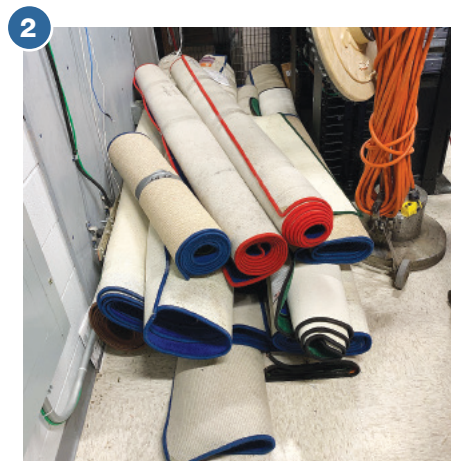
Summary of Recommendations

1. Remove stored non-IT items. Dedicate the space to IT equipment and install card access for IT staff only.
2. Move IT equipment from ITR-3, Basement (B 028A) to this space. Recable the equipment in the racks.
3. Installed video surveillance of door exterior.
4. Install AC system, temperature monitoring, a UPS unit, cable management systems, and firestop in conduits.
5. Attach IT equipment to existing rack grounding bar.
6. Install plywood on one wall and remove the drop ceiling.



Photos, clockwise from top left:

1. Unsecured space shared with office supply storage.
2. Rugs are stored in close proximity to IT equipment racks.
3. A grounding bar is installed in the rack but no equipment is connected to it.
4. Abandoned legacy cable installed in the space.



CATEGORY	CATEGORY GRADE	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
1. Room Size & Rack Access	2	<ul style="list-style-type: none"> The room size meets industry standards. The space lacks adequate front and/or rear rack clearances due to its poor configuration and stored non-IT items. 	<ol style="list-style-type: none"> Remove the stored non-IT items. Dedicate the space to IT equipment and limit access to IT staff. Reposition the rack for adequate clearances.
2. Water Risk	4	No potential direct water threats were observed.	No recommendations at this time.
3. Location	2	The space lacks direct hallway access and must be entered through a classroom. The space is centrally located in its serving zone.	No recommendations at this time.
4. Security	1	<ul style="list-style-type: none"> The space is shared and accessible to non-IT staff. The network equipment and infrastructure are in an open unlocked equipment rack/cabinet. The space lacks card access and video surveillance coverage. 	<ol style="list-style-type: none"> Install Access Control card reader keyed for IT staff only. Install a dedicated video surveillance camera focused on the door to the space.
5. Environmental Control	0	The space lacks a dedicated AC system and a temperature monitoring system connected to the network.	Install a dedicated AC system and a temperature monitoring system.
6. Dedicated and Redundant Power	3	<ul style="list-style-type: none"> The circuit is dedicated. (2) unlabeled duplex outlets are installed and an outlet is available. 	Properly label all electrical outlets.
7. UPS & Emergency Power	0	<ul style="list-style-type: none"> There is no UPS installed in the space. While there is a building generator, none of its power connections are in this space. 	<ol style="list-style-type: none"> Review equipment load to ensure the UPS will provide adequate capacity and run times. Purchase and install a UPS unit as per the 10-Year Roadmap. Connect all equipment to the new UPS. Add labeled electrical connections from the building generator to this space.
8. Grounding Infrastructure	1	A proper bonding/grounding infrastructure is installed but no IT equipment is connected to it.	Attach existing IT equipment to the Grounding Bar.
9. Overhead Cable Management	1	<ul style="list-style-type: none"> No overhead cable management system is installed. Cable radius control is lacking. 	<ol style="list-style-type: none"> Install an overhead cable management system (ladder racks, J hooks) with space for additional capacity. Install a cable radius control system.
10. Cable Termination and Management	2	<ul style="list-style-type: none"> Patch panels are properly labeled but cable jackets are not. The rack has sufficient cable management. 	Properly label cable jackets.
11. Room Construction	2	<ul style="list-style-type: none"> Walls extend to the deck but plywood is not installed on any wall. Cables enter the space in compliant pathways that lack firestop. 	<ol style="list-style-type: none"> Install properly treated plywood on one wall. Install firestop around and inside all horizontal (walls) and vertical (ceilings, floors) ≥4" conduits.
12. VCT Flooring	3	VCT flooring is installed but is not bonded.	No recommendations at this time.
13. Ceiling	1	A drop ceiling is installed less than 10' Above Finished Floor.	Remove the drop ceiling.

4 Excellent. Meets/exceeds district's current and expected needs.
 2 Fair. Minimally meets current needs. Major upgrades are needed.
 0 Fail. System is not installed/implemented at the district.
3 Good. Meets district's current needs but upgrades are needed.
 1 Poor. System is nearing/at end-of-life. Immediate upgrades needed.

2. Existing Conditions and Recommended Improvements - Telecommunications Infrastructure, Spaces (cont.)

Anytown Central School (cont.)

The 10-Year Roadmap on pg. 48 includes Rough Order of Magnitude cost estimates to implement these recommendations.

TELECOMMUNICATIONS INFRASTRUCTURE - SPACES: ITR-3, Basement (B 048A)

Anytown Central School - ITR-3, BASEMENT (B 048A)

CURRENT GRADE

0.9 out of 4.0

CURRENT CONDITION

The space is in **poor** condition and is not worth the investment to upgrade it to industry standards.

RECOMMENDATION

Abandon the current space. Move IT equipment to ITR-2, Storage Room (HS 104).

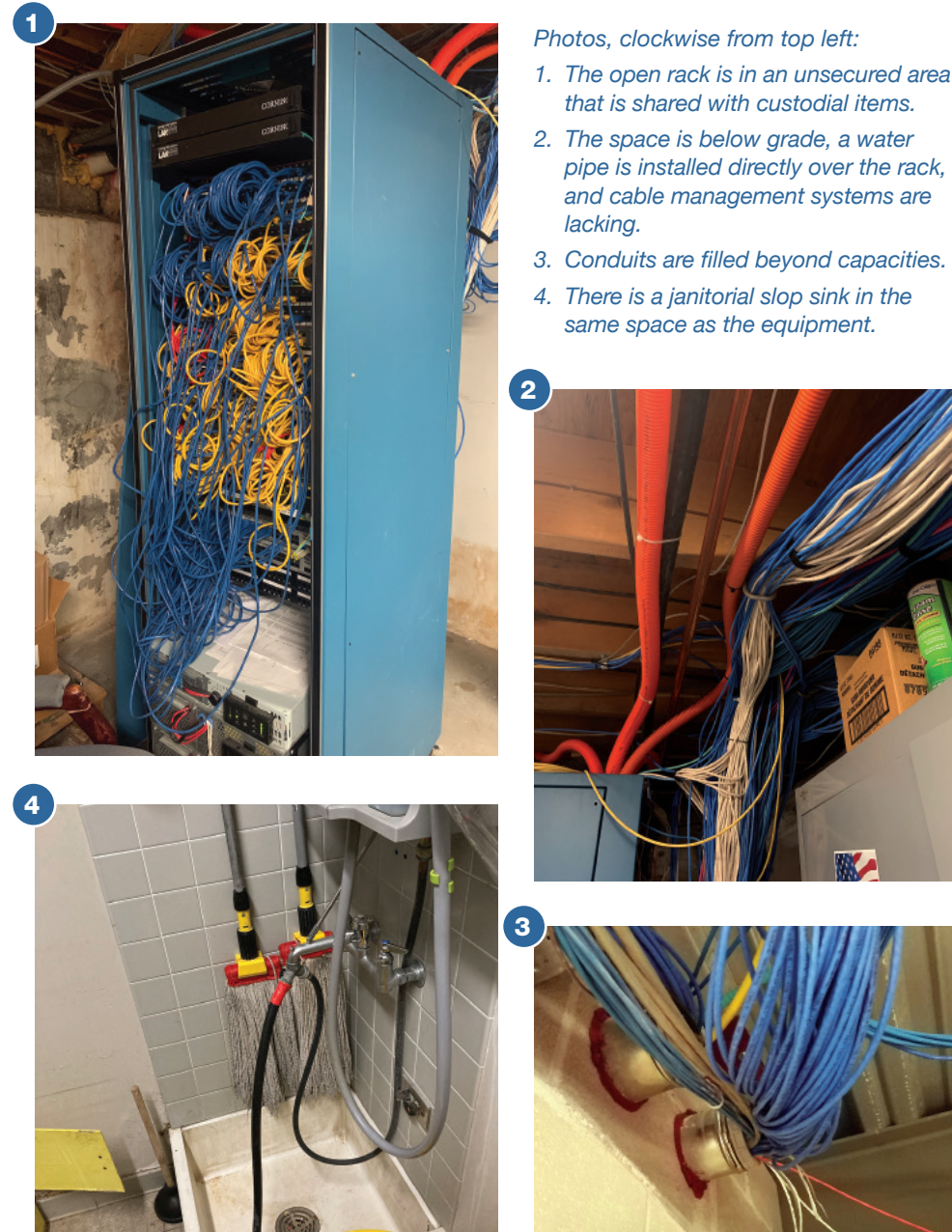
ROM COST ESTIMATE

\$

Summary of Recommendations

1. Move IT equipment from this space to ITR-2, Storage Room (HS 104) to this space. Recable the equipment in the racks.
2. Remove all abandoned IT equipment and cable. Recycle as much material as possible.

