



Anytown Central School District
CER Master Plan & Infrastructure Review

May 1, 2018

Prepared for Anytown Central School District

Presented by Archi-Technology LLC



ARCHI-TECHNOLOGY_{LLC}
Technology Consultants

Connecting People, Technology & Buildings

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Executive Summary

On April 12 – 17, 2018, Archi-Technology LLC conducted a Technology Conditions Survey (TCS) of the technology infrastructure systems—including Communications Equipment Rooms (CERs)—in the following Anytown Central School District buildings:

- High School
- Elementary School
- Middle School
- Bus Garage

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

continued

Anytown Central School District's four major facilities were surveyed for the conditions of their inter- and intra-building Technology Infrastructure systems.



1. Executive Summary (cont.)

Specific Communications Infrastructure components that were surveyed included:

- Horizontal Cabling
- Backbone Cabling (inter- and intra-building)
- Pathways
- Spaces including CERs

Note: The surveys focused on technology infrastructure and did not include other district technology systems typically included in a Technology Conditions Survey such as Communications, Instructional Systems, AV and Security.

Anytown is a small city on the southwest shores of Long Lake in upstate NY. The current district enrollment is 1,202 students in grades PK-12.

The survey included a review of the district's recent purchases, deployments and equipment inventory. The survey also included visual on-site inspection of existing infrastructure conditions and foundational questions that were answered by district representative.

All recommendations are based on industry standards and best practices while taking the districts visions and goals into consideration.

Archi-Technology recommends making improvements focused on creating a secure scalable infrastructure. The most notable recommendations are:

- **High Priority:** Provide 1U Corning Fiber Termination units, panels and strain-relief kits for existing 6-strand SM feed fiber.
- Identify all Elementary School (ES) communications outlets and cables on existing as-built drawings and generate an electronic cable schedule for each TR. Update documentation for all other buildings.
- Rewire the Middle School (MS) and High School (HS) due the Communications Equipment Room (CER) spaces requiring improvement and general condition of the cabling infrastructure. Also install mechanical re-enterable firestop sleeves.
- Provide each classroom with (2) Cat6A cables to support current and future wireless systems.
- Upgrade District Fiber to accommodate a 10Gbe Backbone.
- Install Cable Trays throughout the ES and HS. Provide supplemental Cable Tray in the MS.
- Upgrade all CERs to meet industry standards for security, rack clearance, cable management, lighting, flooring, ceilings, etc.
- Consider enlarging the ES's current CER-A and making this either a secondary data center and the new network service provider Dmarc location.
- Create a MS CER-BB using dedicated space in the MS basement where there is plenty of unused space suitable for a CER.
- Relocate HS CER-A to adjacent Room 101A which might be large enough to act as a Primary Data Center.
- Move HS CER-C to Room 322 which already serves as a Security IDF. Create a new CER-1D in the HS somewhere near the gymnasium.
- Consider relocating the Bus Garage Data Center to either the HS or ES in the future.
- Sample test ES Cat 5e cabling to determine if it is capable of supporting 1Gbs connections. If so, have entire cable plant tested and documented.
- Provide redundant and diverse fiber backbone creating a starmesh backbone topology.

A Rough Order of Magnitude (ROM) Cost Estimate for these and other less critical recommended improvements appears in Appendix B of this document.

Definitions

Term	Acronym	Description
Americans With Disabilities Act	ADA	
Building Distribution Frame	BDF	A legacy Bell Telephone term for the point where all cabling terminates.
CNYRIC	CNYRIC	Central New York Regional Information Center
Communications Equipment Room	CER	A room that supports communications systems cabling and 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	
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.
inter-building		Between two or more separate buildings.
intra-building		Within a building.
Internet Service Provider	ISP	
Main Distribution Frame	MDF	A legacy Bell Telephone term for the main room that supports communications cabling and equipment.
Multi-Mode	MM	A transmission performance category for fiber optic cabling.
National Electrical Code	NEC	
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.
Public Address System	PA	
Personal Computer	PC	
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 communications interface.
Redundant Array of Independent Disks	RAID	A data storage virtualization technology used for data redundancy.
Rough Order of Magnitude	ROM	
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	
Communications Ground Bar	TGB	A component of the Communications Bonding and Grounding system that connects the communications 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.
Telecommunications Room	TR	Generally considered a floor-or tenant-serving (as opposed to building- or campus-serving) space that provides a connection point between backbone and horizontal cabling.
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	
Wireless Access Point	WAP	

