

Request for Proposal: Fiber Optic & Network Cabling

September 9, 2026

Tri County Public School District
72520 Hwy 103
DeWitt, NE 68341

E-Rate Identifier: Cat2.2027Cabling

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Overview

Tri County Public School District is seeking proposals for installation of new fiber optic and network cabling in the district.

Top two Resellers may be asked to present their proposal to the district technology staff in person.

Vendors will have 24 hours after vendor selection is announced to raise any questions. Questions will be addressed via the web site posting answers to all questions. The District will have the final authority to the resolution of all questions.

All bidding vendors must be E-Rate eligible and have an updated Form 473 (SPAC) on file to provide the services requested and provide their Service Provider's Form 498 ID (formally known as SPIN) as part of this RFP. **Vendors are required to state if any proposed equipment and/or services are ineligible for E-Rate funding as part of their proposal documentation.**

Proposals are due in either hardcopy or in electronic form (PDF format) on or before **Wednesday, October 9, 2026 at 3:00 pm CST** at Tri County Public School District, Attn: Jerod Spahr – RFP Response, 72520 Hwy 103, DeWitt, NE 68341 or emailed to jerod.spahr@tricountyschools.org. Emailed proposal documents will be time-stamped from the receiving computer. Tri County Public School District is not responsible for electronic proposals delivery, including lost or garbled proposals. SPAM and/or robotic responses will not be considered valid bid responses and will be disqualified from consideration.

Proposals will be available for inspection, at the District Office (72520 Hwy 103, DeWitt, NE) by Noon on October 14, 2026.

Questions should be addressed, no later than September 23, 2026, to:

Jerod Spahr

Email: jerod.spahr@tricountyschools.org

Questions and Answers will be posted on district website (<http://tricountyschools.org/>) by September 25th.

Vendors are required to contact Jerod Spahr (jerod.spahr@tricountyschools.org) to schedule a walk through. No walk throughs will be scheduled after September 25th, 2026.

1.1 General Description.

The general description of the Scope of Work (SOW) is to install one new fiber optic run and network cabling to various locations throughout the building renovation and addition, per the attached Appendix C, for approximately 60 Cat 6 drops and 120 Cat 6A drops. All bids must comply with all sections of this RFP and the products and services to be considered.

Vendors are required to contact Jerod Spahr (jerod.spahr@tricountyschools.org) to schedule a walk through. No walk throughs will be scheduled after September 25th, 2026.

2.1 Product and services Specifications.

All new fiber optic cabling shall be 6 strand OS2 single mode armored plenum rated fiber. Vendor should supply new fiber enclosures in the new IDF, wall mounted telecom rack, within the existing Auditorium storage room. All fiber strands should be terminated with LC connectors and test results provided to the district. All new network cabling shall be either category 6 or category 6A as follows:

Access Point Cabling - Yellow Category 6a

Camera/Card Access/Video Board/TV Cabling - Blue Category 6a

General Data Cabling - Green Category 6

All network cabling shall be terminated as noted.

Refer to Appendix C for exact locations, quantities, type of cabling and termination details. Refer to Appendix D for exact cabling manufacturer information.

3.1 Installation Schedule.

Cabling installation must be completed during non-school day hours or times agreed upon at signing of contract. All installation equipment must be removed from student access during school hours. A secured storage room will be provided for vendor.

4.1 Changes to Scope of Work.

The District, without invalidating the Contract, may order changes within the SOW consisting of additions, deletions, and/or modifications, the Contract Sum and the Contract Time being adjusted accordingly. All said changes in the SOW shall be authorized by written "Change Order(s)", signed by the District.

5.1 Vendor Responsibilities.

It shall be the responsibility of the selected vendor/contractor to provide the configuration and system quantities to all locations stated herein. The intentional or accidental omission of necessary component(s) or system(s) shall require the selected vendor/contractor to supply said missing component(s) or system(s) at no cost to the District. The District and any Consultants associated with this RFP are not responsible for any omission, failure to detect any requirement, or any other condition required to complete the Scope of Work.

The awarded Bidder shall:

- Meet jointly with representatives of the District to exchange information and agree on details of equipment arrangements and installation interfaces for the cabling project.
- Have sufficient resources in order to complete the SOW within the allotted timeframe.
- Furnish all labor, supervision, tooling, and miscellaneous mounting hardware and consumables for the cabling system installed at the District.
- Furnish, install, and terminate data jacks at each location according to the Product and Services Specifications.
- Attend the mandatory walk-thru.
- Install all cable in accordance with the Product and Services Specifications and/or manufacturer's recommendations and best industry practices.
- Develop and submit for approval a labeling system for the cable installation. At a minimum, the labeling system shall clearly identify all components of the system; racks, cables, panels, and outlets. Sample labels must be approved by the District.
- Test (100%) all cables and termination hardware for defects in installation and to verify cable performance under installed conditions. Testing procedures should be included in proposal documentation.
- Supply documentation of testing and footage of each cabling run in proposal documentation.
- Abide by and responsible for all electrical and fire code regulations.
- Provide a written guarantee/warranty covering the installed cabling system against defects in workmanship, components, and performance, and follow-on support after project completion for a period of fifteen (15) years.

6.1 E-Rate Terms.

Any and all USF E-Rate "ineligible" products and/or services must be listed separately in the Bid.

7.1 Pricing and Payment Structure.

Vendors are required to breakdown equipment as outlined in the table in Appendix A. Vendors are required to complete Appendix A as part of their proposal.

Contracts will be awarded only after receiving a funding commitment and decision letter from SLD or agreed upon by the district. This RFP will automatically become part of any contract awarded to a vendor. The District requests vendors to file a Form 474 (Service Provider Invoice; SPI) to request reimbursement directly from USAC for the eligible E-Rate portion of the contract.

8.1 Evaluation Process.

Please refer to Appendix B for further details regarding the evaluation process.

9.1 Discrepancies and Omissions.

Vendors finding discrepancies or omissions in the RFP or having any doubts as to the meaning or intent of any part thereof shall submit such questions or concerns to Jerod Spahr, Tri County Public School District, jerod.spahr@tricountyschools.org. Addenda issued in correspondence to this RFP shall be considered a part of this RFP and shall become part of any final Contract that may be derived from this RFP. This RFP and its addenda will be part of any possible future contract with successful vendor(s).

10.1 Contingencies.

This RFP should not be considered as a Contract to purchase goods or services, but is a Request for Proposal in accordance with the Terms and Conditions herein and will not necessarily give rise to a contract. However, RFP responses should be as detailed and complete as possible to facilitate the formation of a contract based on the RFP response(s) that are pursued should Tri County Public School District decide to do so. Proposals stating that pricing is valid dependent upon availability and/or subject to prior sale will be considered as non-responsive. Completion of this RFP form and its associated Appendices are a requirement. Failure to do so will disqualify your RFP response submittal. Vendors must submit sealed RFP responses by the due date and time as specified herein. Electronic submissions will be accepted if created in PDF format and e-mail jerod.spahr@tricountyschools.org by the due date and time as specified herein. Date and time stamp of receiving computer will govern all e-mails. Vendors will be considered nonresponsive if the above requirements are not submitted as requested. The Tri County Public School District has the right to reject all submitted proposals and resubmit for new proposals through a revised RFP.

Appendix A

Required Form for RFP Response.

TABLE 1.1: TRI COUNTY PUBLIC SCHOOL DISTRICT			
E-Rate Eligible Services			
Description	Qty	Unit	Total
Installation of Fiber Optic & Network Cabling	1		
<i>* Proposed bids must provide a detailed breakdown of all costs, including materials and labor. Material costs must be itemized by individual item, including quantity and unit cost where applicable. Labor costs must be identified separately from material costs.</i>			

I acknowledge Section 2.1 Pricing and Payment; Tri County Public School District will only accept discount on invoices; therefore, the winning vendor will file a Form 474 (Service Provider Invoice Form) to request payment of the discount amount for eligible services after billing the applicant for the non-discount share of the cost of the equipment and/or services.

Vendor Name: _____

E-Rate Form 498 ID (SPIN): _____

Printed Name: _____

Signature: _____

Date Submitted: _____

Appendix B

Evaluation Rubric Tri County Public School District E-Rate: Cat2.2027Cabling

1. Cost of eligible equipment and/or eligible maintenance25 points

Cost of Equipment will be released at time of proposal opening. Points will be awarded during the evaluation of the proposal(s).

2. Compatibility with currently owned district devices20 points

Compatibility is very important. Points will be awarded during the evaluation of the proposal(s) and determination of compatibility with existing equipment will be done at that same time. Zero (0) points will be awarded for non-compatible devices and twenty (20) points will be awarded for full 100% compatibility.

3. Features included.....15 points

All documented features of the device in the RFP will be evaluated and points award as such. Points will not be awarded for features that are not included in the cost of the device as presented in the RFP.

4. Support of hardware10 points

Technical support will be contacted and will be evaluated on its technical knowledge, English as the primary language, and ease of use.

5. Reliability.....10 points

Reliability score will be determined using the following criteria:

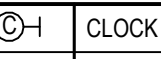
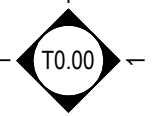
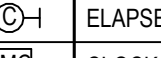
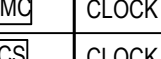
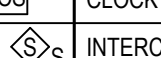
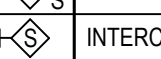
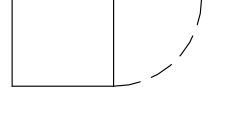
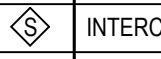
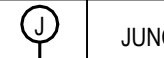
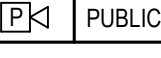
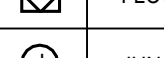
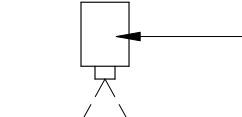
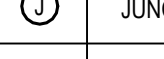
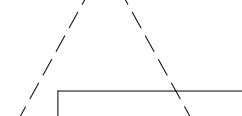
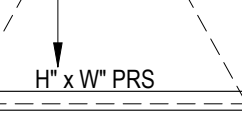
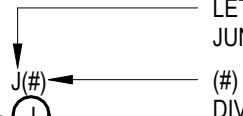
- a. References given in the RFP
- b. Known other users of the device
- c. Personal experiences

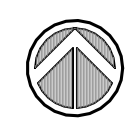
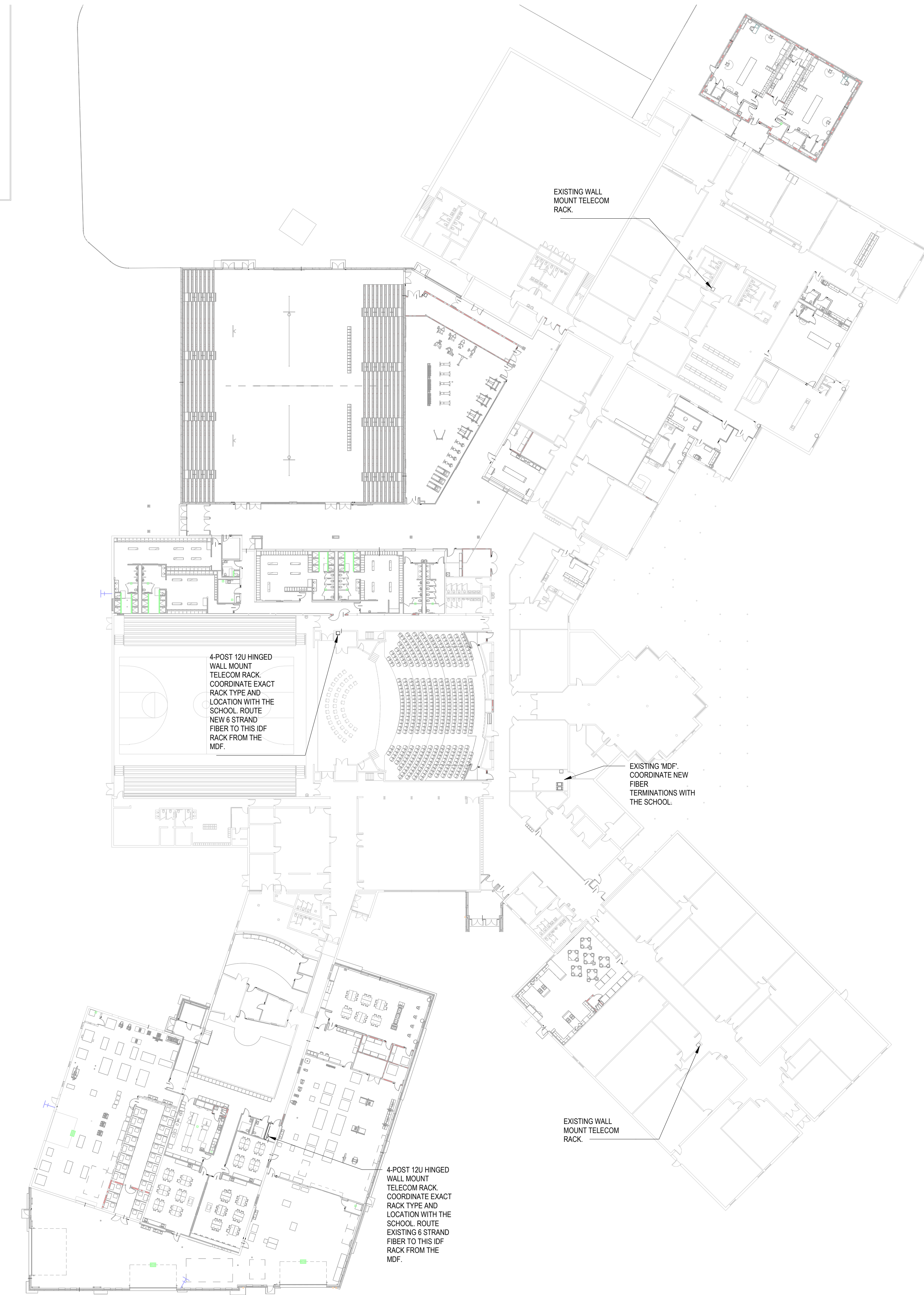
6. User Interface.....10 points

The user interface will be evaluated and points awarded on the ease of use and the completeness of the interface to the device.

7. References.....10 points

References will be contacted and points awarded on their responses.