CATEGORY	CATEGORY GRADE	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
1. Room Size	4	The room size meets industry standards and provides for adequate front and rear rack clearances.	Abandon this space. Move all IT equipment to ITR-2. Remove all legacy cable and equipment.
2. Water Risk	0	<ul style="list-style-type: none"> The space is below grade. The walls and floor shows evidence of past water penetration. A pressurized water line is installed directly above the rack. A custodial slop sink is installed in the space within 6' of the rack. 	
3. Location	1	There is no direct access to the space which is in the basement. it must be entered using a set of stairs and through a service corridor.	
4. Security	0	<ul style="list-style-type: none"> The network equipment and infrastructure are in an open unlocked equipment cabinet. The space is shared and accessible to non-IT staff. The doors to the basement lack locks. The space lacks card reader access and video surveillance coverage. 	
5. Environmental Control	0	The space lacks a dedicated AC system, an exhaust fan, and a temperature monitoring system.	
6. Dedicated and Redundant Power	2	<ul style="list-style-type: none"> The circuit is not dedicated. Power connections lack proper labeling. 	
7. UPS & Emergency Power	0	<ul style="list-style-type: none"> There is no UPS installed in the space. While there is a building generator, none of its power connections are in this space. 	
8. Grounding Infrastructure	0	No bonding or grounding infrastructure was observed.	
9. Overhead Cable Management	1	Overhead cable management does not meet industry standards.	
10. Cable Termination and Management	0	<ul style="list-style-type: none"> Cables are not correctly installed and/or supported within the rack. Patch panels and cable jackets behind the panels lack machine-printed labeling 	
11. Room Construction	1	<ul style="list-style-type: none"> The room has below-grade exterior walls that create a potential water threat. Cable pathways are at or over capacity. Plywood is not installed on any wall. There is poor visibility in the rack due to a lack of lighting. 	
12. VCT Flooring	1	The floor is bare concrete.	
13. Ceiling	2	The ceiling is open to the deck but there is less than 10' Above Finished Floor.	



4 Excellent. Meets/exceeds district's current and expected needs.
 2 Fair. Minimally meets current needs. Major upgrades are needed.
 0 Fail. System is not installed/implemented at the district.
3 Good. Meets district's current needs but upgrades are needed.
 1 Poor. System is nearing/at end-of-life. Immediate upgrades needed.

2. Existing Conditions and Recommended Improvements - Telecommunications Infrastructure, Spaces (cont.)

Anytown Central School (cont.)

The 10-Year Roadmap on pg. 48 includes Rough Order of Magnitude cost estimates to implement these recommendations.

TELECOMMUNICATIONS INFRASTRUCTURE - SPACES: ITR-4, District Office (DO 010)

Anytown Central School - ITR-4, District Office (DO-010)

CURRENT GRADE

3.2 out of 4.0

CURRENT CONDITION

The space is in **good** condition and requires **nominal** upgrades to meet industry standards.

RECOMMENDATION

Upgrade the current space.

ROM COST ESTIMATE

\$

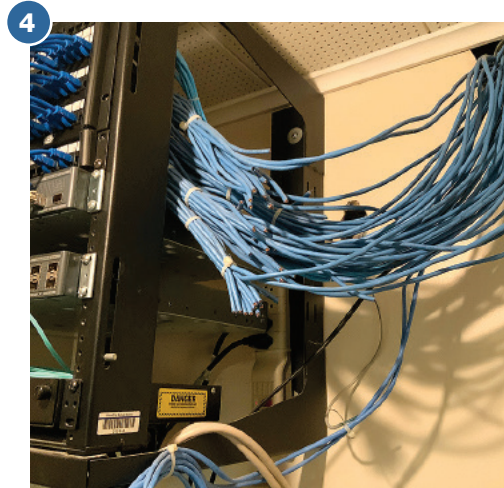
Summary of Recommendations

1. Install a dedicated video surveillance camera focused on the door to the space.
2. Label emergency power outlets.
3. Install horizontal cable management and cable jacket labels at the rack.
4. Install properly treated plywood, conduit with firestop, and VCT tile flooring.

CATEGORY	CATEGORY GRADE	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
1. Room Size	4	The room size meets industry standards and the rack swivels/pivots to provide adequate clearances	No recommendations at this time.
2. Water Risk	4	No potential direct water threats were observed.	No recommendations at this time.
3. Location	4	The space has direct hallway access and is centrally located in the Serving Zone.	No recommendations at this time.
4. Security	3	<ul style="list-style-type: none"> • Access to the space is limited to IT staff and authorized vendors. • The space has card reader access control. • The space lacks video surveillance coverage. 	Install a dedicated video surveillance camera focused on the door to the space.
5. Environmental Control	4	The space has a dedicated AC system and a temperature monitoring system with notifications installed.	No recommendations at this time.
6. Dedicated and Redundant Power	4	The circuit is dedicated and power connections are properly labeled.	No recommendations at this time.
7. UPS & Emergency Power	3	<ul style="list-style-type: none"> • A UPS is sitting on the floor. The connected equipment are susceptible to accidental unplugging. • The building is equipped with a generator but generator power outlets are not identified in the space. 	<ol style="list-style-type: none"> 1. Install a properly sized UPS into the rack. 2. Affix machine-printed labels with panel and circuit IDs to all generator power connections.
8. Grounding Infrastructure	4	A proper bonding/grounding infrastructure is installed and IT equipment is connected.	No recommendations at this time.
9. Overhead Cable Management	4	Proper overhead cable management with correctly installed cable and room for additional capacity is installed.	No recommendations at this time.
10. Cable Termination and Management	2	<ul style="list-style-type: none"> • Cables are not correctly installed and/or supported within the rack. • Patch panels are properly labeled but some/all cable jackets behind the panels are not. 	<ol style="list-style-type: none"> 1. Install horizontal cable management at the rack. 2. Affix machine-printed labels to all patch panels, cords and cable jackets behind the panel.
11. Room Construction	2	<ul style="list-style-type: none"> • The walls extend to the deck but plywood is not installed on any wall. • Cables enter the space in non-compliant pathways. 	<ol style="list-style-type: none"> 1. Install plywood that is either fire retardant or intumescent painted on at least one wall. 2. Install properly sized conduit with proper firestop where it is lacking.
12. VCT Flooring	1	Wood flooring is installed.	Install anti-static VCT floor bonded to the grounding system with copper strips.
13. Ceiling	2	A drop ceiling is installed more than 10' Above Finished Floor.	Remove the drop ceiling.



Photos, clockwise from top left:
 1. A single wall-mount cabinet is installed in the secured dedicated space.
 2. Proper vertical and overhead cable management, and grounding systems are used in the space.
 3. A few non-IT items are stored in the space.
 4. Horizontal cable supports are lacking at the cabinet and abandoned cables have not been removed from the rack.



4 **Excellent.** Meets/exceeds district's current and expected needs. 2 **Fair.** Minimally meets current needs. Major upgrades are needed. 0 **Fail.** System is not installed/implemented at the district.
 3 **Good.** Meets district's current needs but upgrades are needed. 1 **Poor.** System is nearing/at end-of-life. Immediate upgrades needed.

2. Existing Conditions and Recommended Improvements (cont.)

Summary of Recommended Improvements for Telecom Rooms (TRs)

Note: A Rough Order of Magnitude (ROM) Cost Estimate to implement these recommended improvements appears in the 10-Year Comprehensive Technology Plan Roadmap on page 48.

As described in the *Current Conditions and Recommended Improvements* section of this report, most all spaces dedicated to IT equipment in Anytown CSD will need to be subdivided or upgraded in their existing locations to meet the (13) Telecommunication Room performance categories as illustrated on pp. 4 – 5. Additionally, it is recommended that a number of these spaces be abandoned and relocated.