1. Existing Technology Conditions

DISTRICT-WIDE TRENDS

Communications Infrastructure

Horizontal Cabling

1. The installed cable plant in all buildings consists of Category 5, 5e, 6 and Cat 6A cabling with Category 5e cabling most commonly used. Cat 5e has the potential to accommodate 1 Gbps data connections; however, a sample testing of the installed Cat 5e cable should be performed to confirm this.
2. Significant portions of cabling in all buildings were not properly supported using cable trays or other industry-standard products.
3. Except for the Elementary School, all buildings lack suitable cable firestopping.
4. Data faceplate labeling is inconsistent in presence, standardization and accuracy.
5. As-built drawings reflecting serving zones, communications outlets, communications pathways, and cable identification labels and test reports are not available for all buildings.

Backbone Cabling

Service Provider Cabling

- 1. Copper (Verizon).** The copper back bone for the district consists of a main distribution wall field located in the Elementary School's MDF.
 - The copper feed cable originates from Pole #L650, 273-3 TT Co #2 and is routed into the MDF.
 - Two other 100pr copper cables run from the Elementary School's intra-building backbone fiber which consists of 18-strand 62.5 um MM riser fiber. This fiber runs between MDF(CER 1A) and the IDFs (CER-1B and 1C).
 - This fiber does not run through any inner duct or conduit.
 - These fibers have been relatively well terminated and labeled.
- 2. Fiber.** Currently two service providers—Spectrum and Anytown Telephone—have a presence in the District Server Room which is located within the Bus Garage. Each service provider has a single-mode feed cable that enters the building via aerial strand from Pole# L655 336 TT CO #10. Anytown Telephone currently provides the district with network service while the Time Warner equipment is not in use.
- 3. Coax (Spectrum).** Every room in every district building was wired with coax cable. Almost all of these cable run to the TR; however, it is suspected that these cables are not plenum rated.



Main copper backbone distribution wall field in Elementary School MDF



Coax cable outlets are available in every room in the district.

continued

2. Proposed Technology Improvements

Communications Infrastructure

Horizontal Cabling

1. Determine if existing Cat 5e cabling will handle 1Gbe with sample tested to Cat 6 specifications.
2. Identify all communications outlets and cables on existing as-built drawings. Generate an electronic cable schedule for each CER where the cable can be reused.
3. Consider rewiring the Middle and High Schools primarily due the TR spaces requiring improvement. Pathways would also need to be installed.
4. Going forward, install (2) Cat 6A cables per Wireless Access Point.
5. Provide each classroom with (2) Cat6A cables
6. Re-terminate all Cat-6A cables Current cable pairs should not be untwisted more than 0.5". Terminate according to manufacturer's recommendations.
7. Remove unused legacy cabling from all buildings
8. Adopt attached Cable Installation Procedures.
9. Adopt attached Design Guides standards.
10. New cabling should not be installed without first considering improvements to Pathways and Spaces. Failure to do this could result in wasted time, effort and funding.

Backbone Cabling

Inter-building Fiber Optic Backbone

1. Construct new District Server Room **before** upgrading inter-building fiber. This will likely involve a service provider fiber move and should be strategically planned, coordinated and implemented.
2. Install new inter-building backbone SM fiber.

Intra-building Fiber Optic Backbone

1. Make improvements to Pathways and Spaces (CERs) **before** upgrading intra-building fiber.
2. Replace all intra-building backbone cabling in all buildings.
3. Install 50um OM4 and SM-armored fiber designed to handle 10+ Gbe networks.

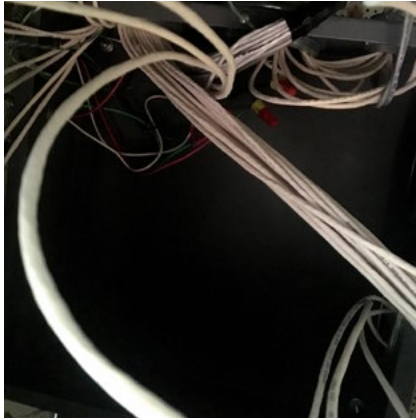
District-Wide Recommendations

1. Provide 1U Corning Fiber Termination units, panels and strain-relief kits for existing 6-strand SM feed fiber. Have these fiber properly installed, tested and labeled within the panels.
2. After CER improvements and new spaces have been built, provide the following:
 - a. 25-pair copper interconnect cables between the Main TR's MDFs and IDF
 - b. 100-pair copper interconnect cables between the MDF and the Verizon service provider demarcation. This will make it easier to provide and distribute POTS, FAX and Fire Alarm panel ring-down services throughout the building.
3. Research the district's contract with its cable TV service provider to determine if and how much the district is charged monthly for CATV service. Then compare that with potential network-based TV options.