AUDIOVISUAL, TELECOM, SECURITY & FIRE ALARM SYSTEMS SYMBOLS LEGEND									
GENERAL SYMBOLS		AUDIOVISUAL SYMBOLS		SECURITY DEVICE SYMBOLS		FIRE ALARM SYMBOLS		MISC. LOW-VOLTAGE SYMBOLS	
	CONDUIT RISER DETAIL # / SHEET #				ACCESS CONTROL PANEL		FIRE ALARM MANUAL PULL STATION		CLOCK AND CLOCK HANGER OUTLET
	ELEVATION SYMBOL DETAIL # / SHEET #				CODE BLUE PHONE		FIRE ALARM BELL		ELAPSED TIME INDICATOR CLOCK
					SURVEILLANCE MONITOR AND OUTLET		FIRE ALARM COMBINATION BELL AND FLASHING LIGHT		CLOCK MASTER CONTROL
					SECURITY SYSTEM CARD READER OUTLET BOX - ROUGH IN ONLY SEE THE CARD ACCESS ROUGH-IN DETAIL FOR ADDITIONAL INFORMATION.		MAGNETIC DOOR HOLD OPEN DEVICE		CLOCK SYSTEM SIGNAL GENERATOR
TECHNOLOGY J-BOX SYMBOLS					ELECTRIC DOOR LOCK		FIRE ALARM HORN UNIT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATINGS)		INTERCOMPUBLIC ADDRESS SPEAKER - SURFACE MOUNTED
	TELECOM WALL OUTLET - CONTRACTOR SHALL INSTALL A 4 1/16" BACKBOX WITH A SINGLE GANG EXTENSION RING AND A 1 1/4" CONDUIT ROUTED TO THE NEAREST ACCESSIBLE CEILING SPACE. BUSH CONDUIT ENDS. TELECOM CONTRACTOR (DIODETECH) SHALL INSTALL J-HOOKS AS REQUIRED TO ADEQUATELY SUPPORT CABLEING.		EQUIPMENT RACK BY AV CONTRACTOR SHOWN FOR COORDINATION PURPOSES ONLY.		INTERCOM - MASTER		FIRE ALARM HORN(S) STROBE UNIT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING)		INTERCOMPUBLIC ADDRESS SPEAKER - WALL MOUNTED
	JUNCTION WALL BOX				INTERCOM W / VIDEO		FIRE ALARM SPEAKER UNIT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING)		INTERCOMPUBLIC ADDRESS SPEAKER - RECESSED
	FLOOR BOX / FLOOR POKE THRU DEVICE / FLOOR CONDUIT STUB		PROJECTOR (PR) BY AV CONTRACTOR SHOWN FOR COORDINATION PURPOSES ONLY. REFER TO DETAIL SHEETS FOR MORE INFORMATION.		MAGNETIC DOOR LOCK		FIRE ALARM SPEAKERSTROBE UNIT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING)		
	JUNCTION CEILING BOX		REFER TO THE PROJECTION SCREEN SCHEDULE FOR MORE INFORMATION.		PANIC BUTTON		FIRE ALARM FLASHING STROBE LIGHT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING) - WALL MOUNT		
	TELECOM CEILING BOX				REQUEST TO EXIT PIR SENSOR		FIRE ALARM FLASHING STROBE LIGHT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING) - CEILING MOUNT		
							FIRE ALARM FLASHING STROBE LIGHT (*FIELD ADJUSTABLE TO INDICATED CANDELA RATING) - CEILING MOUNT		
							POST SUPERVISORY VALVE CONTACTS		
							SUPERVISORY VALVE CONTACTS		
							FIRE ALARM RELAY		
							WATER FLOW SWITCH. COORDINATE EXACT LOCATION WITH FIRE PROTECTION SUPPLIER INSTALLER.		
							TAMPER SWITCH. COORDINATE EXACT LOCATION WITH FIRE PROTECTION SUPPLIER INSTALLER.		
							SMOKE DETECTOR		
							HEAT DETECTOR - COMBINATION RATE OF RISE AND FIXED TEMPERATURE		
							DUCT SMOKE DETECTOR		
							ELEVATOR RECALL SMOKE DETECTOR		
							FIRE ALARM CONTROL PANEL		
							FIRE ALARM ANNUNCIATOR PANEL		
							FIRE ALARM SUPPLY PANEL		
AUDIOVISUAL SYMBOLS									
	CEILING LOUDSPEAKER BY AV CONTRACTOR - SHOWN FOR COORDINATION PURPOSES ONLY. EXACT LOCATION TO BE COORDINATED WITH AV CONTRACTOR AND AV DESIGNER. SUBSCRIPT NUMBER DESIGNATES THE SPEAKER ZONE. PROVIDE DOUBLE GANG BOX W/ FLAT COVER ABOVE CEILING.								
	CEILING AV CAMERA (CC) BY AV CONTRACTOR - SHOWN FOR COORDINATION PURPOSES ONLY. EXACT LOCATION TO BE COORDINATED WITH AV CONTRACTOR AND AV DESIGNER. PROVIDE DOUBLE GANG BOX W/ FLAT COVER ABOVE CEILING.								
	CEILING MICROPHONE BY AV CONTRACTOR - SHOWN FOR COORDINATION PURPOSES ONLY. EXACT LOCATION TO BE COORDINATED WITH AV CONTRACTOR AND AV DESIGNER. PROVIDE DOUBLE GANG BOX W/ FLAT COVER ABOVE CEILING.								
JUNCTION/TELECOM BOX KEY									
			LETTER INDICATES BOX TYPE. REFER TO THE TECHNOLOGY JUNCTION BOX LEGEND FOR MORE INFORMATION.						
			(#) INDICATES NUMBER OF DATA CABLE PULLS. REFER TO DIVISION 27 SPECIFICATIONS FOR CABLE REQUIREMENTS.						
TELECOMMUNICATIONS CABLING LEGEND									
ACCESS POINT CABLING - YELLOW CATEGORY 6A CAMERA/CARD ACCESS/VIDEO BOARD/TV CABLING - BLUE CATEGORY 6A GENERAL DATA/PHONE CABLING - GREEN CATEGORY 6 NEW FIBER - ORANGE ARMORED 6 STRAND FIBER OPTIC		DIODETECH TO COORDINATE ALL CABLING REQUIREMENTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPANH). COORDINATE POTENTIAL CABLING PROCUREMENT VIA THE E-RATE GRANT PROCESS WITH THE SCHOOL AS WELL.							
COORDINATE FACEPLATE AND PORT COLORS WITH THE SCHOOL. NOTE THAT ELECTRICAL DEVICES ARE PLANNED TO BE GRAY WITH STAINLESS STEEL FACEPLATES.									



FIRST FLOOR TELECOM ORIENTATION PLAN

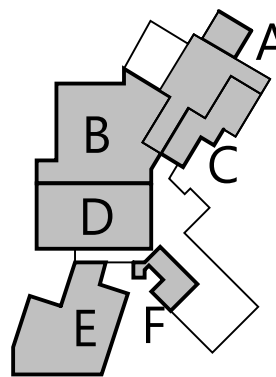
SCALE: 1" = 30'-0"

TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).



SHEET HISTORY:

ISSUED- 08/26/2026 Construction Documents



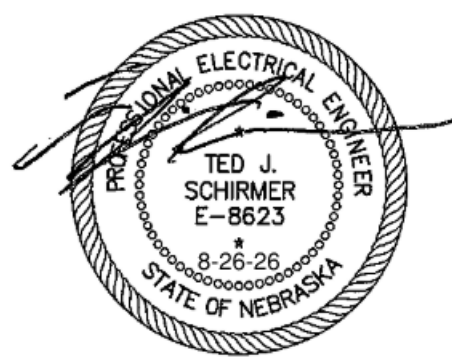
Key Plan

Tri County 2025 Bond Project

72520 Highway 103
DeWitt, NE 68341

CE No.: 506-002-25

August 26, 2026

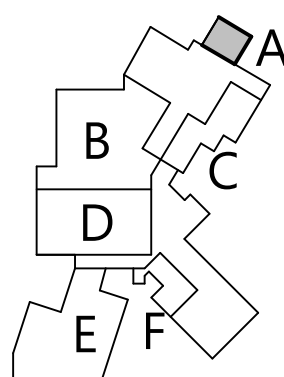


First Floor Telecom
Orientation Plan

T1.11



SHEET HISTORY:
ISSUED- 08/26/2026 Construction Documents

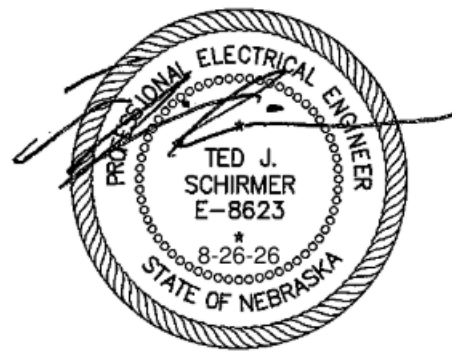


Key Plan

Tri County 2025 Bond Project

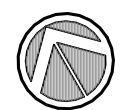
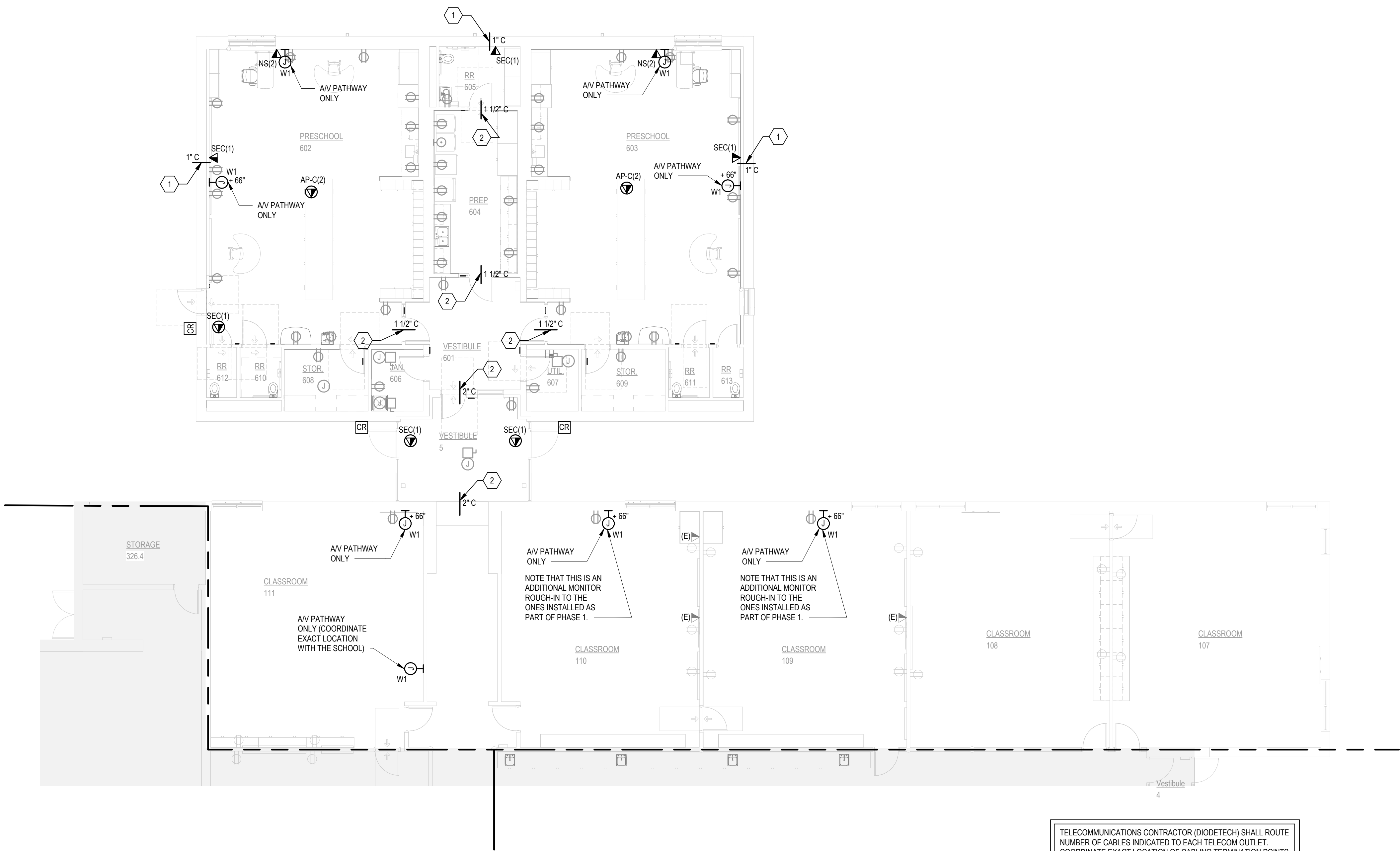
72520 Highway 103
DeWitt, NE 68341

CE No.: 506-002-25
August 26, 2026



Audiovisual & Telecom
Plan - Area A

T1.11A



FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area A

SCALE: 1/8" = 1'-0"

AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
1	SECURITY CAMERA CABLING CONDUIT STUB-OUT, INSTALLED THRU THE EXTERIOR WALL AT THE APPROXIMATE LOCATION INDICATED. COORDINATE EXACT STUB-OUT HEIGHT AND LOCATION OF ASSOCIATED SECURITY CAMERA DATA OUTLET LOCATED ABOVE THE CEILING WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).
2	CONDUIT SLEEVE OF THE SIZE INDICATED ROUTED THRU THE WALL ABOVE THE ACCESSIBLE CEILING SPACE. BUSH CONDUIT ENDS. CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLING THRU.

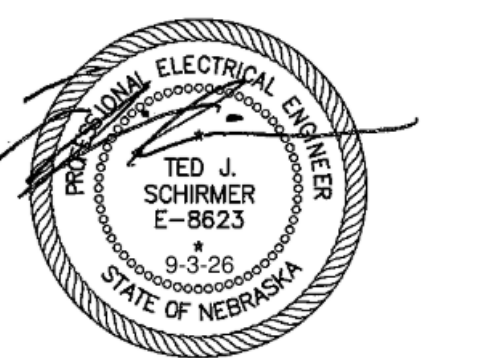
TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).

DIODETECH SHALL PROVIDE AND INSTALL ALL PAGING SYSTEM SPEAKERS, CABLING, CONNECTIONS AND HEAD-END EQUIPMENT AS REQUIRED FOR A FULLY FUNCTIONAL PAGING SYSTEM. COORDINATE ALL REQUIREMENTS OF THE PAGING SYSTEM WITH THE SCHOOL AND THEIR IT REPRESENTATIVE (JEROD SPAHR).



72520 Highway 103
DeWitt, NE 68341

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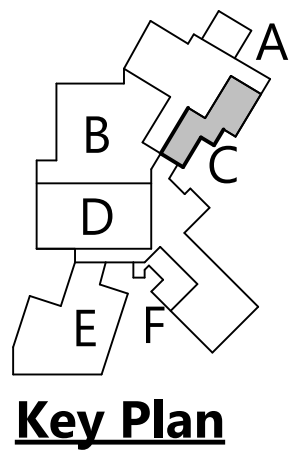
T1.11B



 FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area B
SCALE: 1/8" = 1'-0"

AUDIO/VISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
	SECURITY CAMERA OUTLOOK STUB-OUT. INSTALLED THRU THE EXTERIOR WALL AT THE APPROPRIATE LOCATION INDICATED. EXACT STUB-OUT HEIGHT AND LOCATION OF ASSOCIATED SECURITY CAMERA DATA OUTLET LOCATED ABOVE THE CEILING WITH THE SCHOOL'S REPRESENTATIVE JEROD SMITH. 2. CONDUIT SLEEVE OF THE SIZE INDICATED ROUTED THRU THE WALL ABOVE THE ACCESSIBLE CEILING STRUCK UPON CONDUIT ENDS. CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLES THRU. 3. CONDUIT SLEEVES OF THE SIZE INDICATED ROUTED THRU THE WALL AT A MINIMUM HEIGHT OF THE ACCESSIBLE CEILING STRUCK UPON CONDUIT ENDS CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLES THRU. ALL CABLEING IN THE GYM SHALL BE CONCEALED VERTICALLY BEHIND ONE OF THESE WALLS IN THE GYM.

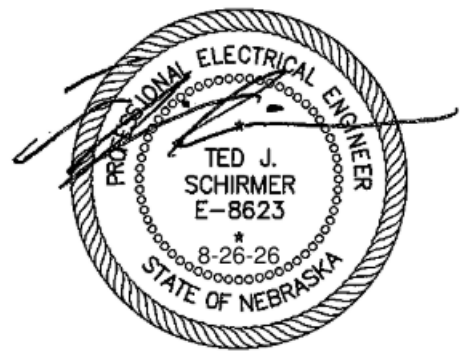
AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
4	IN ADDITION TO THE CONDUIT SLEEVES THRU THE WALL, CONTRACTOR SHALL INSTALL 2" CONDUTITS THE ENTIRE LENGTH OF THE VERTICAL CHASE TO PROVIDE A VERTICAL PATHWAY FOR THE CABLEING FROM THE GYM STRUCTURE SPACE DOWN TO THE ADJACENT SHORTER CEILING SPACES OF THE WEIGHT ROOM AND CORRIDORS. BUSH CONDUIT ENDS. ALL CABLEING IN THE GYM SHALL BE CONCEALED VERTICALLY BEHIND ONE OF THE TWO CHASE WALLS IN THE GYM.
5	WALL MOUNTED PAGING SPEAKER. ELECTRICAL CONTRACTOR TO PROVIDE ROUGH-IN IN PRE-CAST WALL AS REQUIRED BY DICO/ETECH. COORDINATE WITH RCP/ETECH FOR WALL CUTOUTS.



Tri County 2025 Bond Project

72520 Highway 103
DeWitt, NE 68341

CE No.: 506-002-25
August 26, 2026



Audiovisual & Telecom
Plan - Area C & G

T1.11CG

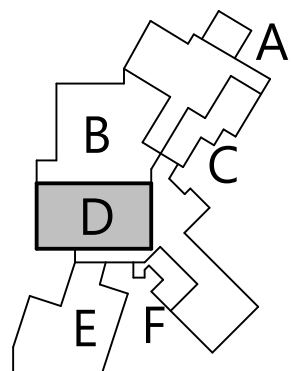


 FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area C
SCALE: 1/8" = 1'-0"

AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
2	CONDUIT SLEEVE OF THE SIZE INDICATED ROUTED THRU THE WALL ABOVE THE ACCESSIBLE CEILING SPACE. BUSH CONDUIT ENDS. CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLING THRU.

TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).

DIODETECH SHALL PROVIDE AND INSTALL ALL PAGING SYSTEM SPEAKERS, CABLING, CONNECTIONS AND HEAD-END EQUIPMENT AS REQUIRED FOR A FULLY FUNCTIONAL PAGING SYSTEM. COORDINATE ALL REQUIREMENTS OF THE PAGING SYSTEM WITH THE SCHOOL AND THEIR IT REPRESENTATIVE (JEROD SPAHR).