TELECOMMUNICATIONS INFRASTRUCTURE - SPACES

ANYTOWN CSD SUMMARY OF TR RECOMMENDED IMPROVEMENTS

ANYTOWN CSD SUMMARY OF TR RECOMMENDED IMPROVEMENTS		ANYTOWN CENTRAL SCHOOL			
		MTR Server Room	TR-108 Storage Room	TR-117 Basement	ITR-4 District Office
PERFORMANCE CATEGORY ▼	TR SURVEY GRADE (0 = poor, 4 = excellent) ►	3.6	1.7	0.9	3.2
1. Room Size. The space is adequately sized with 3’ front and rear rack clearances.		4	2	4	4
2. Water Risk. No water threats are present.		4	4	0	4
3. Location. There is direct hallway access to the space.		4	2	1	4
4. Security. The space is secured, dedicated to IT equipment, and accessible only by IT staff. ED LAW 2D		3	1	0	3
5. Environmental Control. The space has an AC system with independent controls, an exhaust fan, and a temperature monitoring system with automatic notifications.		4	0	0	4
6. Dedicated, Redundant Power. The space has a dedicated, redundant power source and all power connections are machine labeled with panel and circuit numbers. There is a connection to a back-up power source such as a building generator.		3	3	2	4
7. UPS Power. An Uninterruptible Power Source (UPS) is installed in the rack. and all IT equipment is connected to it.		4	0	0	3
8. Grounding Infrastructure. The space includes a grounding or bonding infrastructure connected to the racks, cable pathways, and VCT flooring.		4	1	0	4
9. Overhead Cable Management. Cables entering the space have proper horizontal and vertical support (e.g., ladder racking) and cables are correctly installed in the pathways. Radius control is present as cables exit overhead management system		4	1	1	4
10. Cable Termination & Management. Cable termination, management and labeling is correct at the rack.		3	2	0	2
11. Room Construction. Walls extend to the deck with compliant, sealed cable penetrations.		3	2	1	2
12. VCT Flooring. Vinyl-Coated Tile (VCT) flooring is installed and connected to the grounding system.		3	3	1	1
13. Ceiling. The ceiling is open to the deck with a minimum height of 10’.		4	1	2	2
		▲ upgrade current space \$	▲ dedicate, upgrade current space \$\$\$	▲ abandon current space; merge to ITR-2 \$	▲ upgrade current space \$

4 Excellent. Meets/exceeds district’s current and expected needs.
3 Good. Meets district’s current needs but upgrades are needed.
2 Fair. Minimally meets current needs. Major upgrades are needed.
1 Poor. System is nearing/at end-of-life. Immediate upgrades needed.
0 Fail. System is not installed/implemented at the district.

2. Existing Conditions and Recommended Improvements (cont.)

System Grading key appears on page 17.

The 10-Year Roadmap includes Rough Order of Magnitude cost estimates to implement these recommendations.

DISTRICT-WIDE SYSTEMS

NETWORK CONNECTIVITY		NETWORK CONNECTIVITY			
CURRENT GRADE	SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
3.8 out of 4.0 RECOMMENDATIONS 1. Install a second core data switch for redundancy. 2. Maintain equipment refresh cycles per the CTP Roadmap.	Network Hardware (wired connectivity)	3	General Notes	<ul style="list-style-type: none"> ITRs connect to the MTR, Server Room, using Single Mode fiber which meets district needs. The MTR has a 10G Core Switch. There is only (1) core data switch. 	Install a second core data switch and interconnect with the current equipment to provide redundancy.
			Endpoint Connections - PCs	1Gb connections are available.	No recommendations at this time.
			Endpoint Connections - Server	10Gb connections are available.	No recommendations at this time.
			Network Architecture - VLANs	The district has separate VLANs.	No recommendations at this time.
			Network Equipment - End of Life	<ul style="list-style-type: none"> The district recently upgraded its network switches which meets current needs. The district's current 10-year switch refresh policy does not meet industry standards. 	Update the district's refresh policy to (7) years for network switches and (5) for security components as per the CTP Roadmap.
	Wireless Network	4	General Notes	<ul style="list-style-type: none"> The district uses a wireless network with a virtual controller which meets current needs. WAPs installed in 2018 are approaching End-Of-Life. All WAPs are connected with (2) Cat 6A cables. 	Maintain the equipment refresh cycles per the CTP Roadmap.
			Coverage	WiFi coverage is adequate.	No recommendations at this time.
			Bandwidth	Access points are current generation and provide adequate bandwidth.	
			Wireless Network Segmentation	Unique SSIDs exist for various user groups.	
	Network Security and Monitoring	4	1. Firewall 2. CIPA Compliance 3. Staff/Student Credentials 4. Terms of Use (staff, students and guests)	RIC-provided services meet current needs.	No recommendations at this time.
Telephone/Internet Service	4	Analog Telephone Service	Current analog phone service meets district needs.	Ensure compliance with Kari's Law and Ray Baum's Act.	
	4	Internet Service	Spectrum internet services meet district needs.	No recommendations at this time.	

Photos below, left to right:

1. A ceiling-mounted WAP in an Elementary School classroom.
2. The Spectrum internet connection in the MTR.



2. Existing Conditions and Recommended Improvements (cont.)

System Grading key appears on page 17.

The 10-Year Roadmap includes Rough Order of Magnitude cost estimates to implement these recommendations.

DISTRICT-WIDE SYSTEMS

COMMUNICATIONS SYSTEMS

COMMUNICATIONS SYSTEMS

CURRENT GRADE
1.6 out of 4.0

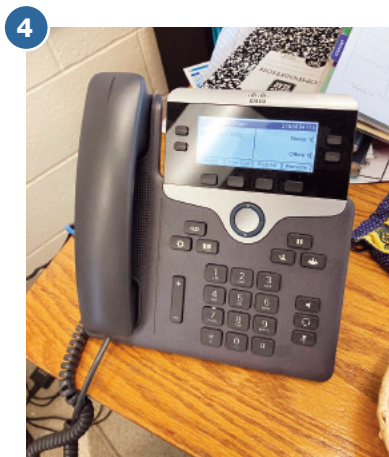
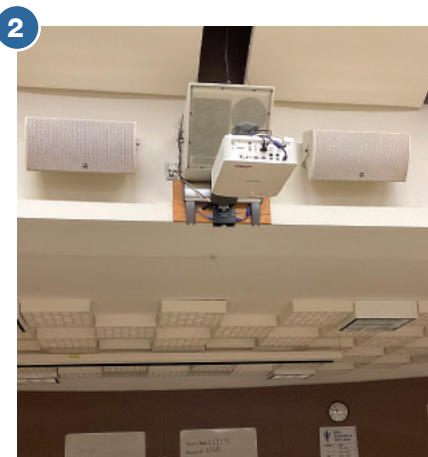
RECOMMENDATIONS

- Replace building PA systems.
- Evaluate 911 call routing.
- Integrate lockdown messaging with Phone, PA and Security systems.
- Ensure all large assembly areas comply with ADA Listening Assist requirements.

SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
Public Address (PA)	2	General Notes	The district's analog PA systems are at End-Of-Life.	1. Replace the PA system with a full IP or IP/analog system as per the <i>CTP Roadmap</i> . 2. Evaluate coverage when designing the new system. 3. Ensure the new system equipment is connected to emergency power.
		Coverage	Current coverage is adequate.	
		Standby Power	None on current system.	
		Bell Schedule	<ul style="list-style-type: none"> • Managed by building Master Clock systems. • Barclay Bells are activated manually. 	
Phone	4	Initiation Location	Push-to-talk microphones and phone interfaces are used.	Upgrade to IP equipment with the PA system upgrade.
		General Notes	A VoIP-based Cisco system and handsets are in use with a break/fix refresh policy that meets district needs.	No recommendations at this time.
		Telephone Location	Cisco VoIP handsets are installed in all classrooms.	Maintain an inventory for break/fix cases.
		Admin Access to Outside Lines	All administrators have DID numbers.	No recommendations at this time.
		Voicemail	The current voicemail system is satisfactory.	No recommendations at this time.
		911 Calls	Any 911 outbound calls alert campus security.	911 calls should also alert designated building administrators.
		Standby Power	Equipment in MTR is connected to building generators.	No recommendations at this time.
Master Clock	2	General Notes	A mix of wireless Primex and wired Simplex clocks are used throughout the district.	Upgrade the Master Clock system per the <i>CTP Roadmap</i> .
		Coverage		Clock systems should be integrated with any upgrades to IP/PA system to maintain seamless integration with the Bell Schedule.
		Time Sources	Current capabilities meet district needs.	
Lockdown	0	Automated Messaging	The district lacks this capability.	Upgrade the phone system to include emergency notification software and integrate with the new PA system.
		ADA Assistive Listening Support	ADA compliant devices are not available district wide.	Review ADA requirements for large group assembly areas and procure appropriate equipment.
Performance Sound Reinforcement*	0	Auto-mute	No auto muting or takeover of performance sound systems was observed.	Install automute/ducking relays as part of the PA update project per the <i>10-Year Roadmap</i> .

Photos below, left to right:

1. Outdated PA headend in the MTR.
2. A Large Group Instruction Audio-Enhancement system in the HS.
3. An analog clock in a High School corridor.
4. A Cisco VoIP handset on a teacher's desk.



* Audio system devices were only surveyed for presence and systems interoperability. The effectiveness of these systems is beyond the scope of this survey. A more comprehensive survey of district audio systems could be part of an audio assessment conducted by a qualified firm.