continued

2. Proposed Technology Improvements/**Communications Infrastructure (cont.)**

Communications Pathways



Power to communication pull box
in Middle School room 224.

Cable Support

1. Install Cable Trays throughout the Elementary and High Schools and provide supplement Cable Tray in the Middle School. All trays need to be grounded and bonded.
2. Ensure that J-hook pathways are installed according to Design Guide standards when the new cabling is installed.
3. Provide radius-controlled secondary pathways to accommodate bend radius and fill capacity of new cabling.
4. Provide mechanical firestop sleeves that can be re-entered for firewall penetrations throughout all buildings.
5. Provide supplemental backbone conductor for Elementary School basement.
6. Provide cable runways within all TRs.
7. Keep and maintain records of all pathways and infrastructure.
8. Have power removed from the communication pull box in Middle School room 224.

Rooms/Spaces – Communications Equipment Rooms (CERs)

District-Wide General CER Recommended Improvements.

Rooms may not require all suggested improvements.

1. Dedicate all CER spaces for the sole purpose of providing network and data service. Do not use these rooms for storage of any type.
2. Provide Grounding and Bonding riser systems in all buildings.
3. Provide dedicate environmental control in every CER.
4. Provide anti-static floor tiles in all CERs.
5. Remove drop-tile ceilings, paint walls, and provide 3/4" provide plywood wall covers.
6. Provide and install new racks and cable management.
7. Provide cable runway within each CER, and provide mechanical firestop sleeves that can be re-entered when needed.
8. Provide additional power as required to support UPS for a 45 min. – 1 hour uptime throughout the district. Label all power circuits and panels.
9. Make provision for access control on CER doors where appropriate.

Elementary School CER Recommended Improvements

1. **CER-A.** Consider enlarging this room and making this either a secondary data center and making it the new network service provider Dmarc location.
 - a. The ES is strategically placed within the center of the district which make it a desirable location from which to distribute a Star topology as opposed to the extremely vulnerable current Bus topology.
 - b. Consider adding a generator to this facility to harden the network even further.
 - c. Provide the district-wide improvements described above.
2. **CER- B.** Carve out a dedicated space within the existing room approximately 8'6" x 10'. Reorganize the room layout and provide the district-wide improvements described above.
3. **CER-C.** Reuse room but reconfigure and provide the district-wide improvements described above.

continued

Appendix A. Technology Conditions Survey Sheets

- District-Wide Conditions 25
- CER Survey Sheets 29

District-Wide TCS Sheets

Mark: E = Excellent S = Satisfactory U = Unsatisfactory

1. COMMUNICATIONS INFRASTRUCTURE			
1.1. Horizontal Cabling			
Item	Minimum Requirement to Pass	Mark	Comments
Horizontal UTP Cabling	Labeled and tested to CAT5E specifications. Cable is installed in one of the following raceway systems: Cable Tray, J-Hooks, Conduit, or Surface Raceway. Note: Fishable walls are acceptable where fire code allows.	U	<ul style="list-style-type: none"> • No records of Cat 5e test results. • Majority of primary pathways are insufficient. • 50% of surface raceway uses 700wrm which will not accommodate more than 2 cables. • 50% of all cabling lacks proper labeling.
Cable Counts	4 cables per classroom (2 in front, 2 in rear), 2 cables per office station	S	
Serving Zones	Serving zones are identified and documented to dictate the coverage area of a Communications Equipment Room (CER).	U	No existing serving zone information.
Wireless Access Point (WAP) Cabling	Each WAP is connected to the network with a CAT5E cable that has been labeled and tested.	U	Not all cables are labeled and there is no proof of testing.
1.2. Backbone Cabling			
Item	Minimum Requirement to Pass	Mark	
Intra-building Backbone Fiber	At least 6 strands of Single Mode fiber installed between primary CER and all secondary CERs.	U	None
Inter-building Backbone Fiber (Campus)	At least 6 strands of Single Mode fiber installed between primary building and all secondary buildings.	U	<ul style="list-style-type: none"> • There is 6 SM between buildings but the cable is poorly installed, terminated and labeled. • The fiber construction is sub par with respect to its purpose and installation environment.
Backbone Fiber Redundancy	Every logical fiber route has a redundant connection.	U	None observed.
Backbone Fiber Installation	All fiber is an armored sheath or contained within a conduit or innderduct. Installation route is documented.	U	No armor and majority of fiber is unprotected.
Service Provider Fiber Installation	All fiber is an armored sheath or contained within a conduit or innderduct. Installation route is documented.	U	Fiber route not documented.