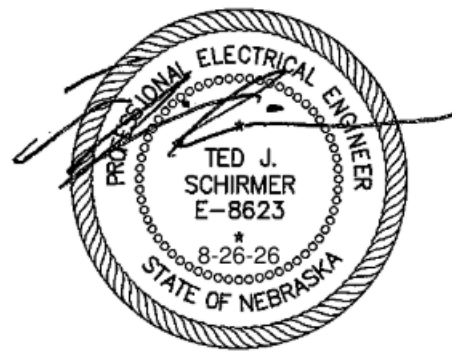


Key Plan

Tri County 2025 Bond Project

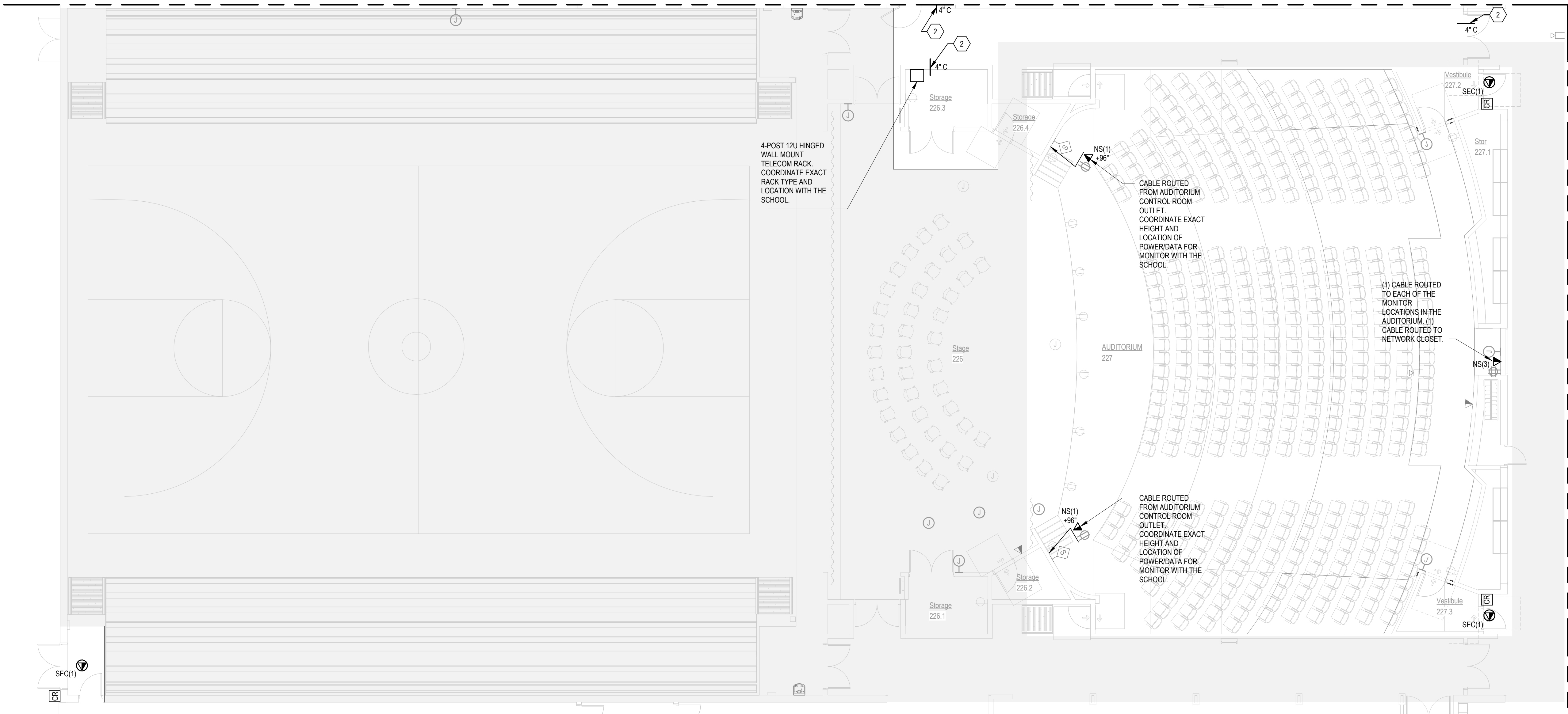
72520 Highway 103
DeWitt, NE 68341

CE No.: 506-002-25
August 26, 2026



Audiovisual & Telecom
Plan - Area D

T1.11D



FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area D

SCALE: 1/8" = 1'-0"

AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
2	CONDUIT SLEEVE OF THE SIZE INDICATED ROUTED THRU THE WALL ABOVE THE ACCESSIBLE CEILING SPACE. BUSH CONDUIT ENDS. CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLING THRU.

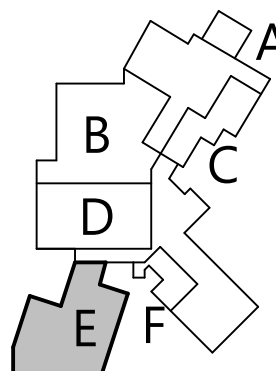
TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).

DIODETECH SHALL PROVIDE AND INSTALL ALL PAGING SYSTEM SPEAKERS, CABLING, CONNECTIONS AND HEAD-END EQUIPMENT AS REQUIRED FOR A FULLY FUNCTIONAL PAGING SYSTEM. COORDINATE ALL REQUIREMENTS OF THE PAGING SYSTEM WITH THE SCHOOL AND THEIR IT REPRESENTATIVE (JEROD SPAHR).



SHEET HISTORY:

ISSUED- 08/26/2026 Construction Documents



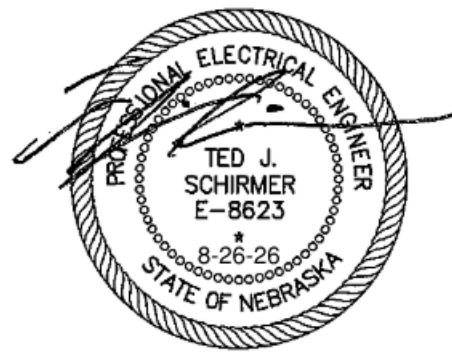
Key Plan

Tri County 2025 Bond Project

72520 Highway 103
DeWitt, NE 68341

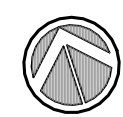
CE No.: 506-002-25

August 26, 2026



Audiovisual & Telecom
Plan - Area E

T1.11E



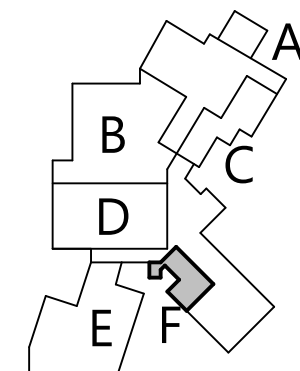
FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area E

SCALE: 1/8" = 1'-0"



SHEET HISTORY:

ISSUED- 08/26/2026 Construction Documents



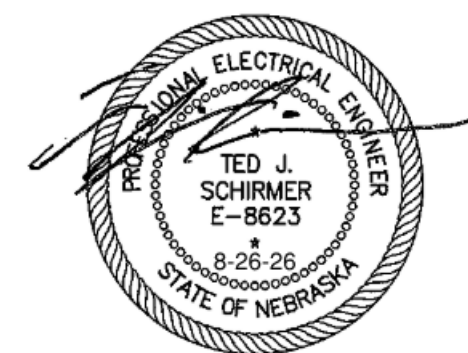
Key Plan

Tri County 2025 Bond Project

72520 Highway 103
DeWitt, NE 68341

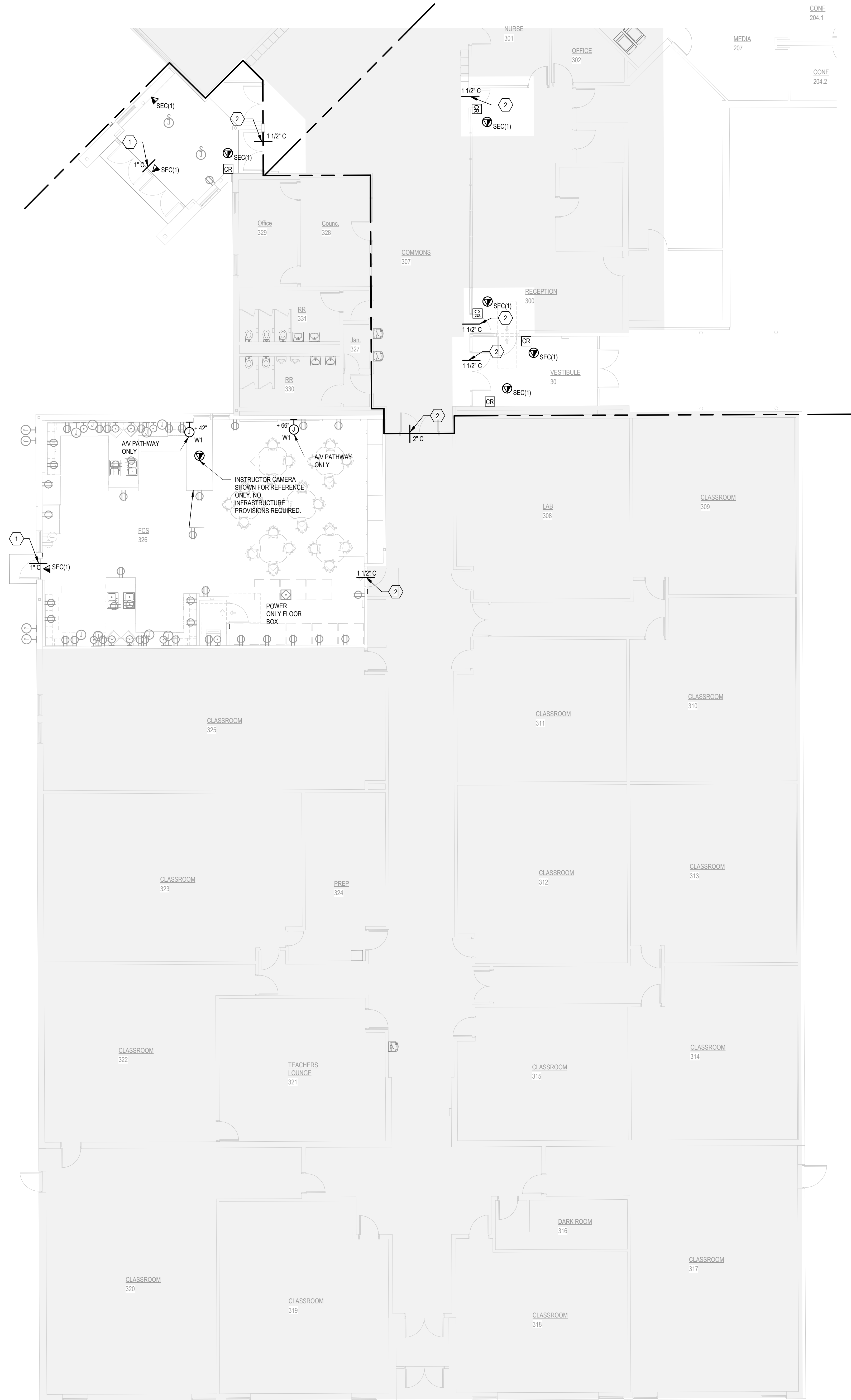
CE No.: 506-002-25

August 26, 2026



Audiovisual & Telecom
Plan - Area F

T1.11F



AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION
1	SECURITY CAMERA CABLING CONDUIT STUB-OUT, INSTALLED THRU THE EXTERIOR WALL AT THE APPROXIMATE LOCATION INDICATED. COORDINATE EXACT STUB-OUT HEIGHT AND LOCATION OF ASSOCIATED SECURITY CAMERA DATA OUTLET LOCATED ABOVE THE CEILING WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).
2	CONDUIT SLEEVE OF THE SIZE INDICATED ROUTED THRU THE WALL ABOVE THE ACCESSIBLE CEILING SPACE. BUSH CONDUIT ENDS. CONDUIT SLEEVES TO BE USED FOR ROUTING TELECOM CABLING THRU.

TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).

DIODETECH SHALL PROVIDE AND INSTALL ALL PAGING SYSTEM SPEAKERS, CABLING, CONNECTIONS AND HEAD-END EQUIPMENT AS REQUIRED FOR A FULLY FUNCTIONAL PAGING SYSTEM. COORDINATE ALL REQUIREMENTS OF THE PAGING SYSTEM WITH THE SCHOOL AND THEIR IT REPRESENTATIVE (JEROD SPAHR).

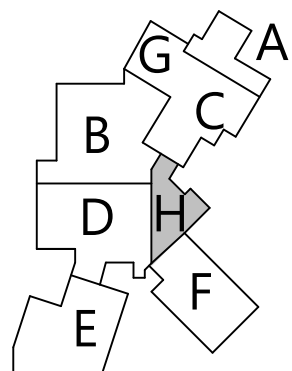


FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area F

SCALE: 1/8" = 1'-0"



SHEET HISTORY:
ISSUED- 08/26/2026 Construction Documents

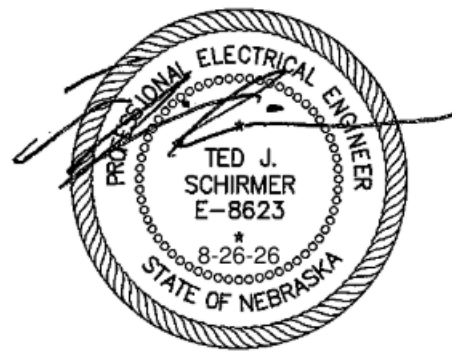


Key Plan

Tri County 2025 Bond Project

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Audiovisual & Telecom
Plan - Area H

T1.11H



 **FIRST FLOOR AUDIOVISUAL & TELECOM PLAN - Area H**
SCALE: 1/8" = 1'-0"

AUDIOVISUAL & TELECOM PLAN NOTES	
KEY NOTE	DESCRIPTION

TELECOMMUNICATIONS CONTRACTOR (DIODETECH) SHALL ROUTE NUMBER OF CABLES INDICATED TO EACH TELECOM OUTLET. COORDINATE EXACT LOCATION OF CABLEING TERMINATION POINTS WITH THE SCHOOL'S IT REPRESENTATIVE (JEROD SPAHR).

DIODETECH SHALL PROVIDE AND INSTALL ALL PAGING SYSTEM SPEAKERS, CABLEING, CONNECTIONS AND HEAD-END EQUIPMENT AS REQUIRED FOR A FULLY FUNCTIONAL PAGING SYSTEM. COORDINATE ALL REQUIREMENTS OF THE PAGING SYSTEM WITH THE SCHOOL AND THEIR IT REPRESENTATIVE (JEROD SPAHR).



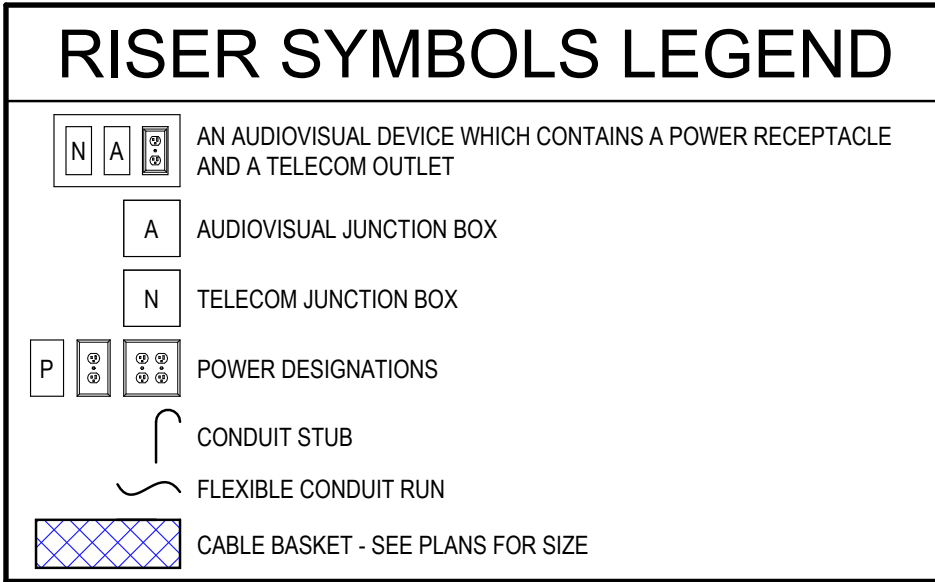
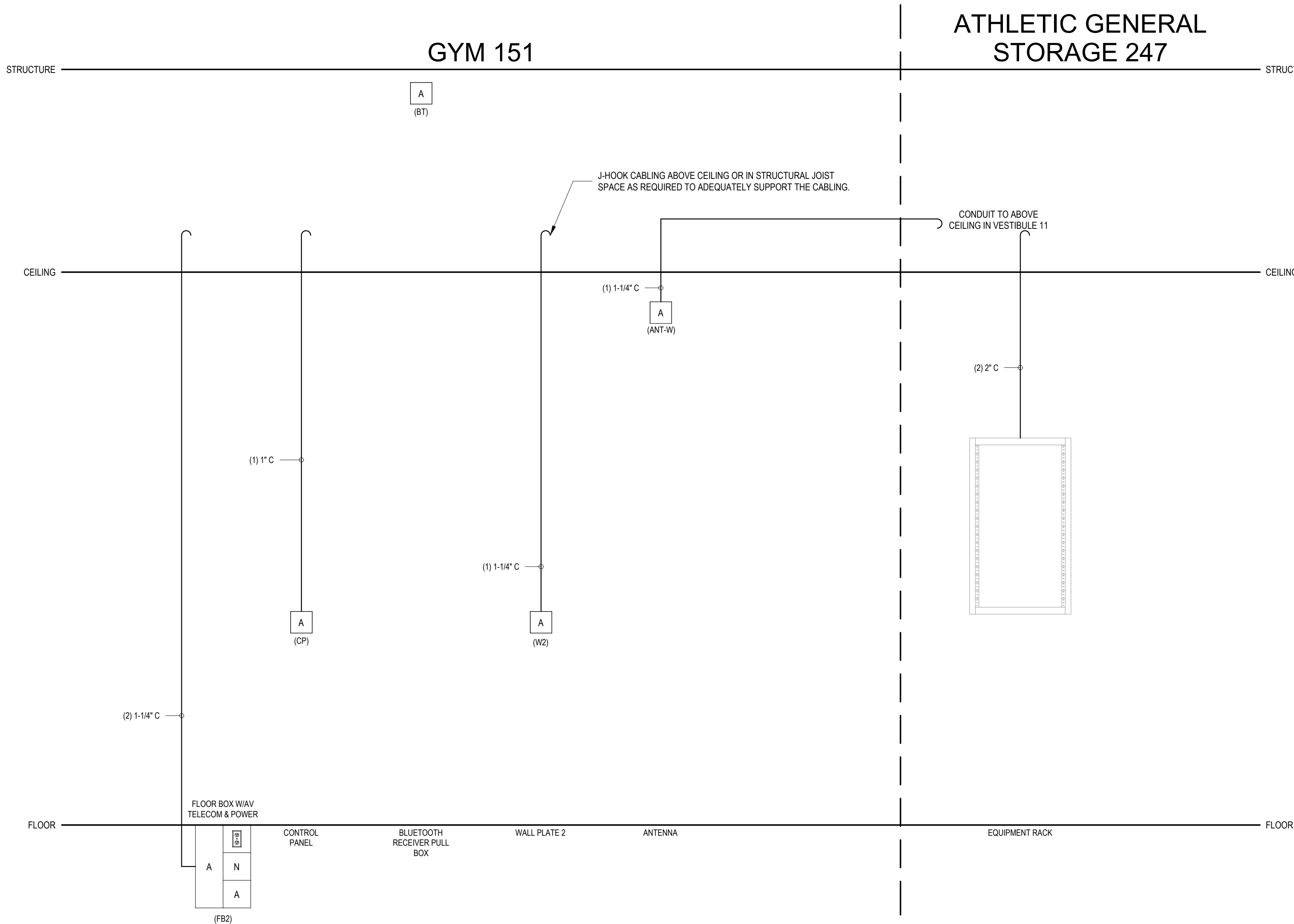
August 26, 2026