2. Existing Conditions and Recommended Improvements (cont.)

System Grading key appears on page 17.

The 10-Year Roadmap includes Rough Order of Magnitude cost estimates to implement these recommendations.

DISTRICT-WIDE SYSTEMS (CONT.)

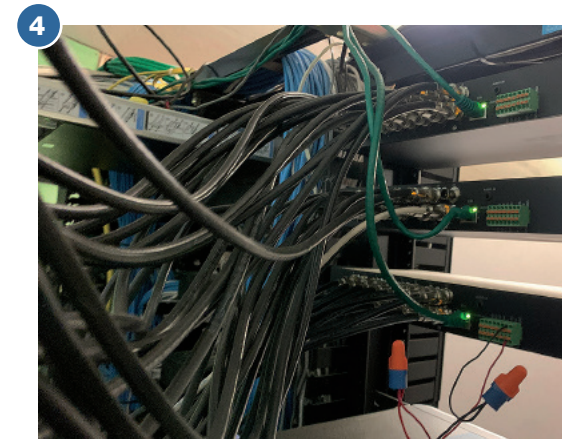
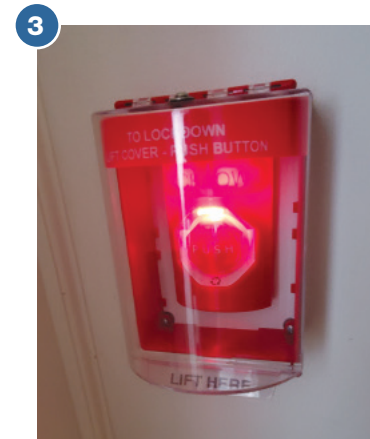
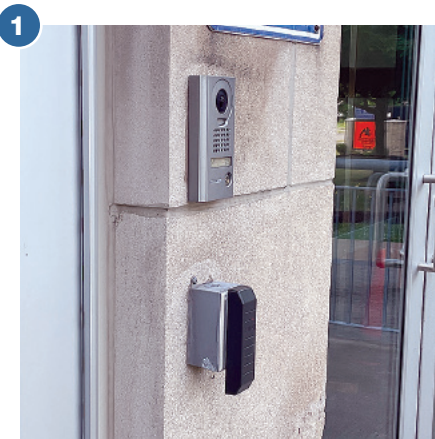
System Grading key appears on page 17.

SECURITY SYSTEMS*		SECURITY SYSTEMS			
SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS	
CURRENT GRADE 2.2 out of 4.0 RECOMMENDATIONS <ul style="list-style-type: none"> • Upgrade analog cameras to IP. • Expand lockdown system capabilities and integrate with district-wide Communication systems. • Ensure all systems have access to emergency power. • Monitor building for unauthorized entrances. 	3	General Notes	<p>Per Ed Law 2D, Section 5,F, 4: “Maintain reasonable administrative, technical and physical safeguards to protect the security, confidentiality and integrity of personally identifiable student information in its custody.” (1/1/2021)</p> <p>Access control alarms are sent to the Security Department.</p>	<ol style="list-style-type: none"> 1. Install door monitoring with notifications. 2. Replace the broken Middle School card reader. 	
		Locations	<ul style="list-style-type: none"> • The main entrance doors are controlled which meets current needs. • Perimeter doors are not monitored. • Card readers are installed at most main and some secondary locations although (1) Middle School reader is not operational. 		
	1	General Notes	The current coax-based cameras and system has limited interoperability with other systems.	<ol style="list-style-type: none"> 1. Upgrade the video surveillance system to an IP-based controller and cameras per the <i>CTP Roadmap</i>. 2. As mentioned in 1. Technology Infrastructure, replace the coax cables with Cat6 cable when the system is upgraded. 3. Invest in security panels to allow for integration with other security systems. 4. Replace the (2) broken cameras in the Middle School with IP-base models per the <i>CTP Roadmap</i>. 5. Install cameras at TR entrances as per recommendations. 6. Maintain other refresh cycles as per the <i>CTP Roadmap</i>. 	
		Equipment & Cabling	<ul style="list-style-type: none"> • Analog cameras are currently in use. • While Cat6 cable was installed throughout the building as part of the 19/'20 Capital Improvement Project, the analog video cameras are still wired with coax cable.. 		
		Coverage	<ul style="list-style-type: none"> • School Building: Generally adequate except at the Middle School due to (2) broken cameras. • Parking lots: All buildings have adequate video coverage. 		
Lockdown	3	Lockdown Initiation	All school greeters have a physical initiation button at their desks.	Consider a mobile application for designated district staff.	
Intrusion Alarm	0	Door Monitoring	No door perimeter intrusion system is installed.	Install door contacts at all exterior perimeter doors to monitor for forced open/propped open status.	
		Motion Detection	No security motion detectors were observed except Transportation.	No recommendations at this time.	
		Battery Backup	Not applicable as no system is installed.	If an Intrusion Detection system is installed, ensure that it has a battery backup or is connected to a UPS unit.	
Visitor Entry	4	Entrance Locations	All locations have video intercoms installed.	No recommendations at this time.	
		Battery Backup	The system has a battery backup.		

* Security system devices were only surveyed for presence and systems interoperability. The effectiveness of these systems is beyond the scope of this survey. A more comprehensive survey of district security systems could be part of a security assessment conducted by a qualified firm.

Photos below, left to right:

1. A typical card reader and video intercom installed at an exterior door.
2. Video Surveillance monitors are located in the District Office.
3. A typical Lockdown Initiation button in the HS Main Office.
4. Analog video surveillance equipment in the MTR.



2. Existing Conditions and Recommended Improvements (cont.)

DISTRICT-WIDE SYSTEMS (CONT.)

System Grading key appears on page 17.

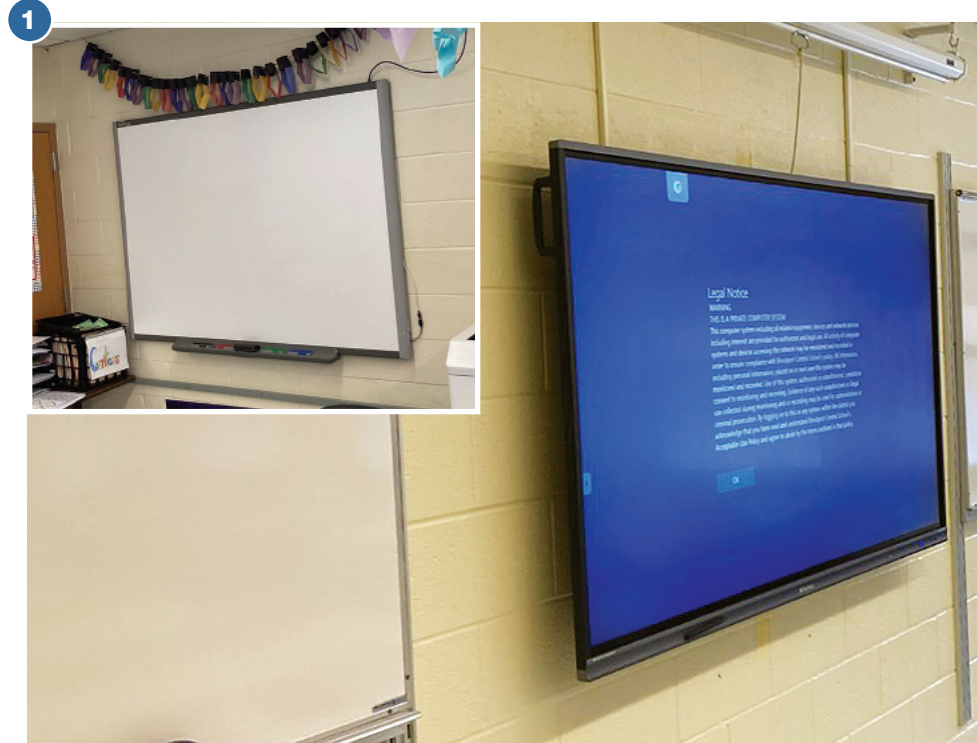
System Grading key appears on page 17.

The 10-Year Roadmap includes Rough Order of Magnitude cost estimates to implement these recommendations.

INSTRUCTIONAL TECHNOLOGIES		INSTRUCTIONAL TECHNOLOGIES			
CURRENT GRADE	SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
2.3 out of 4.0 RECOMMENDATIONS <ul style="list-style-type: none"> Upgrade remaining SMARTBoards. Deploy Classroom Audio Enhancement systems district wide. 	Integrated AV Systems	3	Displays	<ul style="list-style-type: none"> Dell 70 Interactive Flat Panels (IFPs) are currently used throughout the District. Approximately (20) SMARTBoards still need to be replaced. 	<ol style="list-style-type: none"> Continue with the current initiative to refresh some IFPs each year. Further the use of audio reinforcement in the classroom. Establish a Classroom audio system and maintain refresh cycle. Maintain the refresh cycles as per the <i>10-Year Roadmap</i>.
		0	Classroom Audio-Enhancement	<ul style="list-style-type: none"> No classroom audio reinforcement systems are installed. The district provides equipment to students based on their IEPs which meets needs. 	
		4	Document Cameras	HD document cameras are in every classroom which meet district needs.	