continued

Appendix A. TCS Sheets/**District-Wide** (cont.)

Mark: E=Excellent S=Satisfactory U=Unsatisfactory

1. COMMUNICATIONS INFRASTRUCTURE (CONT.)			
1.3. Communication Pathways			
Item	Minimum Requirement to Pass	Mark	Comments
Cable Tray	Cable tray is installed per NEC/manufacturers guidelines. Cabling is supported properly and a fill ratio of 40% is not exceeded.	U	Only cable tray in the district is installed in the Middle School. This cable tray can be reused with adequate modifications.
J-Hooks	J-Hooks are installed at a maximum of 48" apart and attached per NEC / manufacturers guidelines. J-Hooks have bend radius protection to ensure a minimum bend of 2".	U	<ul style="list-style-type: none"> • Many J-hooks are over capacity and exceed 48" in distance. • Some supports are nonexistent.
Conduit	Conduit is installed per NEC guidelines. A fill ratio of 40% is not exceeded.	U	Many sleeves are at or over capacity in the High and Middle schools.
Surface Raceway	Surface Raceway is installed per NEC / manufacturers guidelines. All corner assemblies ensure a minimum bend radius of 2". Communications cabling is installed in a separate channel from 120VAC. A fill ratio of 60% is not exceeded.	U	More the 70% of all raceway fails this criteria.
Major Pathways - Cable Tray, Conduit	All major pathways are electrically continuous and grounded.	U	
1.4. Rooms/Spaces - Communications Equipment Rooms (CERs)			
Item	Minimum Requirement to Pass	Mark	Comments
CER Size	Room is able to support required equipment. Each rack has 3' of clearance to the front and back.	U	See the CER Survey Sheets on pages 29 – 30 for details.
CER Security	Rooms should be dedicated to Technology or Equipment should be in locked cabinets.		
CER Power	Equipment is connected to dedicated power outlets with panel/circuit information identified.		
Uninterruptible Power Supplies (UPS)	All servers, network hardware, telephone systems, and security systems (that cannot be battery backed) are connected to a properly sized UPS.		
CER Grounding	All racks, cable runway, and CER equipment are grounded to a Communications Ground Busbar (TGB) within the room. Each TGB is connected to the Main Communications Ground Busbar (MTGB) and main electrical service ground.		
CER Cooling	Each CER has adequate cooling / ventilation. For rooms with servers or other high heat output equipment, dedicated cooling is provided.		
1.5. EIA/TIA Standards			
Item	Minimum Requirement to Pass	Mark	Comments
Standards Compliance	Communications installations need to be compliant with EIA/TIA standards.	U	

continued

Appendix A. TCS Sheets/**District-Wide** (cont.)

Mark: E=Excellent S=Satisfactory U=Unsatisfactory

2. DATA NETWORK / TELEPHONE ACCESS			
2.1. Network Hardware			
Item	Minimum Requirement to Pass	Mark	Comments
Endpoint Connections - PCs	A minimum network connection of 100 Mb/s is provided to each PC.	S	
Endpoint Connections - Server	A minimum network connection of 1 Gb/s is provided to each Server.	S	
Switch Uplink Connections - Access Switches	A minimum network connection of 1 Gb/s is provided between each access switch to the distribution/core switches.	S	
Network Architecture - VLANs	VLANs have been configured for all voice, video, and building automation systems	S	New VLANs have been configured for data, voice and security.
Network Equipment - End of Life	For all chassis based switches, replacements for sub-components are still available.	S	
2.2. Wireless Network			
Item	Minimum Requirement to Pass	Mark	Comments
Coverage	The wireless network provides adequate coverage to the locations where it is required for educational and administrative support.	S	
Bandwidth	The wireless network provides adequate bandwidth to the locations where it is required for educational and administrative support.	S	
Wireless Network Segmentation	A separate SSID is setup for Staff, Students, and Guests. All district owned devices are configured to automatically connect to the correct network and authenticate using their Active Directory credentials.	S	Separate SSIDs are configured.
2.3. Network Security			
Item	Minimum Requirement to Pass	Mark	Comments
Firewall	Each connection from the network to an outside ISP is made through a firewall.	S	Cisco ASA 5525-X Firewall
CIPA Compliance	All access must be made through a content filter and must monitor student activities.	S	District currently has legacy Websense filter which should be replaced with Lightspeed Rockets. Note that this means that the bandwidth is bottlenecked at the Internet provider. Filter bandwidth TBD.