SHEET HISTORY:

ISSUED- 08/26/2026 Construction Documents



RISER GENERAL NOTES

RISER DRAWINGS AND CONDUIT ROUTING
THE RISER DRAWINGS ARE DIAGRAMMATIC IN NATURE. CONDUIT PATHS SHOWN ON THE RISERS ARE INTENDED TO CONVEY REQUIRED DEVICE INTERCONNECTION AND SIZES ONLY. ACTUAL CONDUIT ROUTING IN THE FIELD MAY BE REQUIRED TO FOLLOW ROUTING CONTRARY TO THAT IMPLIED BY THE RISER. IN ALL CASES, CONDUIT ROUTES SHALL FOLLOW THE SHORTEST PATH POSSIBLE WHILE COMPLYING WITH INDUSTRY STANDARDS AND BEST PRACTICES.

CONDUIT AND PULL BOXES
ALL CONDUIT RUNS SHALL BE STEEL, THIN-WALL ELECTRICAL METALLIC TUBING (EMT), UNLESS OTHERWISE INDICATED. CONDUIT SIZES AND INTERCONNECTIONS SHALL BE AS INDICATED ON THE RISER DRAWINGS. THE CONTRACTOR SHALL PROVIDE A PULL BOX IMMEDIATELY BEFORE AND AFTER ANY CONDUIT RUN SECTION CONTAINING TWO NINETY-DEGREE TURNS OR ANY SINGLE RUN EXCEEDING FIFTY FEET IN LENGTH REGARDLESS OF WHETHER PULL BOXES ARE SHOWN ON THE DRAWINGS OR NOT.

CONDUIT STUBS
TERMINATE CONDUIT STUBS INTO CLEAR SPACE 18 INCHES ABOVE ACCESSIBLE CEILING IN ROOM INDICATED.

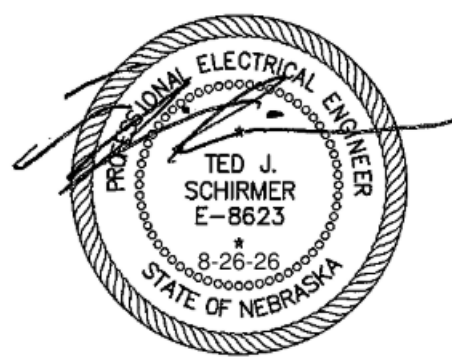
NYLON BUSHINGS
PROVIDE A NYLON BUSHING ON ALL CONDUIT STUBS AND NON-TERMINATING CONDUIT ENDS TO PROTECT WIRE PULLS.

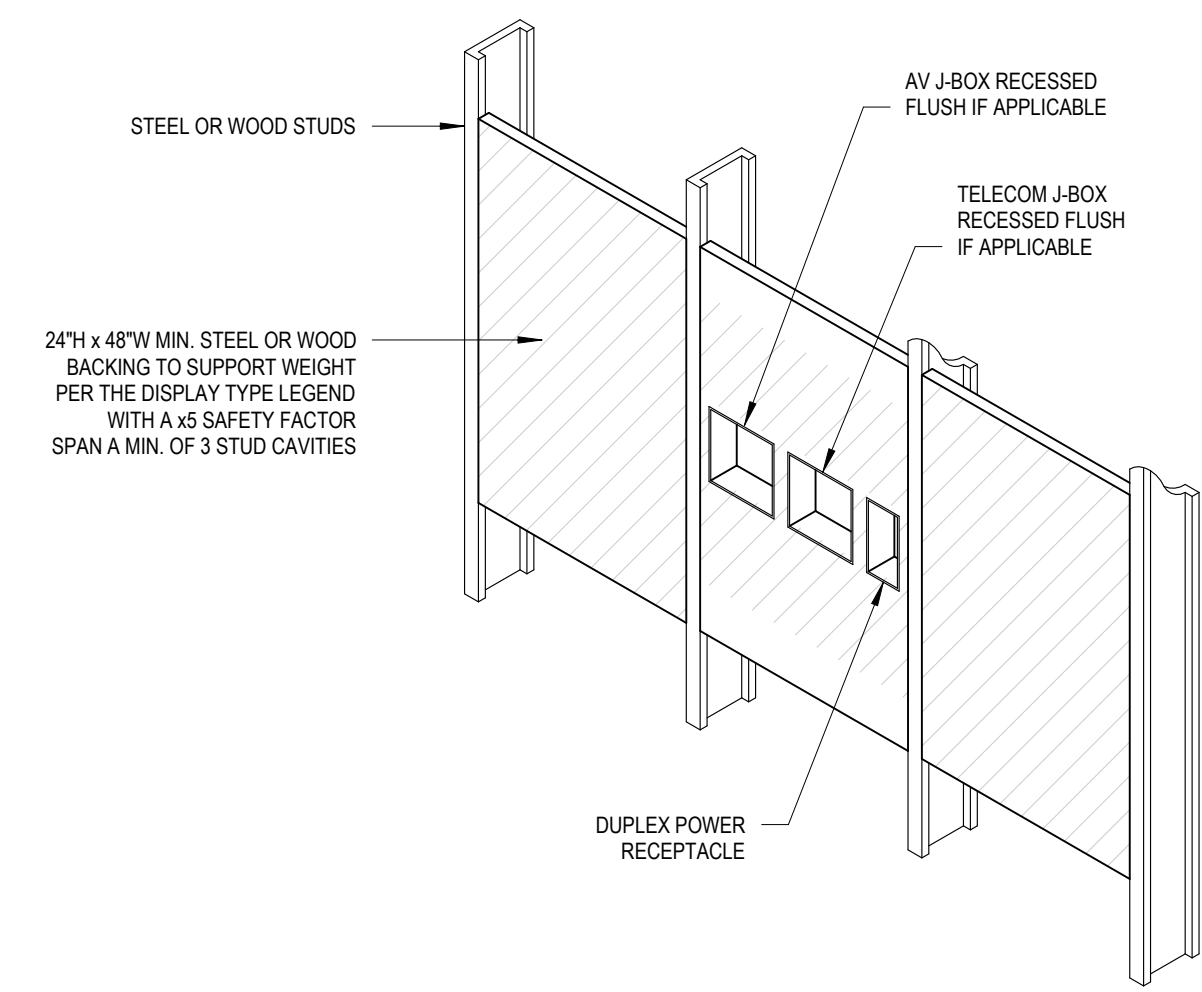
PULL STRINGS
ALL CONDUIT RUNS SHALL BE PROVIDED WITH A PULL STRING.

POWER DESIGNATORS AND RECEPTACLES
POWER DESIGNATORS AND RECEPTACLES WHICH APPEAR ON THE RISER DRAWINGS ARE SHOWN TO INDICATE THEIR ASSOCIATION WITH AND REQUIRED ADJACENCY TO AUDIOVISUAL COMPONENTS. NOTE THAT NOT ALL POWER RECEPTACLES REQUIRED TO SUPPORT THE AUDIOVISUAL SYSTEMS ARE SHOWN ON THE RISER DIAGRAMS. ONLY THOSE THAT ARE PART OF OR INTERFACE WITH THE AUDIOVISUAL JUNCTION BOXES ARE SHOWN. REFER TO THE TECHNOLOGY INFRASTRUCTURE PLANS, ELEVATIONS AND DETAILS FOR ADDITIONAL GUIDANCE REGARDING AUDIOVISUAL POWER LOCATIONS. REFER TO THE ELECTRICAL DRAWINGS FOR COMPLETE POWER LAYOUTS AND CIRCUITING DETAILS.

TELECOM OUTLETS
JUNCTION BOXES FOR TELECOM OUTLETS WHICH APPEAR ON THE RISER DRAWINGS ARE SHOWN TO INDICATE THEIR ASSOCIATION WITH AND REQUIRED ADJACENCY TO AUDIOVISUAL COMPONENTS. NOTE THAT NOT ALL TELECOM OUTLETS REQUIRED TO SUPPORT THE AUDIOVISUAL SYSTEMS ARE SHOWN ON THE RISER DIAGRAMS. ONLY THOSE THAT ARE PART OF OR INTERFACE WITH AUDIOVISUAL JUNCTION BOXES ARE SHOWN. REFER TO THE AUDIOVISUAL & TELECOM PLANS, ELEVATIONS AND DETAILS FOR A COMPLETE LAYOUT OF TELECOM JUNCTION BOXES FOR EACH SPACE.

CONDUIT SHOWN ON THIS SHEET SUPPORT AUDIOVISUAL SYSTEMS ONLY. SEE THE "TELECOM TYPICAL CONDUIT RISER" FOR CONDUIT REQUIREMENTS FOR EACH TELECOM JUNCTION BOX TYPE. CONDUITS SHOWN FOR AV SHALL NOT BE USED FOR TELECOM CABLES.

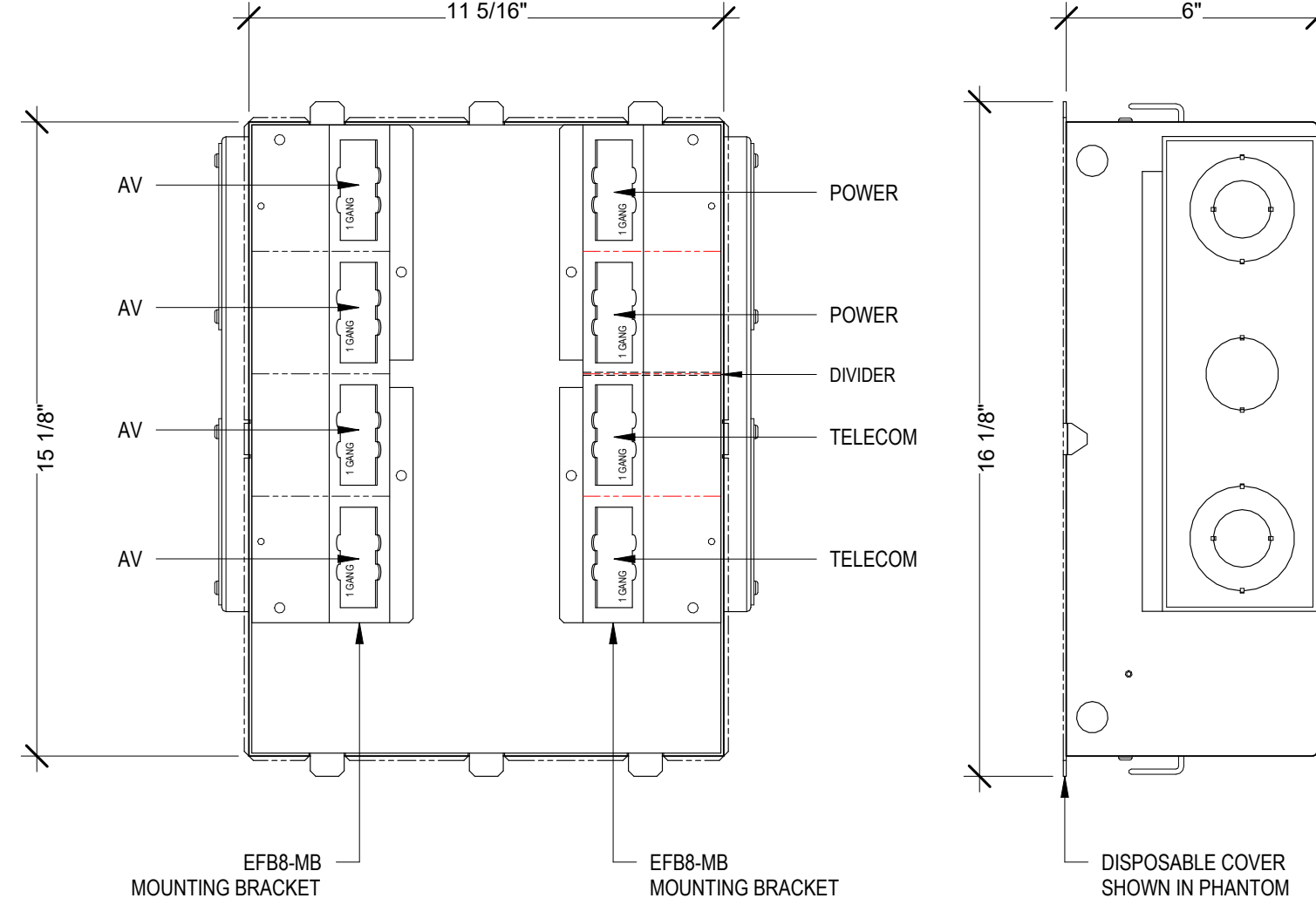




- NOTES:
1. BACKING CENTERED AT LOCATION OF FLAT PANEL DISPLAY.
 2. BACKING MUST BE 24H x 48W MIN.
 3. ALWAYS SPAN BETWEEN AT LEAST THREE STUD CAVITIES.
 4. SEE PARTITION TYPES FOR STUD SIZE AND MATERIAL.
 5. VERIFY LOCATIONS OF BACKING WITH PLANS.
 6. FLAT PANEL DISPLAYS AND MOUNTING BRACKETS BY OWNER.