Photos, left to right:

- Outdated SMARTboards (inset) have largely been upgraded to Interactive Flat Panels (IFPs) in the past few years.
- A typical HD document camera in an ES classroom.



2. Existing Conditions and Recommended Improvements (cont.)

System Grading key appears on page 17.

The 10-Year Roadmap includes Rough Order of Magnitude cost estimates to implement these recommendations.

DISTRICT-WIDE SYSTEMS (CONT.)

System Grading key appears on page 17.

6. STUDENT DEVICES **STUDENT DEVICES**

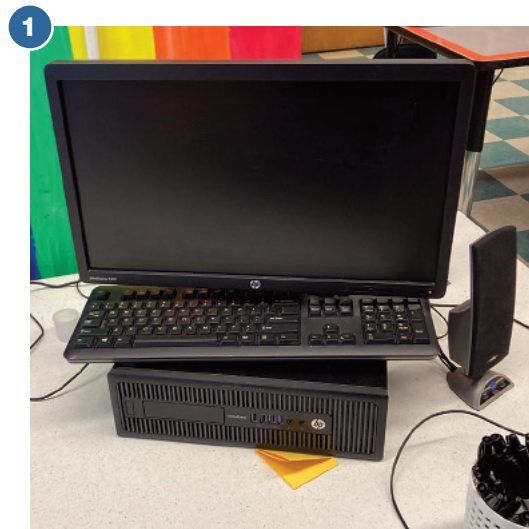
<p>CURRENT GRADE 2.8 out of 4.0</p> <p>RECOMMENDATIONS Review tech programs and upgrade hardware to support district needs.</p>	SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
	PCs/Laptops/Tablets	2.8	Hardware	<ul style="list-style-type: none"> Student desktops are older devices. There are (2) labs that have about 25 devices each. Student Devices: <ul style="list-style-type: none"> Pre-K – 3: iPads 4 –12: ChromeBooks of which approx.500 are new 	<ol style="list-style-type: none"> Update the Tech Lab desktops to support required programs. Maintain refresh cycles per the <i>CTP Roadmap</i>.
			Antivirus	RIC-provided services meet district needs.	No recommendations at this time.
			Technology Refresh	Current refresh policy meets district needs.	Maintain refresh cycles per the <i>CTP Roadmap</i> .

7. TEACHER & ADMIN TECHNOLOGY **TEACHER & ADMIN TECHNOLOGY**

<p>CURRENT GRADE 2.7 out of 4.0</p> <p>RECOMMENDATIONS</p> <ul style="list-style-type: none"> Upgrade outdated laptops and desktops. Establish and maintain consistent refresh policies. 	SYSTEM	SYSTEM GRADE	SYSTEM CATEGORY	CURRENT CONDITION	RECOMMENDED IMPROVEMENTS
	Teacher Computing Devices	4.0	Hardware	A mix of outdated Windows desktops and current iMac desktops are in use.	<ol style="list-style-type: none"> Desktops are schedule to be upgraded to laptops. Maintain refresh cycles per the <i>CTP Roadmap</i>.
			Antivirus	RIC-provided services meet district needs.	No recommendations at this time.
			Technology Refresh	The district lacks a consistent refresh policy for these devices.	Maintain refresh cycles as shown in the <i>CTP Roadmap</i> .
	Admin Computing Devices	0.0	Hardware	About half of the Admin desktop devices are obsolete and out of warranty/service.	Upgrade the obsolete desktops and maintain the refresh cycles per the <i>CTP Roadmap</i> .
			Antivirus	RIC-provided services meet district needs.	No recommendations at this time.
			Technology Refresh	The district lacks a consistent refresh policy for these devices.	Maintain refresh cycles per the <i>CTP Roadmap</i> .
	Copiers and Printers	4.0	Copiers	The current RIC-leased equipment meets district needs.	No recommendations at this time.
			Printers	The current RIC-leased equipment meets district needs.	No recommendations at this time.
Technology Refresh			Meets district needs.	Maintain refresh cycles per the <i>CTP Roadmap</i> .	

Photos left to right:

1. A teacher's classroom desktop in a classroom.
2. A typical classroom printer.
3. A newer iMac teacher desktop with a classroom laser printer.



December 1, 2022



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585.424.1952

December 1, 2022

3. Telecommunications Room (TR) Master Plan

Introduction

Purpose

To ensure all the district’s Telecommunications Rooms—the spaces that securely house IT telecommunications and other systems’ equipment—are designed to the same industry best practices, system technology, and manufacturer-specific standards.

This section is also designed to provide preliminary Serving Zone (SZ) drawings for district use. Serving Zones are determined by building architecture, existing labeling, and cable IDs, and are designed to keep cabling within 300’ of the TR for optimal performance. These SZ drawings will assist with the planning of future cabling projects.

Audiences

These Design Standards shall be used by the following involved parties in the design, procurement, or installation of Telecommunications Rooms and other IT-equipment spaces:

- Architectural/Engineering firms
- Design professionals
- System integrators/vendors
- District IT professionals to assist in troubleshooting and locating the origination and destination of cabling.
- Tradespeople

Sections and Subsections

Each section focusing on a technology infrastructure system includes the following subsections:

- **Overview** describing the major functional requirements of the system.
- **Product Standards** to use when purchasing products from vendors.
- **Implementation Standards** to use when designing, installing and deploying these systems.
- **Documentation Standards** to use for Design and As-Built documentation for these subsystems.

Contents

- Applicable Industry Standards 37
- Telecommunications Rooms (TRs) and Spaces 38
 - Overview 38
 - Product Standards for TR and Spaces 39
 - Implementation Standards for TRs and Spaces 40
 - TR Requirements 41
 - Documentation Standards 42
- Anytown CSD Serving Zone drawing 44

A complete set of Anytown CSD Building Serving Zone drawings has also been supplied to the district by Archi-Technology under separate cover.

continued

Applicable Industry Standards

- Americans with Disabilities Act
- ANSI/BICSI 005-2103 Electronic Safety and Security (ESS) System Design and Implementation Best Practices
- ANSI/TIA-568-C
- ANSI/TIA-569-C
- ANSI/TIA-606-B
- ANSI/TIA-607-D
- ANSI/TIA-758-B
- ANSI/NECA/BICSI 568
- ANSI/TIA-862-B Building Automations Systems
- ANSI/
- Building Code of New York State
- BICSI Telecommunications Distribution Methods Manual
- BICSI Customer-Owned Outside Plant Design Manual
- Federal Communications Commission
- Federal Occupational Safety and Health Administration
- Institute of Electrical and Electronics Engineers, Inc. (IEEE)
- Insulated Cable Engineers Association
- ISO/IEC 11801-International Organization for Standardization
- National Life Safety Code, NFPA 101
- National Electrical Code, NFPA 70 (NEC)
- NYS State Education Department (NYSED), Office of Facilities Planning - Manual of Planning Standards for school buildings
- New York State Department of Labor Rules and Regulations
- New York State Department of Health
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- OSHA (Standards-29 CRF) Telecommunications –1910.268
- TIA/EIA-J-STD-037
- Underwriters Laboratory

continued

Overview

Telecommunications Rooms (TRs) contain Network, Voice, Access Control, Intrusion Detection, Video Surveillance and Public Address (PA) equipment and cabling. There are several types of these rooms which are described below along with their functions and requirements. The terms and definitions are specific to the MMCS D IT Department. They also hold sensitive data on servers such as student data, surveillance video.

Telecommunications Room (TR)

These are rooms that contain equipment and cabling for systems such as Network, Voice, Public Address (PA), Access Control, Intrusion Detection, Video Surveillance, Life Safety, and CATV cabling and equipment. Each TR provides a connection point between the work area outlets and edge devices of each system and the network in a predetermined serving zone. Each building must have at least one TR but most buildings have several. The number of TRs a building has depends on the several factors such as:

- Distance limitations of the Horizontal cabling
- Connected Device counts
- Building Construction

Because of their function TRs are specialized rooms that have unique requirements that need to be considered during the Design such as;

- **Security.** Ed Law 2D, Section 5,F, 4: “Maintain reasonable administrative, technical and physical safeguards to protect the security, confidentiality and integrity of personally identifiable student information in its custody.” (1/1/2021)
- Environmental control
- Power/ Emergency Power
- Telecommunications Grounding Backbone

TRs are grouped into two categories:

- Main Telecommunications Rooms (MTR) and;
- Intermediate Telecommunications Rooms (ITRs).