continued

Appendix A. TCS Sheets/**District-Wide** (cont.)

Mark: E=Excellent S=Satisfactory U=Unsatisfactory

2. DATA NETWORK/TELEPHONE ACCESS (CONT.)			
2.4. Network Monitoring			
Item	Minimum Requirement to Pass	Mark	Comments
Network Monitoring	All major components are monitored for faults. If faults are detected, automatic notifications are sent to the appropriate personnel.	S	
2.5. Communications Services			
Item	Minimum Requirement to Pass	Mark	Comments
Analog Telephone Service	A minimum of 3 POTS line to each school and 1 POTS line to all other buildings.	S	
Analog Telephone Backup	For schools that utilize a VoIP phone system, a minimum of 1 POTS line to each of the following locations: Main office, Nurses office, Security office.	S	
SIP Telephone Service	For schools that utilize a VoIP phone system based on SIP connections, a dedicated portion of their Internet bandwidth has been dedicated to the phone service.	S	
Internet Service	The primary Internet connection for the school / district to be a minimum of 1 Mb/s per 100 users.	S	
Redundant Service	A secondary Internet connection is provided to each location to ensure continuity of service in the event the primary connection fails.	U	No redundancy

 Appendix A. TCS Sheets/CERs - Elementary & Middle Schools

Mark: E=Excellent S=Satisfactory U=Unsatisfactory

1.4: TECH INFRASTRUCTURE: ROOMS/SPACES - COMMUNICATION EQUIPMENT ROOMS (CER)						ELEMENTARY SCHOOL						
Room No.	Grade	Size 3' Clear Space Front & Back	Security Secure/Dedicated Space or Locked Cabinet.	Environmental Control Air Conditioned, Controls, Forced Air Exhaust Vent, Environmental Controls	Dedicated Power Dedicated 20A Redundant, Circuits Labeled w/ Panel and Circuit ID	UPS/EM Power In Room or Building	Grounding Infrastructure TMGB, TGB, Grounding Conductors Correct Size, 2 Hole Lugs, Labeled	Overhead Cable Management	Cable Termination and Management Racks, cabinets, and horizontal and vertical wire management are adequate.	Room Construction Walls extended to Deck. Cable penetrations are compliant and sealed.	VCT Flooring	Ceiling
MDF CER-1A	Grade	U	S	U	S	S	U	U	S	S	U	U
	Notes	Does not have 3' clearance behind racks.	Room is dedicated to IT.	Room has residential-grade cooling that conflicts with the room heater in the winter months.	Room appears to have dedicated power but the outlets are unlabeled.		Grounding Riser non-existent.	No overhead cable management.			Concrete floor	Room has drop-tile ceiling . This is undesirable in TR's
IDF CER-B E33	Grade	U	U	U	S	S	U	U	S	S	U	S
	Notes	Does not have 3' clearance behind racks.	Room is a shared space with a copy room.	No dedicated environmental controls.	Outlets unlabeled.		Grounding Riser non-existent.	No overhead cable management.			Concrete floor	
IDF CER-C E22G	Grade	U	S	U	S	S	U	U	U	S	U	U
	Notes	Does not have 3' clearance behind racks.	Room appears to be dedicated to IT and the cabinet was locked.	No dedicated environmental controls.	Outlets unlabeled.		Grounding Riser non-existent.	No overhead cable management.	Enclosed cabinet with no horizontal cable management.		9" tile, most likely asbestos.	Room has drop-tile ceiling which is not desirable in a TR.
1.4: TECH INFRASTRUCTURE: ROOMS/SPACES - COMMUNICATION EQUIPMENT ROOMS (CER)						MIDDLE SCHOOL						
IDF CER-A E110A	Grade	U	U	U	S	U	U	U	U	S	S	U
	Notes	No rack.	Shared with Electric.	No environmental controls.	Power appears to be dedicated but it is not labeled.	No UPS.	Grounding Riser non-existent.	Non-existent.	None			Hard ceiling which is undesirable for a TR.
IDF CER-B E210A	Grade	U	U	U	S	U	U	U	U	S	S	U
	Notes	No rack.	Shared with Electric.	No environmental controls.	Power appears to be dedicated but it is not labeled.	No UPS.	Grounding Riser non-existent.	Non-existent.	None			Hard ceiling which is undesirable for a TR.
MDF CER-C 215	Grade	U	E	S	S	S	U	U	U	U	S	U
	Notes	Room lacks 3' of clearance in the back of the rack.	Dedicated IT space.		Power appears to be dedicated but it is not labeled.		Grounding Riser non-existent.	Non-existent.	Enclosed cabinets have very little wire management.	Walls do not got to deck on the interior.		Drop-tile ceiling which is undesirable for a TR.
IDF CER-D E310A	Grade	U	U	U	U	U	U	U	U	S	S	
	Notes	No rack.	Shared with Electric.	No environmental controls.	Power appears to be dedicated but it is not labeled.	No UPS.	Grounding Riser non-existent.	Non-existent.	None			Hard ceiling which is undesirable for a TR.