1 WALL MOUNTED FLAT PANEL DISPLAY BACKING

SCALE: 1" = 1'-0"

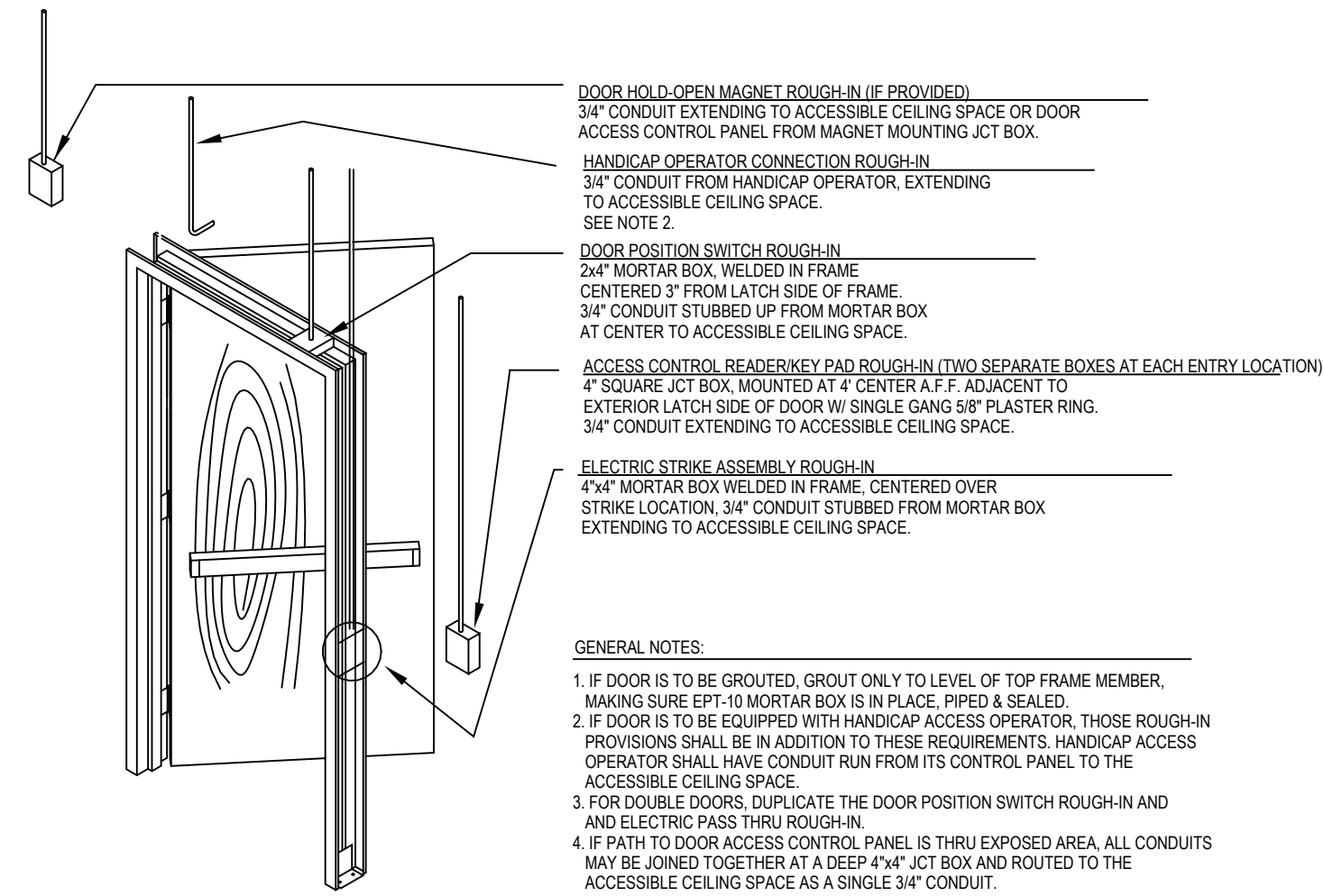


- NOTES:
1. KNOCKOUT PLATES SHOWN COME WITH THE BOX. ADDITIONAL KNOCKOUT PLATES SHALL BE ORDERED AS NECESSARY TO MEET THE CONDUIT REQUIREMENTS FROM THE AUDIOVISUAL INFRASTRUCTURE ROOM RISERS AND THE TELECOM TYPICAL CONDUIT RISER.
 2. (2) EFB8-MB MOUNTING BRACKETS COME WITH THE BOX. (1) EFB8-22GMB MOUNTING BRACKET SHALL BE ORDERED SEPARATELY.

KNOCKOUT CHART		
K.O. HOLE SIZE	LOCATION	QTY
1-1/4"	FRONT & BACK	4
1"	BOTTOM	8
1" x 2"	SIDES	4
1-1/4"	SIDES	2

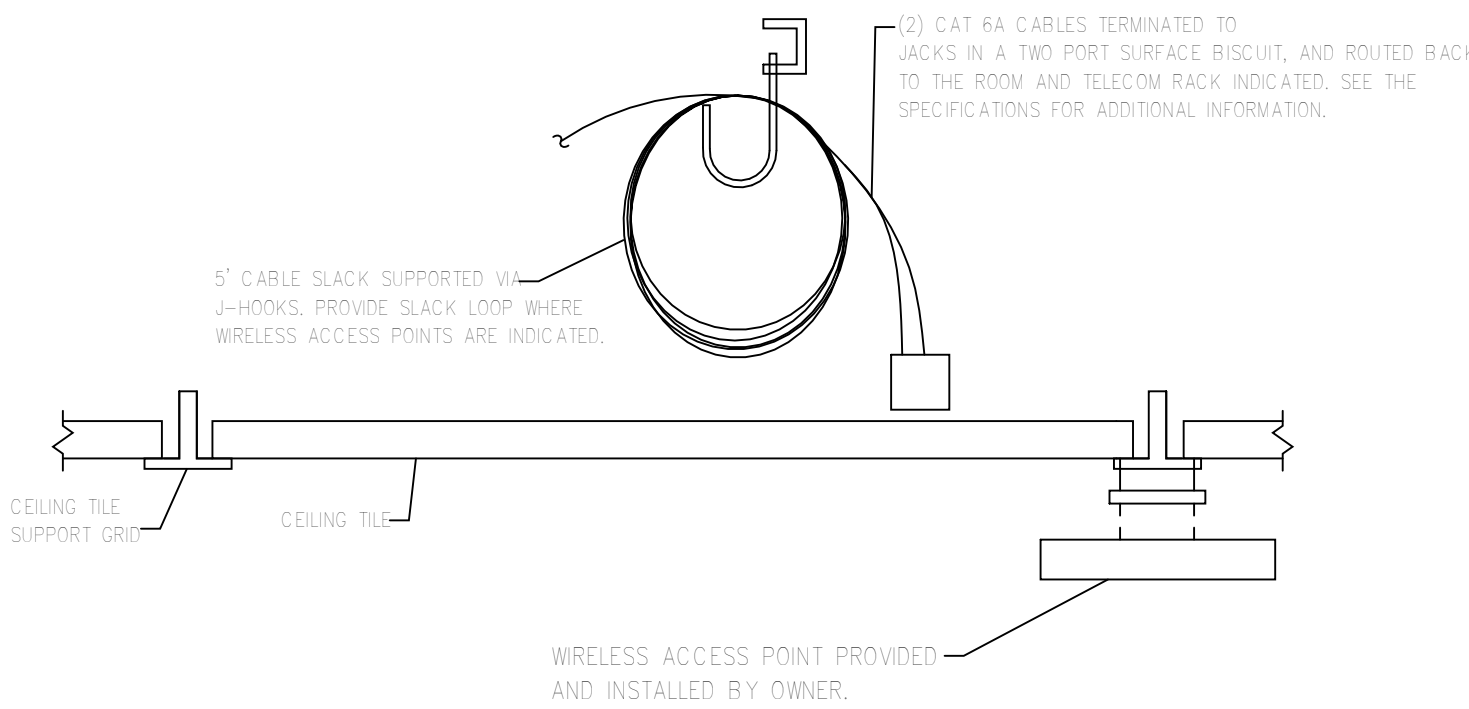
2 WIREMOLD EFB8S-OG 8-GANG FLOOR BOX W/ EFB8-22GMB

SCALE: 3" = 1'-0"

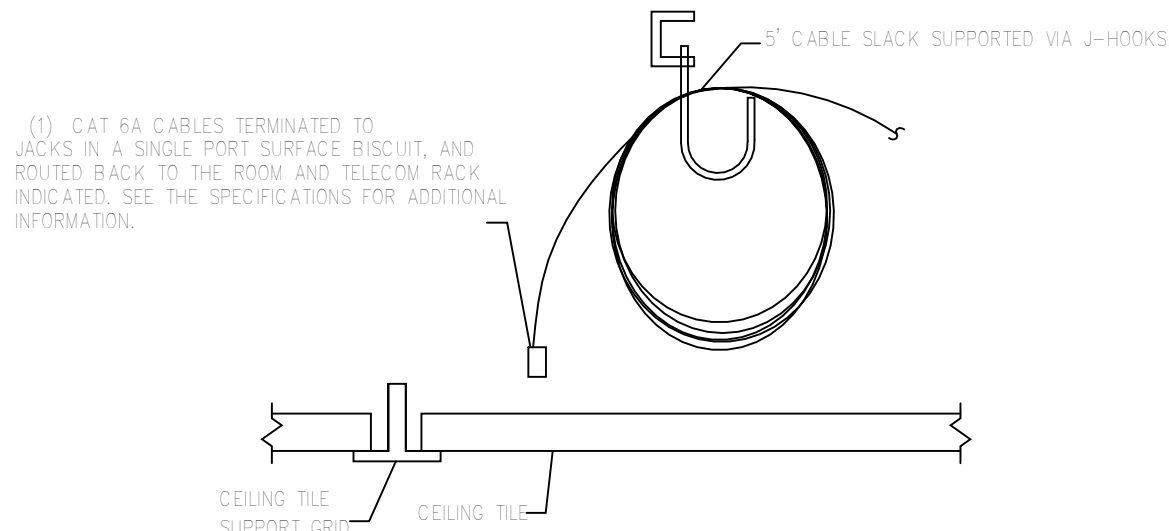


- GENERAL NOTES:
1. IF DOOR IS TO BE GROUTED, GROUT ONLY TO LEVEL OF TOP FRAME MEMBER. MAKING SURE EFB8 MORTAR BOX IS IN PLACE, PIPED & SEALED.
 2. IF DOOR IS TO BE EQUIPPED WITH HANDICAP ACCESS OPERATOR, THOSE ROUGH-IN PROVISIONS SHALL BE IN ADDITION TO THOSE REQUIREMENTS. HANDICAP ACCESS OPERATOR SHALL HAVE CONDUIT RUN FROM ITS CONTROL PANEL TO THE ACCESSIBLE CEILING SPACE.
 3. FOR DOUBLE DOORS, DUPLICATE THE DOOR POSITION SWITCH ROUGH-IN AND HANDICAP ACCESS THRU ROUGH-IN.
 4. IF PATH TO DOOR ACCESS CONTROL PANEL IS THRU EXPOSED AREA, ALL CONDUITS MAY BE JOINED TOGETHER AT A DEEP 4x4" JCT BOX AND ROUTED TO THE ACCESSIBLE CEILING SPACE AS A SINGLE 3/4" CONDUIT.

3 CARD ACCESS ROUGH-IN DETAIL



4 WIRELESS ACCESS POINT CABLING DETAIL



5 CARD ACCESS SECURITY CABLING DETAIL

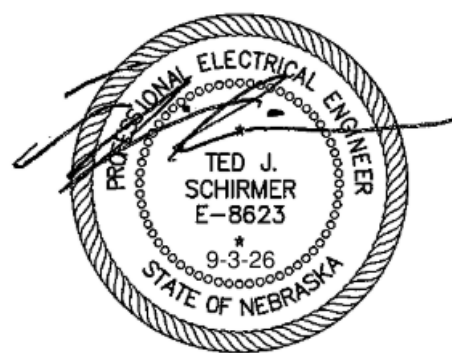
CLARK & ENERSEN LOW VOLTAGE SYSTEMS RESPONSIBILITY MATRIX					
PROJECT #: 506-002-25	TRI COUNTY 2025 BOND PROJECT				DATE: 8/26/2026
		INCLUDED	PROCURE / INSTALL	DESIGN / SPEC	Notes
INFRASTRUCTURE / FURNISHINGS	DIV 11 / 12				
Electronic Scoreboards	11 66 43	Equipment and Rough-In	CFCI/Erate RFP Telecom Contractor	C&E	Coordinate rough-in infrastructure requirements with the Erate RFP awarded telecom contractor and Diode. Erate RFP awarded telecom contractor provides low-voltage cabling.
COMMUNICATIONS (IT/TELECOM)	DIV 27				
Telecom Pathways / Spaces	27 00 00	Rough-In Only	CFCI	C&E/Owner	Contractor provides rough-ins. Coordinate rough-in infrastructure requirements with the Erate RFP awarded telecom contractor and Diode.
Cabinets, Racks, Frames, and Enclosures	27 00 00	Rough-In Only	Diode	Diode/Owner	
Termination Blocks and Patch Panels	27 00 00	Rough-In Only	Diode	Diode/Owner	
Outside Plant / Fiber Service to Building	27 00 00	Rough-In Only	Segra	C&E/Owner	Segra currently coordinating relocation work to be bid directly to the school.
Structured Cabling — Copper	27 00 00	Rough-In Only	Erate RFP Telecom Contractor	C&E/Owner	Coordinate rough-in infrastructure requirements with Erate RFP awarded telecom contractor.
Structured Cabling — Fiber	27 00 00	Rough-In Only	Erate RFP Telecom Contractor	C&E/Owner	Coordinate rough-in infrastructure requirements with Erate RFP awarded telecom contractor.
Network Electronics — Switching/Routing	27 00 00	Rough-In Only	OFOI	Owner	Coordinate rough-in infrastructure requirements with Diode.
Wireless Network / WAPs	27 00 00	Rough-In Only	OFOI	Owner	Coordinate rough-in infrastructure requirements with Diode.
Network Security / Servers / Storage	27 00 00	Rough-In Only	OFOI	Owner	Coordinate rough-in infrastructure requirements with Diode.
VoIP / Telephony	27 00 00	Rough-In Only	Diode/Owner	Diode/Owner	Coordinate rough-in infrastructure requirements with Diode.
Intercom	N/A	Rough-In Only	Diode/Owner	Diode/Owner	Coordinate rough-in infrastructure requirements with Diode.
Clock System	N/A	Rough-In Only	Diode/Owner	Diode/Owner	Coordinate rough-in infrastructure requirements with Diode.
AUDIOVISUAL SYSTEMS	DIV 27 41 13				
Audiovisual — Gym Sound System	27 41 13	Rough-In Only	CFCI/Diode	C&E/Owner	Contractor provides rough-ins. Coordinate rough-in infrastructure requirements with Diode.
Public Address / Paging	N/A	Rough-In Only	Diode/Owner	Diode/Owner	Coordinate rough-in infrastructure requirements with Diode.
ELECTRONIC SAFETY & SECURITY	DIV 28				
Access Control	N/A	Rough-In Only	CFCI/Erate RFP Telecom Contractor/OFOI	C&E/Owner	Contractor provides rough-ins. Erate RFP awarded telecom contractor provides low-voltage cabling. Owner installs equipment and devices.
Video Surveillance	N/A	Rough-In Only	CFCI/Erate RFP Telecom Contractor/OFOI	C&E/Owner	Contractor provides rough-ins. Erate RFP awarded telecom contractor provides low-voltage cabling. Owner installs equipment and devices.
Fire Detection & Alarm	28 31 11	Equipment & Rough-In	CFCI	C&E	

Tri County 2025 Bond Project

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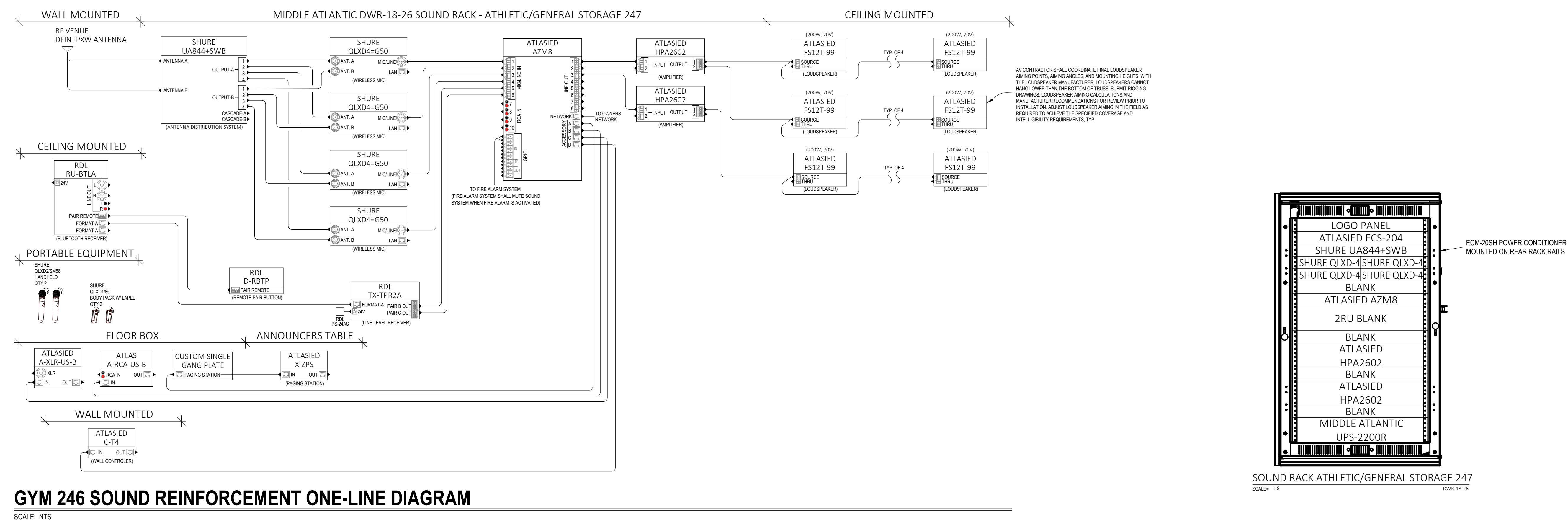
CE No.: 506-002-25

August 26, 2026



Audiovisual & Telecom
Details

T5.01



Clark & Enersen Project No.: 506-002-25

APPENDIX D

SECTION 27 00 00 - COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Complete communications infrastructure for Tri County Public Schools Renovation and Addition. Electrical contractor shall only provide rough-ins as noted on the telecommunications plans. An Erate RFP awarded telecommunications contractor shall provide all cabling and terminations. Diode Tech shall bid all other work within this specification and the telecommunications plans directly to the school.
2. Telecommunications spaces, equipment room fittings, entrance facility coordination, telecommunications rooms, pathways, grounding, bonding, cable management, backbone cabling, horizontal cabling, outlets, terminations, patch cords, testing, labeling, documentation, warranty, and training.
3. Communications infrastructure serving voice, data, wireless access points, instructional technology, video surveillance, access control, intrusion detection, intercom, digital signage, building automation, public address, clocks, network audio, emergency communications, and other IP-connected systems where indicated.
4. Renovation coordination, including existing cabling investigation, protection of active services, demolition of abandoned cabling, cutover support, temporary service continuity, and coordination with occupied K-12 school operations.
5. Addition coordination, including new pathways, telecommunications rooms, backbone cabling, horizontal cabling, grounding, racks, cabinets, and connection to existing school communications infrastructure.
6. Complete testing, certification, as-built documentation, and manufacturer warranty for new communications cabling system.