An MTR connects all ITRs via Intra-building backbone cabling and pathways. The MTR is also the location where the building Network equipment connects to the Inter-building Outside Plant Cabling (OSP) cabling of the District’s CORE Networks.

Entrance Facilities (EF)

Entrance Facilities (EF) are communications spaces that provide a Transition Point between the Outside Plant cabling and the Service Provider cabling. EFs can be located within a TR but, due to code considerations with respect to OSP cabling, these are often separate spaces near the point where the OSP cabling enters the building. Entrance Facilities also provide a Demarc location between Outside Service Providers where the district can connect to the Services.

Server Rooms (SR)

Server Rooms (SR) are climate controlled spaces dedicated to the continuous operation of computer servers. These spaces shall have min 36” doors to allow for the installation and removal of large equipment.

Location: Shall not be located on the top floor or in basements. Avoid exterior walls with windows to maximize security. Ideally the room should be located in a centralized location within the building. The Server Room shall be accessible from a corridor and without having to use stairs of any type. Generally first levels are preferred locations.

continued

Product Standards for TRs and Spaces

These general recommended standards and best practice will vary slightly between districts.

Racks

- **Size:** 19”w x 84”h
- **Type:** 4 post
- **Fittings**
 - Provide communications racks within each TR.
 - Racks must accommodate at least 33% growth after original design.

Cabinets

- **Size:** 19”w x 7’h x 28”d

Horizontal and Vertical Cable Management

- **Size:** 16”w x 7”h
- **Vertical Cable Management Fittings:** Provide a minimum of (2) vertical Front/Rear cable management to each rack.

Overhead Cable Management - Ladder Racks

- **Size:** 12” – 18”w
- **Type:** Hollow bar, Telco-style construction with 9” spacing between rungs and black powder coated.
- **Fittings:** Hollow-bar, metal cable runway shall be provided around the room and over the communication racks. (Wire basket tray or any other cable tray is not permitted. See details for typical room configuration).
 - The cable runway shall be mounted 7’6” above the Communications Racks.
 - Provide a rack mount kit that connects to the cable runway to the Communications Racks.
 - Provide radius drop out kits where cables will drop into vertical management of the Communications Racks.
 - Runway must accommodate at least 33% growth after original design.
 - Runway must be supported by wall brackets, trapeze hangers and 3/8”-threaded rod and rack connection kits (provide threaded rod covers as required).

Power Distribution Units

- **Type:** 8-outlet, 20 Amp
- **Fittings:** Provide (2) power strips for each rack.
- **UPS:** Connect to UPS.

continued

Implementation Standards for TRs and Spaces

TR Location

The TR **shall be**:

- Centrally located within the Serving Zone.
- Free of water or drain pipes not directly required in support of the equipment within the room.
- Located in an accessible area on each floor. Access to the TR should be directly from hallways or service corridors; not through classrooms, offices, or spaces not accessible by maintenance level keys.
- Vertically stacked between floors where possible. When staking TRs, make sure that the doors are also aligned to prevent conflicts with the riser pathways and cabling between floors.

The TR **shall not** be located:

- In any place that may be subject to water, steam, humidity, heat, and any other corrosive atmospheric or environmental substance.
- Near electrical power supply transformers, elevator or pump motors, generators, radio transmitters, induction heating devices, and any other potential sources of electromagnetic interference (EMI).
- Near sources of mechanical vibration that could be conveyed to the room through the building structure such as air handlers and exhaust fans.
- In a shared space or near electrical closets, boiler rooms, washrooms, janitorial closets and storage rooms.

TR Sizing

Recommended **minimum** IT Room sizes:

- **Entrance Facility:** 6'w x 4'd
- **Main Telecommunications Room (MTR):** 10'w x 12'd
- **Intermediate Telecommunications Room (ITR):** 9'w x 10'd

TR Layout

- In a TR dedicated to communications infrastructure, the communications rack(s) shall be installed adjacent to each other and parallel to the wall with the greatest length.
- A clearance of 6" should be maintained from the first rack to the wall, and a minimum of 3' should be left at the anticipated end of the row of equipment racks. A 3' minimum clearance at the front and back of the equipment racks will allow space for wall mounted equipment and cable terminations.
- In larger buildings requiring additional rows of equipment racks, the racks shall be lined up in rows with 5' separation row-to-row, and 3' row-to-wall. The number of equipment racks required will determine the dimension.

continued

TR Requirements

Major factors that must be considered when designing the ER/TR include:

Ceiling

- The minimum ceiling height must be 9'.
- Ceiling protrusions need to be removed to assure a minimum clear height of 8'6 inches to provide space over the equipment facilities for cables and suspended racks.
- For maximum flexibility, accessibility and airflow, drop ceilings shall not be installed.

Entrance Doors

- The door shall be a minimum of 36" w x 80" h. Door shall be fire rated for a minimum of one hour or more as required by local code requirements.
- Doors must open outward (code permitting).
- TR doors shall be equipped with Card Access.
- Provide double doors for shallow closet TRs.

Walls

- Interior finishes shall be in a light color (linen) to enhance room lighting.
- TRs shall be supplied with void-free, 3/4-inch AC-grade plywood 8' in length. Quantity and layout will be based on cable support structure and routing pathways required in the space.
- The plywood must be securely fastened to the wall-framing members.
- Plywood shall be fire retardant or painted with fire retardant paint. Plywood will be mounted vertically starting at 6" above the finished floor.

Floors

- Floors must be anti static Vinyl Composition Tile (VCT) that has been bonded to minimize dust and static electricity that can damage electronics located in the room.
- Floor loading capacity in the TR shall be designed for a minimum distributed load rating of 50 lbf/ft².

Environmental Controls

- The recommended operating temperature should be set between 60°F to 80°F.
- The recommended humidity level should fall between 30% and 65%. Humidity should be a concern if it is anticipated that normal level within the TR would fall outside these parameters.
- Heating, ventilation, and air-conditioning sensors and dedicated control equipment related to the environment within the TR must be located in the TR.

Lighting

- Provide a min of 50 ft. candles measured 3' above finished floor.
- Suspended light fixtures should be mounted at 8'6" above the finished floor.
- Position the light fixture(s) above an aisle area, front and back only, and not directly over equipment racks or cabinets.
- Wall-mounted fixtures are permissible if lighting standards are met. Wall mounts should be placed in such a manner that they will not interfere with infrastructure pathways, protective equipment, and cables.
- Emergency lighting should ensure that the loss of power to normal lights will not hamper emergency exits from the telecommunication spaces.

continued

3. TR Master Plan (cont.)

TR Requirements (cont.)

Electrical

- All TRs shall have a minimum of (2) 20A dedicated power circuits per equipment rack.
- These power circuits shall be sourced from two different electrical risers and one shall be sourced from emergency power if available.
- TRs shall also have a minimum of two courtesy outlets mounted on two different walls with in the room.
- Check with IT Department for additional power requirements for UPS's

Bonding and Grounding

- Bonding and Grounding shall conform to ANSI/TIA-J-STD-607-B Generic Telecommunications Grounding and Bonding (Earthing) for Customer Premises, NEC Article 250 and hardware manufacturer's grounding requirements.
- The telecommunications grounding main busbar must be connected to the electrical system building ground electrode. All TRs must be provided with a Telecommunications Grounding Busbar (TGB) that is ANSI approved and UL listed.
- The IT bonding and grounding system shall be dedicated to the TRs within the building.

Documentation Standards

All Technology Infrastructure projects shall have the following components for Design and As-Built documentation.

Design Documentation

T-Drawings Technology drawings shall be identified as "T" series (Technology) drawings in the approved construction drawings, separated from "E" (Electrical) drawings. These T-series drawings shall include:

- Symbols and Legends: Use industry standard symbols with explanatory legends.
- Riser diagrams for communications cabling.
- System one-line drawings
- Serving Zone Boundaries Identified
- Plan view drawings showing outlets, cable pathways, sleeves, and conduits.
- Telecommunications Room layout/elevations
- Equipment rack layouts
- Installation Details to include, but not limited to:
 - Communications outlets
 - Teaching Stations
 - Cable trays
 - Grounding and bonding
 - Wireless Access Points
 - Camera locations
 - IP clocks and PA speaker locations.
 - Installation information
- Outside plant, cabling, methods and paths with footages and bends.

Documents MUST be provided to the District for review and approval before final design acceptance will be issued.

continued

3. TR Master Plan (cont.)

As-Built Drawings

Upon completion of each project, a complete As-built of the installed cable plant shall be provided by the contractor to the district's IT department. As-built documentation shall include the following:

Drawings

Including cable routing, termination location and labeling information

- CAD files of the As-builts
- PDFs of the As-builts
- Hard copies: (1) set of drawings printed at the same size as the Contract Construction drawings.