continued

Appendix B. Rough Order of Magnitude (ROM) Cost Estimate

Explanation of Costs The costs for items identified to be corrected from the TCS as well as items needed to help the district meet the goals identified in this report have been identified in the Rough Order of Magnitude Estimate.

Appendix B. Anytown CSD ROM Cost Estimate

Product	Notes	Quantity	Total
27 00 00 Communications (CER AMEP)			
BG Existing Server Room 116	AMEP Requirements Provide Grounding and bonding for all racks and Cable runways with in the room. Label power circuits.	1 EA	\$1,000
ES MDF CER-A	AMEP Requirements Enlarge existing room, provide grounding and bonging riser, provide commercial grade AC , Remove ceiling paint walls install plywood, Add Power, Provide anti-static floor tiles, improve lighting.	1 EA	\$20,000
ES IDF CER-B Existing Room E33	AMEP Requirements Section off dedicated space within existing room; provide grounding and bonding riser; provide commercial grade AC; paint walls; install plywood; add power; provide anti-static floor tiles; improve lighting.	1 EA	\$20,000
ES IDF CER-C Room E22G	AMEP Requirements Provide grounding and bonding riser; provide commercial-grade AC; remove ceiling and paint walls; install plywood; add power; provide anti-static floor tiles; improve lighting.	1 EA	\$15,000
HS New CER for Serving Zone C in Room 322	AMEP Requirements Build out room; provide grounding and bonding riser; provide commercial-grade AC; remove ceiling and paint walls; install plywood; add power; provide anti-static floor tiles; provide lighting.	1 EA	\$15,000
HS New CER for Serving Zone D	AMEP Requirements Build out room; provide grounding and bonding riser; provide commercial-grade AC; remove ceiling and paint walls; install plywood; add power; provide anti-static floor tiles; provide lighting.	1 EA	\$25,000
HS New CER in room 101A	AMEP Requirements Build out room; provide grounding and bonding riser; provide commercial-grade AC; remove ceiling and paint walls; install plywood; add power; provide anti-static floor tiles; provide lighting. (Potential location for Server Room.)	1 EA	\$30,000
HS IDF CER-B Room 402	AMEP Requirements Provide grounding and bonging riser, consider active ventilation , Remove ceiling, paint walls install plywood, Add Power, Provide anti-static floor tiles, improve lighting.	1 EA	\$10,000
MS CER-C Room 215	AMEP Requirements Enlarge existing room, provide grounding and bonging riser, , Remove ceiling paint walls install plywood, Add Power, Provide anti-static floor tiles, improve lighting. Raise interior wall to the deck.	1 EA	\$12,500
MS New Basement TR	AMEP Requirements Build new 10'x12' room; provide grounding and bonding riser; provide commercial-grade AC; paint walls and install plywood; add power, provide anti-static floor tiles; provide lighting.	1 EA	\$25,000
		Total	\$173,500

continued