B. Basis of Design:

1. Belden structured cabling system. Other manufacturers are acceptable for use, if currently installed in the school, or approved by the school.
2. Copper Horizontal Cabling: Belden Category 6 or 6A, 10GX, 10GXS, 10GXW, 10GXM, or Owner-approved Belden Category 6 or 6A cable appropriate to the application.
3. Copper Connectivity: Belden REVConnect Category 6 or 6A connectivity system, including jacks, patch panels, modular plugs, faceplate modules, patch cords, and accessories.
4. Optical Fiber Backbone Cabling: Belden FiberExpress or Belden-approved OS2 single-mode optical fiber cabling.
5. Fiber Connectivity: Belden FiberExpress ECX, FiberExpress UHD, or Owner-approved Belden fiber patch panel, adapter, cassette, splice, connector, and patch cord system.
6. Racks, Cabinets, Cable Management, and Physical Support: Belden racks, cabinets, horizontal cable managers, vertical cable managers, fiber shelves, cable management, grounding accessories, and related infrastructure.
7. Warranty: Belden certified system warranty, installed by Belden-authorized or Belden-certified contractor.

C. Related Requirements:

1. Division 01 – General Requirements.

COMMUNICATIONS

27 00 00 - 1

Clark & Enersen Project No.: 506-002-25

2. Section 07 84 00 – Firestopping.
3. Section 08 31 00 – Access Doors and Panels.
4. Section 09 90 00 – Painting and Coating.
5. Section 26 05 00 – Common Work Results for Electrical.
6. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
7. Section 26 05 29 – Hangers and Supports for Electrical Systems.
8. Section 26 05 33 – Raceways and Boxes for Electrical Systems.
9. Section 26 05 36 – Cable Trays for Electrical Systems.
10. Section 26 27 26 – Wiring Devices.
11. Section 27 41 00 – Audiovisual Systems.
12. Section 28 31 00 – Fire Detection and Alarm.
13. Drawings: Telecommunications room layouts, technology plans, riser diagrams, outlet schedules, pathway plans, rack elevations, and low-voltage coordination drawings.

D. Work Excluded Unless Specifically Indicated:

1. Active network switches, wireless access points, firewalls, routers, servers, controllers, network management software, and endpoint device programming are Owner-furnished and Owner-installed unless specifically indicated otherwise.
2. Public service provider work is by service provider; Contractor shall provide pathways, backboards, grounding, sleeves, conduits, pull strings, and demarcation support as indicated.
3. AV equipment, access control devices, video surveillance cameras, intrusion devices, intercoms, clocks, speakers, and building automation devices are specified in their respective sections. Communications Contractor shall provide cabling and outlets where indicated.
4. Final network switch configuration, VLAN assignment, IP addressing, wireless access point adoption, and network activation are by Owner unless specifically indicated otherwise.

E. Contractor Responsibility:

1. Provide complete communications infrastructure ready for Owner network equipment and endpoint systems.
2. Verify field dimensions, existing conditions, service continuity requirements, renovation phasing, and Owner standards before procurement and installation.
3. Provide new cabling, terminations, patch panels, racks, cabinets, cable management, grounding, labeling, firestopping, testing, documentation, and warranty.
4. Coordinate work with active school operations, construction phasing, temporary egress, security, fire alarm, network operations, and Owner IT requirements.
5. Remove abandoned communications cabling in project areas unless specifically directed otherwise by Owner.
6. Protect existing communications infrastructure to remain.
7. Maintain existing school communications services during occupied phases except for Owner-approved outages.
8. Provide written outage requests and cutover plans for Owner approval before interrupting active services.

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1.2 SYSTEM DESCRIPTION

A. General:

1. Provide a complete standards-based structured cabling system serving the renovated existing school areas and new addition.
2. System shall support voice, data, wireless, AV, classroom technology, video surveillance, access control, intrusion detection, intercom, building automation, public address interfaces, digital signage, scheduling panels, PoE devices, and future IP-connected systems.
3. System shall be designed and installed as permanent building infrastructure.
4. System shall support moves, adds, changes, technology refresh, school reconfiguration, and future classroom, administrative, and safety technology needs.
5. System shall use standards-based topology, components, administration, grounding, labeling, and testing.

B. Performance Intent:

1. Support high-density wireless access throughout instructional areas, offices, media center, commons, gymnasium, cafeteria, corridors, and exterior learning or gathering areas where indicated.
2. Support classroom technology, interactive displays, teacher stations, lecture capture or streaming where indicated, AV-over-IP where indicated, digital signage, and hybrid learning applications.
3. Support electronic safety and security systems, including access control, video surveillance, intrusion detection, emergency communications, intercoms, and network audio where indicated.
4. Support building systems, including BAS, lighting control gateways, energy metering, kitchen systems, scoreboards, clocks, elevator communications, and facility-management systems where indicated.
5. Support renovation and addition phasing without compromising existing educational operations.
6. Provide spare capacity in pathways, rooms, racks, patch panels, fiber strands, copper ports, grounding infrastructure, and cable management.

C. System Topology:

1. Provide a hierarchical star topology from the Main Equipment Room or Main Telecommunications Room to telecommunications rooms serving each floor, building wing, or addition area.
2. Horizontal cabling shall extend from telecommunications rooms to work-area outlets, wireless access point outlets, AV outlets, security outlets, BAS outlets, and other endpoint locations.
3. Backbone cabling shall connect main communications room to each telecommunications room.
4. Do not daisy-chain telecommunications outlets.
5. Do not route horizontal communications cabling through one work area to serve another work area.
6. Provide dedicated home-run cabling from serving telecommunications room to each outlet unless zone cabling or consolidation point is specifically indicated and approved.

Clark & Enersen Project No.: 506-002-25

D. Design Criteria:

1. Horizontal copper cabling shall be Category 6 or 6A, four-pair, 100-ohm balanced twisted-pair cable unless otherwise indicated. Locations depicted on the telecommunications plans.
2. Horizontal copper permanent link length shall not exceed 90 meters.
3. Total copper channel length including patch cords and equipment cords shall not exceed 100 meters.
4. Backbone optical fiber shall include OS2 single-mode fiber unless Owner standards require otherwise.
5. Backbone fiber strand counts shall include spare capacity for future systems.
6. Copper cabling shall support IEEE 802.3 Ethernet applications, including 10GBASE-T over Category 6 or 6A cabling.
7. Copper cabling shall support PoE, PoE+, and PoE++ applications where required by endpoint devices.
8. Pathways shall be sized for initial installed cabling plus minimum 40 percent spare capacity unless more stringent requirements are indicated.
9. Racks, cabinets, and cable management shall be sized for initial equipment plus minimum 25 percent spare rack-unit and cable-management capacity unless otherwise indicated.
10. Telecommunications rooms shall allow safe access, patching, cable management, equipment replacement, serviceability, and future expansion.

E. Renovation Requirements:

1. Survey existing communications cabling, pathways, rooms, racks, cabinets, grounding, and active services in areas of work before demolition.
2. Identify existing services to remain, be relocated, be extended, or be removed.
3. Protect existing active cabling and equipment to remain.
4. Coordinate temporary relocations or extensions required to maintain school operations.
5. Remove abandoned cabling and termination hardware within project areas unless otherwise directed by Owner.
6. Do not cut, remove, or abandon existing cabling without Owner approval.
7. Provide temporary labeling where existing cabling is modified during phased work.
8. Firestop penetrations affected by cable demolition or new cabling.

F. Addition Requirements:

1. Provide new communications pathways, telecommunications rooms, grounding, racks, cabinets, backbone cabling, horizontal cabling, labeling, testing, and documentation for the new addition.
2. Connect addition telecommunications rooms to existing main communications room or designated network distribution point as shown on Drawings.
3. Coordinate fiber and copper backbone routing between existing building and addition.
4. Provide weatherproof, sealed, firestopped, and code-compliant transitions where cabling crosses between existing and new construction.
5. Maintain separation between construction activities and active school operations.

1.3 DEFINITIONS

A. AHJ: Authority Having Jurisdiction.

B. AP: Wireless access point.

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- C. AV: Audiovisual
- D. BAS: Building automation system.
- E. BDF: Building distribution frame.
- F. CP: Consolidation point.
- G. EF: Entrance facility.
- H. ER: Equipment room.
- I. HC: Horizontal cross-connect.
- J. IDF: Intermediate distribution frame.
- K. LAN: Local area network.
- L. MC: Main cross-connect.
- M. MDF: Main distribution frame.
- N. MPTL: Modular plug terminated link.
- O. OSP: Outside plant.
- P. PoE: Power over Ethernet.
- Q. PoE+: IEEE 802.3at Power over Ethernet.
- R. PoE++: IEEE 802.3bt Power over Ethernet.
- S. RU: Rack unit.
- T. TBB: Telecommunications bonding backbone.
- U. TGB: Telecommunications grounding busbar.
- V. TMGB: Telecommunications main grounding busbar.
- W. TR: Telecommunications room.
- X. WAO: Work-area outlet.
- Y. WAP: Wireless access point.

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1.4 REFERENCE STANDARDS

- A. Comply with latest adopted editions of applicable codes, standards, and guidelines, including:
1. NFPA 70 – National Electrical Code.
 2. NFPA 75 – Standard for the Fire Protection of Information Technology Equipment, where applicable.
 3. NFPA 101 – Life Safety Code, where applicable.
 4. ANSI/TIA-568 series – Telecommunications cabling standards.
 5. ANSI/TIA-569 – Telecommunications pathways and spaces.
 6. ANSI/TIA-606 – Administration standard for telecommunications infrastructure.
 7. ANSI/TIA-607 – Telecommunications bonding and grounding.
 8. ANSI/TIA-942 – Telecommunications infrastructure standard for data centers, where applicable.
 9. ANSI/TIA-598 – Optical fiber color coding.
 10. ANSI/TIA-1152 – Field testing instruments and requirements for balanced twisted-pair cabling.
 11. ANSI/TIA-526 series – Optical fiber test procedures.
 12. IEEE 802.3 – Ethernet and Power over Ethernet standards.
 13. BICSI Telecommunications Distribution Methods Manual.
 14. BICSI Information Technology Systems Installation Methods Manual.
 15. BICSI 007 – Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises, where applicable.
 16. UL 444 – Communications cables.
 17. UL 1651 – Optical fiber cable.
 18. UL 1863 – Communications circuit accessories.
 19. UL 2043 – Fire test for heat and visible smoke release for discrete products installed in air-handling spaces, where required.
 20. ASTM E814 or UL 1479 – Fire tests of penetration firestop systems.
 21. Manufacturer's current installation requirements.
 22. Owner's technology, safety, security, cybersecurity, and acceptable-use policies.
- B. Where conflicts occur among standards, codes, Drawings, Specifications, Owner policies, and manufacturer instructions, comply with the most stringent requirement.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Coordination Meeting:
1. Conduct meeting before rough-in, demolition, procurement, or cabling installation.
 2. Attendees shall include Owner IT representative, Owner facilities representative, Architect, Engineer, general contractor, electrical contractor, communications contractor, AV contractor, security contractor, BAS contractor, fire alarm contractor, and other trades requiring network cabling.
 3. Review:
 - a. Existing communications infrastructure.
 - b. Active school services to remain operational.
 - c. Renovation phasing and construction sequencing.
 - d. Addition backbone connectivity.
 - e. Telecommunications room locations and layouts.

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- f. Rack elevations.
- g. Backbone topology.
- h. Cable tray and pathway routing.
- i. Sleeves and penetrations.
- j. Grounding and bonding requirements.
- k. Power and HVAC requirements for telecommunications spaces.
- l. Firestopping responsibilities.
- m. Outlet locations and mounting heights.
- n. Wireless access point cabling and mounting.
- o. AV and classroom technology coordination.
- p. Security system cabling coordination.
- q. BAS and building systems coordination.
- r. Labeling scheme.
- s. Testing requirements.
- t. Warranty requirements.
- u. Owner-furnished equipment interface.
- v. Outage windows and cutover requirements.
- w. Occupied school safety procedures.
- x. Background check and access requirements for Contractor personnel.

B. Coordination with Owner IT Standards:

- 1. Confirm Owner standards before procurement.
- 2. Coordinate:
 - a. Cable colors.
 - b. Jack colors.
 - c. Faceplate colors.
 - d. Patch cord colors and lengths.
 - e. Rack and cabinet types.
 - f. Copper patch panel style.
 - g. Fiber connector type.
 - h. Fiber strand counts.
 - i. Fiber polarity method.
 - j. Telecommunications room naming.
 - k. Outlet labeling convention.
 - l. Wireless access point outlet requirements.
 - m. Network switch mounting and clearance requirements.
 - n. UPS and power distribution coordination.
 - o. Grounding and bonding standards.
 - p. Warranty requirements.
 - q. Existing network equipment to remain.
 - r. Demolition of abandoned cable.
 - s. Final cutover and activation responsibilities.

C. Coordination with Other Systems:

- 1. Coordinate communications outlets for:
 - a. Wireless access points.
 - b. IP cameras.
 - c. Access control panels and door controllers.
 - d. Intercoms and video door stations.

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- e. Emergency phones or call stations.
 - f. Digital signage.
 - g. Classroom displays.
 - h. AV-over-IP encoders and decoders.
 - i. AV control processors.
 - j. Scheduling panels.
 - k. Lecture capture or streaming appliances where indicated.
 - l. Network audio devices.
 - m. BAS controllers.
 - n. Lighting control gateways.
 - o. Elevators and elevator communications equipment.
 - p. Fire alarm communicators where applicable.
 - q. Metering and energy-management devices.
 - r. Kitchen systems requiring network connection.
 - s. Scoreboards and athletic systems where indicated.
 - t. Specialty educational equipment requiring network connection.
2. Coordinate each IP endpoint's serving room, outlet type, cable count, patch panel location, and Owner switch port requirement.

D. Occupied Campus Requirements:

1. Coordinate work areas, staging, access routes, deliveries, shutdowns, noise, dust, and life-safety impacts with Owner.
2. Contractor personnel shall comply with Owner school safety, background check, identification, access control, and student contact requirements.
3. Do not leave tools, ladders, open ceilings, exposed cabling, unsecured rooms, or incomplete pathways accessible to students or staff.
4. Maintain the security of telecommunications rooms, equipment rooms, and active network equipment.
5. Do not prop exterior doors or secure doors open without Owner approval.
6. Provide temporary protection, barricades, dust control, and signage as required.
7. Schedule disruptive work outside student-occupied hours where required by Owner.

E. Sequencing:

1. Complete telecommunications room construction, painting, lighting, grounding, power, HVAC, plywood backboards, cable tray, sleeves, and environmental controls before installing communications equipment and cabling.
2. Do not install cabling in spaces that are wet, dusty, unsecured, or not environmentally suitable.
3. Protect installed cabling from damage during construction.
4. Complete testing before Owner network equipment installation unless approved by Owner.
5. Coordinate demolition and cutover to avoid interruption of active school services.
6. Provide written cutover plan at least 10 business days before planned service interruption unless Owner permits shorter notice.

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1.6 SUBMITTALS

A. Product Data:

1. Submit manufacturer product data for:
 - a. Copper cable.
 - b. Copper jacks.
 - c. Copper patch panels.
 - d. Copper patch cords.
 - e. Faceplates and surface boxes.
 - f. Modular furniture adapters.
 - g. Consolidation point enclosures.
 - h. Zone cabling enclosures.
 - i. Optical fiber cable.
 - j. Fiber enclosures.
 - k. Fiber adapter panels.
 - l. Fiber cassettes.
 - m. Fiber connectors.
 - n. Fiber patch cords.
 - o. Racks.
 - p. Cabinets.
 - q. Vertical cable managers.
 - r. Horizontal cable managers.
 - s. Ladder rack.
 - t. Cable runway.
 - u. Cable tray.
 - v. J-hooks and supports.
 - w. Grounding busbars.
 - x. Bonding conductors.
 - y. Firestopping systems.
 - z. Labels and administration materials.