Cable schedules

Excel formatted minimally with individual columns labeled:

- TR
- Cable ID# (ex 1A-A-48)
- Room #

Cable Test results

- **Copper test results:** Organized by TR in electronic format
- **Fiber test results:** Organized by TR in electronic format

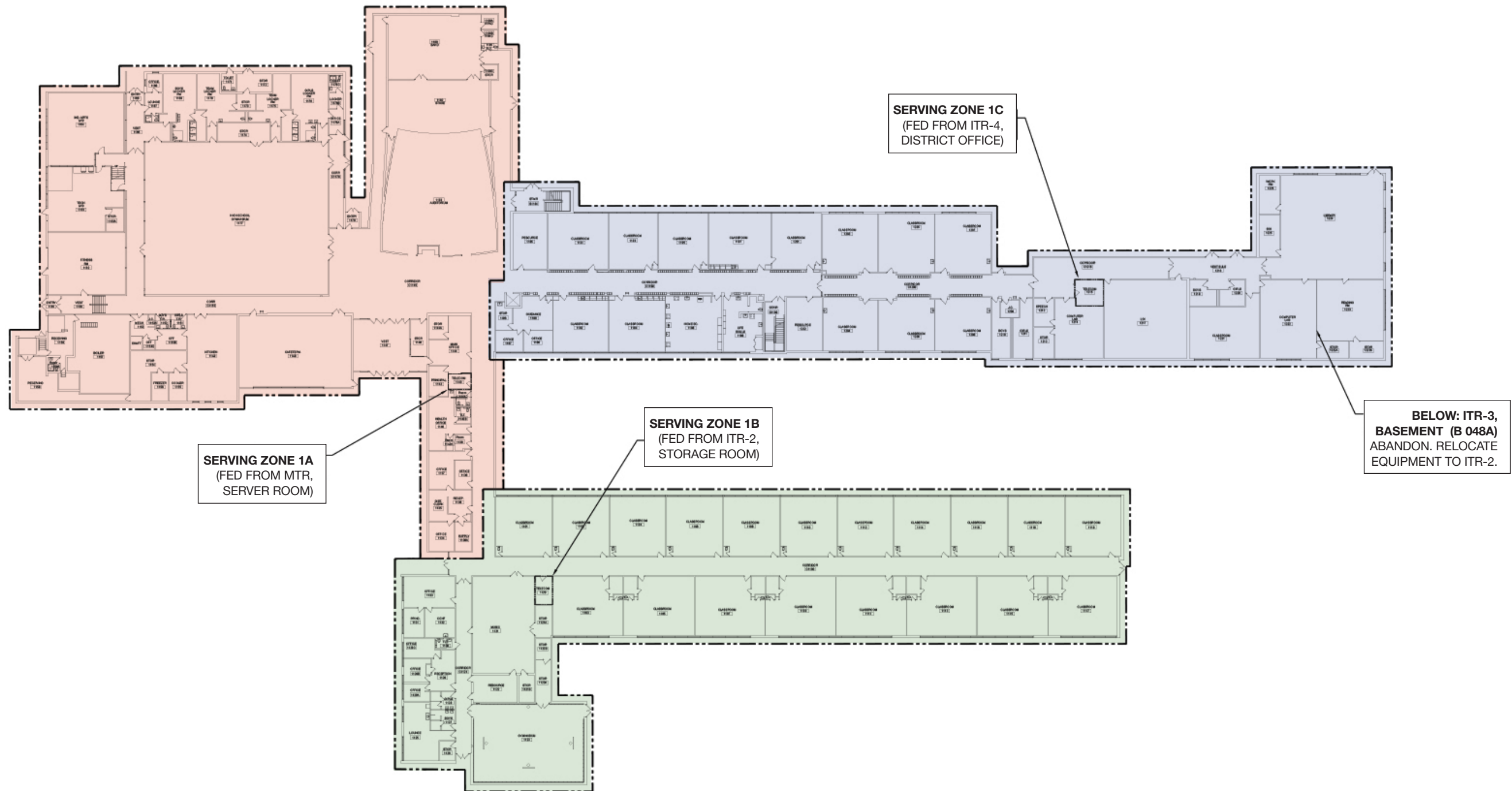
Documents MUST be provided to the District for review and approval before final acceptance will be issued and or the project closed out.

3. TR Master Plan (cont.)

Sample Anytown CSD Serving Zone Drawings

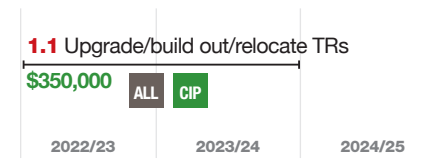
A complete set of Serving Zone (SZ) drawings for each floor of every building surveyed has been provided to the district under separate cover as a PDF file. Here is a district SZ drawing that illustrates the level of detail in each drawing.

ANYTOWN CENTRAL SCHOOL FIRST FLOOR



4. 10-Year Comprehensive Technology Roadmap

4. 10-Year Comprehensive Technology Roadmap (cont.)



EXAMPLE ROADMAP PROJECT

This Telecom Room upgrade project:

- Has an ROM cost estimate of \$350,000.
- Will occur over two full academic years (22/23 & 23/24).
- Will apply to all district buildings.
- Will be funded by a Capital Improvement Project.
- Supports the District's Scalable Technology Infrastructure goal.

About the District's 10-Year Technology Roadmap

The 10-Year Comprehensive Technology Roadmap on the following pages provides a one-page snapshot of the District's total ten-year spending on technology including:

- Identified technology projects needed to meet strategic needs
- Rough Order of Magnitude (ROM) estimated cost
- Duration and year(s)
- Applicable district building(s)
- Alignment with a District long-term goal.

The 10-Year Roadmap (example project entry shown at left) was developed specifically for the District based on a number of sources:

- The Technology Conditions Survey of district buildings, as per section 2 of this report, Existing Conditions and Recommended Improvements.
- Interviews with and data from district department staff including Superintendent, Instructional, Technology, Facilities, and Business.
- Past and current projects, budgets, and expenses.
- Telecom Room Master Plan (section 3).

Projects are shown in priority order with the first goal, Technology Infrastructure, having the highest priority as all other goals are reliant on it.

Equipment Lifespans and Refresh Cycles

Unlike many Architectural, Mechanical, Electrical, and Plumbing systems, Technology systems, components and devices have much shorter usable lives. For example, while a well-maintained boiler could be expected to run efficiently for 20 years or more, even a well-cared for network server or switch is only good for 5 – 7 years.

The shorter lifespans of technology devices—also driven by improvements in computing—require seemingly endless “refresh cycles” to constantly keep equipment up to date.

This is especially true for student computing devices such as ChromeBooks and iPads which have about a 3-year replacement cycle due to breakage.

Funding Sources and Purchasing Paths

Available from local, state, and federal sources, district funding and purchasing paths are an alphabet soup of acronyms: SSBA, E-RATE, BOCES CIP, COP, SAFE.

As shown below in a partial list, each source/path has restrictions on what it can be used to fund. Some sources will only fund infrastructure or learning devices while others only apply to services like internet access or network components.

The 10-Year Roadmap on the next page accounts for these qualifications and restrictions to optimize all available sources and paths available to the district.

Each technology project on the 10-Year Roadmap aligns with one or more long-term district goals to take a strategic approach to project funding



Summary of Funding Sources/Purchasing Paths for K12 Technology Projects

SOURCE/PATH	DESCRIPTION	QUALIFYING SYSTEMS	NOTES	DISTRICT GOAL(S) SUPPORTED	
American Rescue Plan	One-time federal funding source for Covid relief	<ul style="list-style-type: none"> • Infrastructure • Communications • Security 	<ul style="list-style-type: none"> • Classroom systems • Computing devices • Consultants 	Available funds must be used by Dec. 31, 2024	1 2 3 4 5 6 7 8
Board of Cooperative Educational Services (BOCES)	NYS-subsidized purchasing path	Discounted equipment and services		Usually requires the purchase of additional BOCES services that may outweigh the financial discounts.	2 5 6 7 8
Capital Improvement Project (CIP)	District funding source	Infrastructure and other systems		Requires community referendum as part of a construction project.	1 2 3 4 5 6 7 8
Capital Outlay Project	Per NYSED, a project with a total cost of no more than \$100,000. A district may receive aid for a maximum of one such project in any aid year.	<ul style="list-style-type: none"> • Infrastructure • Communications • Security 	<ul style="list-style-type: none"> • Classroom systems • Computing devices • Consultants 	Payments are made over the span of 12 months or more, or funds can be allocated toward the improvement of existing assets.	1 2 3 4 5 6 7 8
E-Rate	Two categories of federal funding source for internet connectivity	<p>Category 1. Telecom services including internet and telephone dial-tone access</p> <p>Category 2. Network equipment including racks, switches and servers</p>		Cannot be used for any devices or equipment.	2
Instructional Material Aid	NYSED program for “Instructional Computer Hardware and Technology Equipment Aid”	<ul style="list-style-type: none"> • Classroom • Computing devices 	<ul style="list-style-type: none"> • Equipment repair • Systems training 	Paid in the spring of the aid year.	5 6 7 8
Operations	District funding source from annual budget	Infrastructure and most other systems		Fully funded by district with no discounted rates.	1 2 3 4 5 6 7 8
SAFE Act	Federal funding source	Security systems and devices such as video surveillance cameras, access control, etc.		Cannot be used for any other systems including infrastructure.	4
Smart School Bond Act (SSBA)	One-time NYS technology funding source from '13 \$2B Bond Act	<ul style="list-style-type: none"> • Infrastructure • Communications • Security 	<ul style="list-style-type: none"> • Instructional/Classroom • Computing Devices • Consultants 	<ul style="list-style-type: none"> • NYS Education Dept. (NYSED) review & approval required which can take 6 – 8 months. • Funds never expire and can be applied to multiple projects. 	1 2 3 4 5 6 7 8