B. Shop Drawings:

1. Submit coordinated shop drawings showing:
 - a. Telecommunications room layouts.
 - b. Existing telecommunications spaces affected by renovation.
 - c. Rack elevations.
 - d. Wall-field elevations.
 - e. Cable tray routing.
 - f. Conduit and sleeve pathways.
 - g. Backbone riser diagram.
 - h. Existing-to-new backbone transition points.
 - i. Fiber strand allocation.
 - j. Copper backbone allocation where indicated.
 - k. Horizontal outlet locations.
 - l. Wireless access point outlet locations.
 - m. AV and security outlet coordination.
 - n. Grounding and bonding topology.
 - o. Firestopping details.
 - p. Communications equipment room clearances.

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- q. Service provider entrance pathway and demarcation location.
- r. Modular furniture feed locations.
- s. Floor-box and poke-through telecommunications insert configurations.
- t. Demolition and temporary service coordination plans.

C. Cable Schedule:

- 1. Submit cable schedule identifying:
 - a. Cable identifier.
 - b. Serving telecommunications room.
 - c. Origin termination.
 - d. Destination termination.
 - e. Cable type.
 - f. Cable color.
 - g. Jack or port number.
 - h. Patch panel number.
 - i. Room number.
 - j. Outlet number.
 - k. Device served.
 - l. Length.
 - m. Test result file reference.
 - n. Existing, new, relocated, or demolished status.
 - o. Remarks.

D. Backbone Schedule:

- 1. Submit fiber backbone schedule identifying:
 - a. Cable number.
 - b. Fiber type.
 - c. Strand count.
 - d. Origin room.
 - e. Destination room.
 - f. Fiber termination type.
 - g. Connector type.
 - h. Strand allocation.
 - i. Spare strands.
 - j. Measured length.
 - k. Test results.
 - l. Polarity method.

E. Demolition and Cutover Submittals:

- 1. Existing cable survey.
- 2. Active services to remain.
- 3. Abandoned cable to be removed.
- 4. Existing cable to be relocated or extended.
- 5. Proposed cutover sequence.
- 6. Proposed outage windows.
- 7. Temporary service plan.
- 8. Risk mitigation plan.
- 9. Owner approval documentation.

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F. Warranty Submittals:

1. Submit documentation verifying Contractor's Belden certification status.
2. Submit proposed Belden warranty type.
3. Submit manufacturer warranty registration requirements.
4. Submit list of products included in warranty.
5. Submit cable manufacturer and product numbers demonstrating warranty eligibility.

G. Testing Submittals:

1. Submit proposed test equipment make, model, serial number, software version, calibration date, and calibration certificate.
2. Submit sample copper test report.
3. Submit sample fiber test report.
4. Submit testing plan before testing.
5. Submit complete final test results in native tester format and PDF summary format.

H. Closeout Submittals:

1. As-built drawings.
2. Final rack elevations.
3. Final cable schedules.
4. Final fiber strand assignments.
5. Final copper test reports.
6. Final fiber test reports.
7. Final grounding and bonding documentation.
8. Final labeling schedule.
9. Warranty certificates.
10. O&M manuals.
11. Manufacturer data sheets.
12. Spare materials inventory.
13. Training documentation.
14. Demolition completion report.
15. Electronic files in Owner-approved format.

1.7 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Contractor shall be regularly engaged in structured cabling installation.
2. Contractor shall have completed not fewer than three K-12, higher education, institutional, healthcare, government, or commercial structured cabling projects of similar size and complexity within the past five years.
3. Contractor shall be Belden Partner Alliance-certified or otherwise certified by Belden for the installed cabling system.
4. Contractor shall provide manufacturer-certified technicians for copper and fiber installation.
5. Contractor shall have at least one BICSI RCDD on staff or assigned to the project.
6. Fiber splicing, connectorization, polishing, and testing shall be performed by technicians trained in optical fiber installation and testing.

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B. Installer Qualifications:

1. On-site lead technician shall have current Belden training or BICSI Installer/Technician certification.
2. Contractor shall have at least one supervisor on site during cabling installation who is experienced in Category 6A installation, optical fiber installation, telecommunications grounding, labeling, and testing.
3. Contractor shall not use untrained labor for cable termination or testing.
4. Contractor shall comply with Owner school access, background check, identification, and safety requirements.

C. Manufacturer Qualifications:

1. Basis-of-design manufacturer shall provide copper connectivity, fiber connectivity, racks, physical support, cable management, warranty program, and technical support.
2. Manufacturer shall provide published product data and installation instructions.
3. Manufacturer shall support extended warranty registration where specified.

D. Single-Source Compatibility:

1. Provide copper cable and copper connectivity as a Belden-certified end-to-end system.
2. Provide fiber cable and fiber connectivity as a Belden-certified system.
3. Provide patch cords compatible with the installed Belden system.
4. Components shall be listed, tested, and warranted together as a system where extended warranty is required.

E. Mockups:

1. Provide a mockup of a typical communications outlet, faceplate labeling, patch panel labeling, rack cable management, and a wireless access point outlet where requested.
2. Approved mockup may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original packaging.
- B. Store in clean, dry, conditioned location.
- C. Protect cable reels, boxes, connectors, patch panels, fiber enclosures, racks, and accessories from moisture, dust, impact, crushing, and contamination.
- D. Do not store cabling outdoors unless cable is listed for outdoor storage and protected from weather.
- E. Do not install cable that has been kinked, crushed, water-damaged, exposed to excessive heat, or otherwise damaged.
- F. Protect fiber connectors and adapters with dust caps until final connection.

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- G. Do not store materials in student-accessible areas unless secured and approved by Owner.

1.9 WARRANTY

- A. Provide manufacturer's standard product warranty.
- B. Provide Contractor labor warranty for not less than one year from Date of Substantial Completion.
- C. Provide a Belden-certified cabling system warranty where required by the Owner.
- D. Install products in strict accordance with Belden warranty requirements.
- E. Submit warranty application and provide final warranty certificate to Owner.
- F. Warranty shall include copper connectivity, fiber connectivity, approved cable, patch cords where required, installation workmanship where covered, and performance compliance as defined by the manufacturer's warranty program.
- G. Correct defective cabling, terminations, labeling, grounding, cable management, and test failures at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 - 1. Belden.
- B. Approved System:
 - 1. Belden Category 6 or 6A copper cabling and REVConnect connectivity.
 - 2. Belden FiberExpress optical fiber cabling and connectivity.
 - 3. Belden racks, cabinets, patch panels, cable management, faceplates, patch cords, and related accessories.
- C. Substitutions:
 - 1. Substitutions shall comply with Division 01.
 - 2. Submit comparison matrix identifying compliance with every specified requirement.
 - 3. Substitutions shall not reduce performance, warranty, standards compliance, port density, cable management, physical support, testing requirements, PoE capability, or Owner maintainability.
 - 4. Substitutions shall be reviewed before procurement.
 - 5. Substitutions submitted after procurement are not acceptable.
 - 6. Substitutions shall be fully compatible with Owner's existing infrastructure and new system warranty requirements.

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2.2 SYSTEM PERFORMANCE

A. Copper Horizontal Cabling:

1. Category 6 or 6A, four-pair, 100-ohm balanced twisted-pair cabling.
2. Support 10GBASE-T to 100 meters.
3. Support PoE applications up to IEEE 802.3bt where installed conditions and cable bundle design comply with applicable standards and manufacturer requirements.
4. Provide unshielded or shielded construction as indicated by the Owner's standard and project conditions.
5. Use the same performance category for cable, jack, patch panel, and patch cords.

B. Fiber Backbone Cabling:

1. Provide OS2 single-mode fiber unless otherwise indicated.
2. Provide strand counts as indicated on Drawings.
3. Fiber backbone shall be installed in innerduct, armored cable, or pathway as indicated.

C. Administration:

1. Labeling shall comply with ANSI/TIA-606 and Owner requirements.
2. Every cable, outlet, patch panel port, fiber strand, rack, cabinet, busbar, and pathway shall be labeled.
3. Labeling shall match as-built drawings and test reports.

2.3 TELECOMMUNICATIONS ROOMS AND EQUIPMENT ROOM FITTINGS

A. General:

1. Provide room fittings required for complete communications spaces.
2. Coordinate with architectural, mechanical, electrical, and fire protection trades.
3. Telecommunications rooms shall not be used for storage, custodial equipment, unrelated electrical panels, plumbing, mechanical equipment, or other non-communications systems unless approved by Owner.

B. Backboards:

1. Provide 3/4-inch fire-retardant plywood backboards where indicated.
2. Paint with two coats of light-colored fire-retardant paint.
3. Leave fire-retardant stamp visible.
4. Mount vertically, securely fastened to wall structure.
5. Extend from 6 inches above finished floor to 8 feet above finished floor unless otherwise indicated.

C. Cabinets:

1. Provide wall-mount or floor-mount cabinets where indicated.
2. Cabinets shall be ventilated, lockable, and sized for equipment, patching, cable management, bend radius, and service access.
3. Provide front and rear access where required.

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4. Provide fan kits where required by heat load.
5. Coordinate cabinet depth with Owner network electronics.
6. Bond metallic cabinets to telecommunications grounding system.

D. Horizontal Cable Managers:

1. Basis of Design: Belden horizontal cable managers.
2. Provide horizontal cable managers above and below patch panel groups and as required for organized patching. Coordinate details with the school's IT representative.
3. Provide bend-radius control and covers.
4. Provide 1 RU or 2 RU units as required by density.

E. Ladder Rack and Cable Runway:

1. Provide ladder rack or cable runway around telecommunications rooms and above racks as indicated.
2. Provide wall brackets, rack-to-runway kits, radius drops, waterfalls, elevation kits, butt-splice kits, and grounding hardware.
3. Ladder rack shall be bonded to telecommunications grounding system.
4. Maintain cable bend radius and separation from power systems.

F. Shelves and Accessories:

1. Provide fixed or vented shelves where indicated for Owner equipment.
2. Provide blank panels to maintain airflow and professional appearance.
3. Provide rack screws, cage nuts, strain relief, cable rings, brush panels, grommet panels, and mounting accessories.

2.4 COMMUNICATIONS PATHWAYS

A. General:

1. Provide communications pathways as indicated and as required for complete cabling system.
2. Pathways shall comply with ANSI/TIA-569 and NEC requirements.
3. Pathways shall maintain cable bend radius, pulling tension limits, fill capacity, separation from electromagnetic interference sources, and service access.
4. Pathways shall be dedicated to communications cabling unless otherwise approved.
5. Do not install communications cabling loose on ceilings, ceiling grids, piping, ductwork, sprinkler piping, conduit, or lighting supports.

B. Cable Tray:

1. Provide wire basket tray, ladder tray, or solid-bottom tray as indicated.
2. Cable tray shall be sized for installed cabling plus minimum 40 percent spare capacity.
3. Provide radius fittings, dropouts, supports, dividers, bonding jumpers, and accessories.
4. Maintain minimum 12 inches clearance above tray where possible.
5. Do not exceed manufacturer load ratings.
6. Bond metallic cable tray to telecommunications grounding system.

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C. Conduits:

1. Provide conduits where indicated, where cabling is concealed in walls, where exposed cabling is subject to damage, and where required by code or Owner standard.
2. Minimum conduit size shall be 1 inch for communications outlets unless otherwise indicated.
3. Provide larger conduit for multi-cable outlets, AV outlets, floor boxes, WAPs, and security endpoints as required.
4. Conduit bends shall be long sweep.
5. Do not exceed two 90-degree bends between pull points.
6. Provide pull boxes where required.
7. Provide insulated bushings on conduit ends.
8. Provide pull string in empty conduits.
9. Cap conduits to prevent debris entry.
10. Conduit fill shall not exceed code and manufacturer requirements.

D. J-Hooks and Supports:

1. Use J-hooks only where cable tray or conduit is not indicated and where allowed by Owner standards.
2. J-hooks shall be specifically listed for communications cabling.
3. Space supports not more than 4 feet on center unless manufacturer requires closer spacing.
4. Do not exceed fill capacity.
5. Do not use bridle rings for Category 6A cabling unless approved by Engineer.

E. Sleeves and Penetrations:

1. Provide sleeves through walls and floors as indicated.
2. Size sleeves for installed cables plus 40 percent spare capacity.
3. Firestop penetrations through rated assemblies.
4. Provide protective bushings.
5. Provide spare sleeves where indicated.

F. Innerduct:

1. Provide innerduct for fiber backbone cabling where indicated.
2. Use plenum-rated innerduct in plenum spaces.
3. Provide pull tape.
4. Label innerduct at each end.

2.5 GROUNDING AND BONDING

A. General:

1. Owner requirements have indicated that no grounding and bonding infrastructure is required.

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2.6 COPPER HORIZONTAL CABLING

A. General:

1. Provide Belden Category 6 or 6A horizontal cabling from serving telecommunications room to outlets and device locations.
2. Cable shall be four-pair, 100-ohm balanced twisted-pair.
3. Cable jacket rating shall be CMP plenum, CMR riser, or other rating as required by installed location and code.
4. Cable color shall be coordinated with Owner.
5. Provide different cable colors for designated systems where required by Owner.

B. Performance:

1. Category 6 or 6A cabling shall comply with ANSI/TIA-568 Category 6A requirements.
2. Channel shall support 10GBASE-T Ethernet to 100 meters.
3. Cabling shall support PoE, PoE+, and PoE++ applications where installed in compliance with manufacturer requirements.
4. Use manufacturer-recommended practices for high-PoE bundle sizes and thermal management.

C. Installation Requirements:

1. Do not exceed pulling tension.
2. Maintain bend radius.
3. Do not kink, crush, untwist excessively, deform, staple, or sharply bend cable.
4. Maintain pair twist to termination point.
5. Do not exceed 1/2 inch pair untwist at termination.
6. Do not use wire nuts, splices, insulation displacement connectors outside approved termination hardware, or field splices.
7. Do not install cable in wet locations unless cable is listed for wet location.
8. Replace damaged cable; do not repair.

D. Cable Length:

1. Permanent link shall not exceed 90 meters.
2. Channel shall not exceed 100 meters including patch cords and equipment cords.
3. Contractor shall notify Engineer before installation if pathway routing may exceed length limits.

2.7 COPPER CONNECTIVITY

A. Modular Jacks:

1. Basis of Design: Belden REVConnect Category 6 or 6A modular jacks.
2. Jacks shall be eight-position, eight-contact modular jacks.
3. Jacks shall be Category 6 or 6A rated.
4. Terminate using T568B wiring scheme unless Owner standard requires T568A.
5. Jack color shall be coordinated with Owner.
6. Provide icons or color inserts where required by Owner.

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B. Patch Panels:

1. Basis of Design: Belden REVConnect Category 6 or 6A patch panels.
2. Patch panels shall be rack-mounted, 19-inch EIA.
3. Provide 24-port or 48-port panels as required.
4. Patch panels shall include rear cable management.
5. Provide label fields for each port.
6. Provide blank inserts or covers for unused openings.
7. Patch panels shall match horizontal cabling category.
8. Fully coordinate telecom rack layouts with the school's IT representative.

C. Faceplates and Outlets:

1. Provide Belden-compatible workstation plates, boxes, modules, inserts, and accessories.
2. Provide faceplates with port capacity indicated.
3. Provide blank inserts for unused openings.
4. Faceplate color shall match electrical device color unless otherwise directed by Architect or Owner.
5. Provide stainless steel faceplates in public, high-abuse, or unfinished areas where indicated.
6. Provide surface-mount boxes where flush mounting is not possible.
7. Provide floor-box, poke-through, and furniture adapters compatible with installed floor-box and furniture systems.

E. Modular Plug Terminated Links:

1. MPTL terminations are permitted only for specific devices where indicated or approved by Owner, including wireless access points, IP cameras, access control devices, intercoms, displays, and BAS devices.
2. MPTL shall use Belden-approved field-terminable plugs.
3. MPTL shall be tested as MPTL using tester configuration appropriate to ANSI/TIA requirements.
4. MPTL shall not be used for general work-area outlets.

2.8 WORK-AREA OUTLETS

A. General:

1. Provide outlet configurations as indicated on Drawings.
2. Where outlet configuration is not indicated, provide quantity of Category 6 or 6A cables and quantity of Category 6 or 6A jacks at each standard telecommunications outlet, as indicated on the drawings.
3. Mount outlets at height indicated; where not indicated, align with adjacent electrical receptacles.
4. Coordinate outlet locations with furniture, casework, markerboards, displays, teaching walls, lab benches, lockers, cabinetry, and equipment.

B. Device Outlets:

1. Provide dedicated communications outlet for each IP device unless device is served by approved MPTL.

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2. Provide two Category 6A cables to each wireless access point location unless Owner standards indicate otherwise.
3. Provide one Category 6A cable minimum to each IP camera unless security drawings indicate more.
4. Provide one Category 6A cable minimum to each access control panel, door controller, intercom, BAS panel, lighting control gateway, digital signage player, or similar IP device unless indicated otherwise.

2.9 WIRELESS ACCESS POINT CABLING

A. General:

1. Provide cabling to WAP locations indicated on Drawings.
2. Provide two Category 6A cables to each WAP location unless Owner standard requires more.
3. Terminate WAP cables in ceiling outlet box, biscuit, zone enclosure, MPTL, or other Owner-approved method.
4. Coordinate final WAP locations with wireless design, ceiling plan, lighting, HVAC diffusers, sprinklers, speakers, projectors, cameras, and architectural elements.