4. Anytown CSD Comprehensive Technology Planning: 10-Year Roadmap

- FUNDING SOURCES** BOCES BOCES Aidable CIP Capital Improvement Project E-RATE E-Rate G State Hardware/Software Grants SAFE SAFE Schools Act OPS Operations
- SSBA** Smart School Bond Act Allocation CO Capital Outlay Project TR Technology Reserve ARP American Rescue Plan (3.2021): ACSD allocation \$1,208,675

All ROM cost estimates are based on current market pricing on the date this report was issued. These cost estimates are subject to change based on evolving market conditions including supply chains, inflation, labor availability, etc.

DISTRICT GOALS	LIST OF PLANNED PROJECTS	ESTIMATED GRAND TOTAL												VISION	
		2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2032/33			
1 Reliable Sustainable Technology Infrastructure	<p>1.1 Build/relocate standards-compliant Telecom Rooms \$95,000 CIP</p>													SUBTOTAL \$95,000	School of the Future
2 Highly Reliable Network Connectivity	<p>2.1 Install redundant Core Switch \$15,000 E-RATE</p> <p>2.2 Refresh WIFI WAPs \$70,000 E-RATE</p> <p>2.3 Refresh UPSs & accessories \$12,500 E-RATE</p>													SUBTOTAL \$257,500	
3 Enhanced Communications	<p>3.1 Refresh VOIP equipment/software or replace analog system \$1,400/year x (10) years = \$14,000 BOCES</p> <p>3.2 Upgrade all PA systems to IP-based or hybrid Clock/PA system \$40,000 CO</p>													SUBTOTAL \$54,000	
4 Safe School Environment	<p>4.1 Replace/upgrade Security Cameras & Servers \$80,000 CO</p> <p>4.1 Replace coax cable with Cat6 \$12,000 CO</p> <p>4.2 Implement Lockdown System (door contacts) \$10,000 SSBA</p>													SUBTOTAL \$102,000	
5 Technology-Enriched Environment	<p>5.1 Refresh classroom display systems \$25,000/year (x) 10 years = \$250,000 SSBA</p> <p>5.2 Deferred payments for (5) printers & copiers \$7,500/year (x) 10 years = \$75,000 BOCES</p> <p>5.3 Replace physical servers with VMware servers & SAN \$50,000 BOCES</p>													SUBTOTAL \$425,000	
6 Personalized Learning	<p>6.1 Upgrade obsolete student desktops \$37,500 BOCES</p> <p>6.2 Refresh student ChromeBooks \$50,325/year (x) 10 years = \$503,200 BOCES</p>													SUBTOTAL \$615,750	
7 Anywhere/Anytime Learning	<p>7.1 Mobile Hotspots annual fee \$5,000/year (x) 10 years = \$50,000 E-RATE</p>													SUBTOTAL \$50,000	
8 Teachers and Staff Computing Devices	<p>8.1 Replace staff laptops \$37,500 BOCES</p> <p>8.1 Replace staff desktops \$10,500 BOCES</p>													SUBTOTAL \$96,000	
9 Annual Software Subscriptions	<p>9.1 Annual Professional Development \$26,000/year (x) 10 years = \$260,000 BOCES</p> <p>9.1 Annual Instructional Software fees \$9,000/year (x) 10 years = \$90,000 BOCES</p> <p>9.2 Annual Administrative Software fees \$9,000/year (x) 10 years = \$90,000 BOCES</p>													SUBTOTAL \$440,000	
10 Service Maintenance Agreements	<p>10.1 PA & Phone Systems Maintenance Contracts \$7,000/year (x) 10 years = \$70,000 BOCES</p>													SUBTOTAL \$70,000	
		2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2032/33			

Practical Next Steps to implementing this Plan at Anytown CSD



Now that Anytown Central School District (ACSD) has a 10-year *Comprehensive Technology Plan* based on its current systems' conditions, how can district management put the plan into action? In Archi-Technology's planning experience with over 50 upstate NYS school districts, here are five ways to implement the recommendations in this report and plan.

1. Upgrade Technology Infrastructure with a Capital Improvement Project referendum

As illustrated in this report, ACSD's **technology infrastructure**—cables, pathways and spaces—is the foundation for all of the district's technology systems including Instructional, Security and Communications. Upgrading this mission-critical system to industry standards across all district buildings should be every districts highest priority.

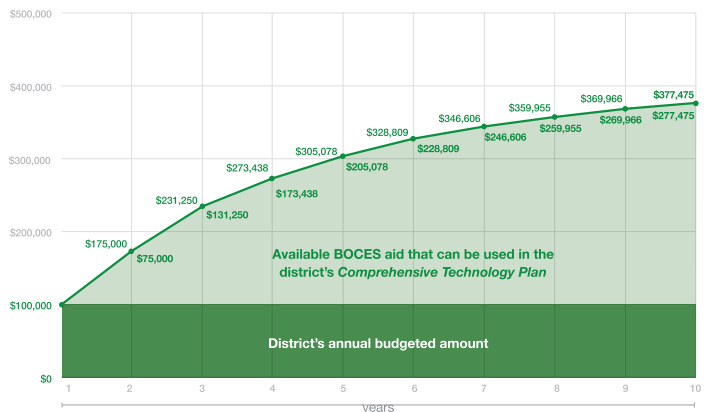
The Capital Improvement Project Rough Order of Magnitude (ROM) cost estimates for Technology Infrastructure in the *Comprehensive Technology Plan* can be used to develop a district referendum for voter approval. Several of our district clients have successfully used this strategy to get a strong start out of the gate.

2. Reinvest BOCES aid in technology to maximize future aid.

By consistently spending all its annual BOCES budgeted amount, NYS school districts can increase their Year-Over-Year available BOCES aid as shown in this example.

Over ten years, a district with a 75% BOCES Aid Rate that maintains an annual BOCES spend of \$100,000 can increase its available BOCES aid by about 150% from \$75,000 in Year 2 to \$277,475 in Year 10.

Allocate your district's BOCES aid generated by technology spending back into technology spending each year, thereby rolling-up your technology budget over time.



3. Perform Design Reviews for constructability and interoperability.

While individual contractors and vendors will submit design drawings and specifications for review, it's vital that all technology systems design are objectively and thoroughly reviewed for **constructability** to identify obstacles before a project is actually built to reduce or prevent errors, delays, and cost overruns.

That's why knowledge of and adherence to evolving industry standards by a certified specialist at the Design phase is critical to a project's success. Your design team should include a Registered Communications Distribution Designer (RCDD) to ensure compliance to these technology systems standards as well as best practices and constructability.

Designs also need to be compared to each other to ensure correct **interoperability** at systems cutover.

4. Actively manage Technology Systems construction.

Once construction begins, ongoing Technology Construction Management (TCM) is critical to coordinate all construction activities relating to the technology components of a capital project with owners, vendors, architects, CM firms and IT staff.

TCM ensures that all systems' designs are being adhered to during the construction phase with proper testing. In addition to regular site visits to see work in progress, Construction Administration (CA) services may be needed to manage all the electronic documents required including front-end documents and construction management of RFIs, Submittals, Field Orders, etc.

5. Revisit the 10-Year Plan at least twice a year.

Unlike most Architectural, Mechanical, Electrical and Plumbing systems, Technology systems are constantly being repaired, upgraded, or replaced due to increasing utilization and rapid evolution. It is recommended that key staff meet at least twice a year to ensure the 10-Year *Comprehensive Technology Plan* is kept up to date.

Archi-Technology can provide many of these services to districts or they can be self-performed (based on the district's in-house resources). Our Planning and Design QA/Build QC services are NYSED aidable and can also be funded as an incidental expense for a capital project.

> Contact **Kevin Zimmer** at **315.796.8212** to discuss how Archi-Technology can help Anytown CSD make this plan a reality.