B. Mounting Coordination:

1. Provide outlet and slack to allow access point mounting without exposed cabling where practical.
2. Provide mounting brackets by Owner or network equipment supplier unless indicated otherwise.
3. Do not coil excessive cable at WAP location.
4. Provide service loop above accessible ceiling as recommended by manufacturer and Owner.
5. Do not install WAP outlets above inaccessible ceilings unless access panel is provided.

C. Labeling:

1. Label WAP cables at telecommunications room and device end.
2. Label shall correspond to Owner AP naming convention where provided.

2.10 OPTICAL FIBER BACKBONE CABLING

A. General:

1. Provide Belden optical fiber backbone cabling between telecommunications rooms, equipment rooms, entrance facilities, and other locations indicated.
2. Cable shall be suitable for installed environment.
3. Provide plenum, riser, indoor/outdoor, outside plant, armored, or innerduct-installed cable as required.
4. Provide OS2 and OM4 fiber types unless otherwise indicated.
5. Provide strand counts indicated on Drawings.

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B. Single-Mode Fiber:

1. OS2, 9/125 micron single-mode optical fiber.
2. Jacket color shall be yellow unless otherwise required by Owner.
3. Use for long-term backbone capacity, campus connectivity, high-speed uplinks, and future applications.

C. Multimode Fiber:

1. OM4, 50/125 micron laser-optimized multimode optical fiber.
2. Jacket color shall comply with Owner standard and fiber type identification requirements.
3. Use for building backbone applications where multimode fiber is required by Owner equipment.

D. Installation:

1. Install fiber in continuous lengths without splices except where indicated or approved.
2. Maintain the manufacturer's bend radius and pulling tension.
3. Use pulling grips, swivels, and lubricants approved by cable manufacturer.
4. Protect fiber from crushing, kinking, twisting, and excessive tension.
5. Provide service loops in each telecommunications room.
6. Store service loops neatly on cable management hardware.
7. Do not leave fiber unsupported or exposed to damage.

E. Termination:

1. Terminate fibers in rack-mounted fiber enclosures unless otherwise indicated.
2. Use LC connectors unless Owner standard requires otherwise.
3. Use fusion-spliced pigtails, pre-terminated assemblies, cassettes, or field-installable connectors as approved by Owner and warranty requirements.
4. Provide dust caps on unused adapters and connectors.
5. Clean and inspect fiber end faces before testing and final connection.

2.11 FIBER CONNECTIVITY

A. Fiber Enclosures:

1. Basis of Design: Belden FiberExpress ECX or FiberExpress UHD fiber enclosures.
2. Provide rack-mounted enclosures sized for installed terminations plus minimum 25 percent spare adapter capacity.
3. Provide front and rear cable management.
4. Provide strain relief, slack management, bend-radius control, splice trays where required, adapter panels, labeling, and covers.
5. Enclosures shall be accessible for maintenance without disturbing adjacent equipment.

B. Adapter Panels and Cassettes:

1. Basis of Design: Belden FiberExpress adapter panels and cassettes.
2. Provide LC duplex adapters unless otherwise indicated.
3. Adapter color shall comply with fiber type and Owner standard.

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4. Provide modular cassettes where pre-terminated trunk systems are used.
5. Maintain proper polarity.

2.12 FIRESTOPPING

- A. Provide firestopping for communications penetrations through fire-rated floors, walls, partitions, and smoke barriers.
- B. Firestopping shall be UL-listed system appropriate for assembly type, penetrating items, cable fill, and rating.
- C. Firestopping shall allow future cable changes where practical through re-enterable systems.
- D. Label firestopped penetrations where required by Owner.
- E. Do not use non-rated foam, mineral wool alone, or unlisted sealants.
- F. Restore firestopping at penetrations affected by removal of abandoned cabling.

2.13 IDENTIFICATION AND LABELING

- A. General:
 1. Provide permanent machine-printed labels.
 2. Labels shall be legible, durable, and suitable for installed environment.
 3. Handwritten labels are not acceptable.
 4. Labeling shall comply with Owner standards and ANSI/TIA-606.
- B. Labeling Locations:
 1. Label each cable at both ends.
 2. Label each outlet.
 3. Label each patch panel.
 4. Label each patch panel port.
 5. Label each fiber enclosure.
 6. Label each fiber adapter panel and strand.
 7. Label each rack and cabinet.
 8. Label each busbar.
 9. Label each backbone cable.
 10. Label each consolidation point and zone enclosure.
 11. Label each sleeve and pathway where required by Owner.
 12. Label existing cabling modified or extended under this Project.
- C. Label Format:
 1. Use Owner's labeling convention.
 2. Where Owner convention is not provided, use format identifying building, floor, telecommunications room, rack, patch panel, port, room, and outlet.
 3. Final labeling format shall be approved before installation.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field conditions before installation.
- B. Confirm telecommunications rooms are ready to receive communications work.
- C. Confirm pathways are complete, clean, dry, and free of sharp edges.
- D. Confirm sleeves, conduits, boxes, cable tray, ladder rack, backboards, grounding, lighting, HVAC, and power are installed.
- E. Confirm ceiling access is available.
- F. Confirm architectural and furniture layouts are sufficiently complete to locate outlets.
- G. Confirm that existing services to remain are identified and protected.
- H. Notify Architect of conditions that prevent compliant installation.
- I. Do not proceed until unsatisfactory conditions are corrected.

3.2 DEMOLITION AND PROTECTION

- A. Survey existing cabling in renovation areas before demolition.
- B. Identify active cables, inactive cables, abandoned cables, and cables to remain.
- C. Do not disconnect or remove active cables without Owner approval.
- D. Remove abandoned communications cabling in project areas unless otherwise directed by Owner.
- E. Remove abandoned termination hardware, patch panels, faceplates, surface raceway, and supports where indicated or where associated cabling is removed.
- F. Existing conduit and boxes may remain where approved by Owner and code-compliant; provide blank covers for abandoned boxes.
- G. Firestop openings affected by cable removal.
- H. Protect existing communications infrastructure to remain.
- I. Repair damage caused by demolition.
- J. Maintain Owner network operations during occupied phases unless an Owner-approved outage is scheduled.

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3.3 TELECOMMUNICATIONS ROOM INSTALLATION

- A. Install racks, cabinets, ladder rack, cable managers, backboards, grounding, and accessories as shown on approved shop drawings.
- B. Maintain working clearances.
- C. Anchor racks and cabinets.
- D. Bond racks, cabinets, cable tray, ladder rack, and metallic supports.
- E. Arrange patch panels, fiber enclosures, and cable management for orderly patching.
- F. Separate copper, fiber, security, AV, and other systems where indicated.
- G. Provide neat cable routing with strain relief and bend-radius control.
- H. Do not obstruct access to electrical panels, mechanical equipment, valves, controls, or access panels.
- I. Keep telecommunications rooms clean during installation.
- J. Remove debris daily.

3.4 PATHWAY INSTALLATION

- A. Install pathways according to approved shop drawings.
- B. Coordinate routing with other trades.
- C. Maintain separation from power conductors, lighting ballasts, motors, transformers, and sources of electromagnetic interference.
- D. Install cable tray level, aligned, and securely supported.
- E. Install conduit with bushings, pull strings, and pull boxes.
- F. Provide sleeves through walls and floors.
- G. Firestop penetrations.
- H. Maintain pathway fill limits.
- I. Do not install cabling until pathways are complete and accepted.

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3.5 CABLE INSTALLATION

A. General:

1. Install cabling according to manufacturer instructions, standards, and approved shop drawings.
2. Use proper cable handling equipment.
3. Do not exceed pulling tension.
4. Maintain bend radius.
5. Provide cable support independent of ceiling grid and other systems.
6. Do not lay cable directly on ceiling tiles.
7. Do not attach cable to sprinkler piping, ductwork, conduit, ceiling grid wires, or other trades' supports.
8. Keep cabling grouped and organized.
9. Avoid excessive slack.
10. Replace damaged cable.

B. Copper Cable:

1. Install each cable as continuous run from patch panel to outlet or approved consolidation point.
2. Do not splice copper horizontal cable.
3. Maintain cable geometry.
4. Avoid tight bundling where high PoE loads are expected.
5. Use hook-and-loop cable ties.
6. Do not use nylon zip ties tightened around communications cables.
7. Provide service loop in telecommunications room and at outlet where practical.
8. Dress cables neatly in racks and cable managers.

C. Fiber Cable:

1. Install fiber with care to prevent damage.
2. Maintain bend radius during and after installation.
3. Use protective innerduct where indicated.
4. Provide service loops at each end.
5. Secure fiber without crushing.
6. Protect exposed fiber in telecommunications rooms.
7. Clean and inspect connectors before mating.

D. Cable Separation:

1. Maintain separation from electrical power cabling as required by code, standards, and manufacturer recommendations.
2. Cross power cabling at 90 degrees where crossing is unavoidable.
3. Maintain separation from heat sources, fluorescent ballasts, motors, transformers, and sources of electromagnetic interference.
4. Maintain separation from plumbing, steam, hydronic piping, and mechanical systems.

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3.6 TERMINATION

A. Copper Termination:

1. Terminate copper cabling on Belden Category 6A jacks and patch panels.
2. Use T568B wiring scheme unless Owner requires T568A.
3. Maintain pair twist to termination point.
4. Use manufacturer-approved termination tools.
5. Terminate shields and bonding where shielded cabling is used.
6. Provide strain relief at terminations.
7. Re-terminate cables with excessive untwist, damaged conductors, or failed test results.

B. Fiber Termination:

1. Terminate fiber in Belden FiberExpress enclosures.
2. Use LC connectors unless otherwise indicated.
3. Fusion splice pigtails where required.
4. Install splice trays and protect splices.
5. Provide dust caps.
6. Clean connectors before testing and final turnover.
7. Maintain polarity.

C. Patch Panels:

1. Route cables to patch panels through vertical and horizontal managers.
2. Dress cables in bundles by destination and port sequence.
3. Provide rear cable support.
4. Do not obstruct adjacent rack units.
5. Provide labels after termination and testing.

3.7 OUTLET INSTALLATION

- A. Install outlets at locations and heights indicated.
- B. Coordinate with architectural finishes and furniture.
- C. Provide faceplates flush and aligned.
- D. Install jacks in consistent orientation.
- E. Provide blank inserts in unused openings.
- F. Label outlets after testing.
- G. For floor boxes and poke-throughs, coordinate device plates, trim, furniture, and floor finish.
- H. For modular furniture, coordinate service locations, furniture feed points, slack, and final terminations.
- I. Protect outlets in areas accessible to students during construction.

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3.8 WIRELESS ACCESS POINT ROUGH-IN

- A. Install WAP cabling at indicated locations.
- B. Coordinate final locations with Owner wireless design.
- C. Provide outlet, biscuit, or MPTL as approved.
- D. Provide service loop above accessible ceiling.
- E. Label cables clearly.
- F. Do not install WAP outlets above inaccessible ceilings unless access panel is provided.
- G. Coordinate with ceiling systems to avoid blocking RF propagation or interfering with architectural features.

3.9 FIRESTOPPING

- A. Firestop communications penetrations after cable installation.
- B. Use listed firestop systems.
- C. Maintain rating of penetrated assembly.
- D. Install firestopping neatly and completely.
- E. Provide re-enterable firestop systems for major cable pathways where practical.
- F. Identify firestop systems in closeout documentation.
- G. Replace damaged firestopping caused by subsequent work or cable demolition.

3.10 FIELD QUALITY CONTROL

- A. General:
 - 1. Test every installed copper cable and fiber strand.
 - 2. Testing shall be performed by trained personnel using calibrated test equipment.
 - 3. Submit passing test reports before Substantial Completion.
 - 4. Cables or fibers without passing test reports are not accepted.
- B. Copper Testing:
 - 1. Test each Category 6A permanent link.
 - 2. Use Level IIIe or better field tester suitable for Category 6A certification.
 - 3. Test to ANSI/TIA Category 6A permanent link requirements.

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4. Test parameters shall include, at minimum:
 - a. Wire map.
 - b. Length.
 - c. Propagation delay.
 - d. Delay skew.
 - e. Insertion loss.
 - f. NEXT.
 - g. PSNEXT.
 - h. ACR-F.
 - i. PSACR-F.
 - j. Return loss.
 - k. Alien crosstalk where required by standards, Owner, or project conditions.
5. MPTL links shall be tested using appropriate MPTL test adapters and limits.
6. Failed links shall be corrected and retested.
7. Do not submit marginal "pass*" results unless accepted in writing by Owner and Engineer.

C. Fiber Testing:

1. Test each fiber strand after termination.
2. Test multimode and single-mode fiber according to applicable ANSI/TIA and manufacturer requirements.
3. Perform Tier 1 testing on each strand:
 - a. Continuity.
 - b. Polarity.
 - c. Length.
 - d. Insertion loss.
4. Perform OTDR testing where indicated, for backbone links, outside plant links, or where required by Owner.
5. Test multimode fiber at 850 nm and 1300 nm.
6. Test single-mode fiber at 1310 nm and 1550 nm.
7. Test in both directions where required by standard, Owner, or manufacturer warranty.
8. Clean and inspect connectors before testing.
9. Failed fibers shall be corrected and retested.

D. Grounding and Bonding Testing:

1. Verify continuity of bonding conductors.
2. Verify racks, cabinets, ladder rack, and cable tray are bonded.
3. Submit test results.

E. Visual Inspection:

1. Engineer and Owner may inspect:
 - a. Telecommunications room layout.
 - b. Rack installation.
 - c. Cable management.
 - d. Labeling.
 - e. Firestopping.
 - f. Grounding and bonding.
 - g. Outlet installation.
 - h. Pathways.

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- i. Service loops.
- j. Patch panel terminations.
- k. Existing-to-new cabling transitions.
- l. Abandoned cable removal.
- 2. Correct deficiencies.

3.11 SYSTEM ACCEPTANCE

- A. System shall not be accepted until:
 - 1. Installation is complete.
 - 2. Telecommunications rooms are clean and orderly.
 - 3. Labels are complete.
 - 4. Cable testing is complete and passing.
 - 5. Fiber testing is complete and passing.
 - 6. Grounding and bonding is complete.
 - 7. Firestopping is complete.
 - 8. Abandoned cable removal in project areas is complete.
 - 9. As-built documentation is submitted.
 - 10. Warranty registration is submitted.
 - 11. Owner training is complete.
 - 12. Deficiencies are corrected.
- B. Owner may withhold acceptance of communications cabling that cannot be traced, tested, warranted, or documented.

3.12 CLEANING

- A. Remove debris from telecommunications rooms and work areas.
- B. Vacuum racks, cabinets, and rooms.
- C. Remove dust from equipment surfaces.
- D. Remove unused cable, packaging, scrap, and abandoned materials generated by this Work.
- E. Leave telecommunications rooms clean, organized, and ready for Owner equipment installation.
- F. Do not leave construction debris in student-occupied areas.

3.13 TRAINING

- A. Provide Owner training after installation and before final acceptance.
- B. Training shall include:
 - 1. System topology.
 - 2. Telecommunications room organization.
 - 3. Labeling scheme.

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4. Copper patching.
5. Fiber patching.
6. Fiber polarity and connector care.
7. Warranty requirements.
8. Test documentation.
9. As-built documentation.
10. Procedures for moves, adds, and changes.
11. Cleaning and inspection of fiber connectors.
12. Cable management requirements.
13. Grounding and bonding overview.
14. Existing-to-new cabling transitions.
15. Spare capacity and future expansion provisions.

- C. Provide a minimum of 4 hours of training unless otherwise indicated.

3.14 CLOSEOUT

- A. Submit complete closeout package.

- B. Closeout documents shall include:

1. As-built floor plans showing outlet locations and identifiers.
2. As-built telecommunications room layouts.
3. As-built rack elevations.
4. Backbone riser diagram.
5. Fiber strand assignment schedule.
6. Copper cable schedule.
7. Test results.
8. Grounding and bonding documentation.
9. Warranty certificate or warranty application confirmation.
10. Product data.
11. O&M documentation.
12. Spare materials inventory.
13. Training record.
14. Demolition report identifying abandoned cable removed and existing cable left in place by Owner direction.
15. Cutover report identifying services cut over, unresolved issues, and Owner acceptance.

- C. Electronic Documentation:

1. Provide PDF record documents.
2. Provide editable CAD or Revit files where required by Division 01.
3. Provide cable schedules in Microsoft Excel format.
4. Provide test results in native tester format and PDF format.
5. File names shall match Owner requirements.

3.15 PROTECTION

- A. Protect communications infrastructure until final acceptance.

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- B. Replace damaged cables, connectors, faceplates, patch panels, fiber enclosures, racks, cabinets, and labels.
- C. Do not allow other trades to use communications racks, cable tray, ladder rack, or pathways for unrelated systems without approval.
- D. Maintain dust protection in telecommunications rooms until building is clean.
- E. Keep telecommunications spaces locked when not actively occupied by authorized workers.

3.16 FIRST-YEAR REVIEW

- A. Within 11 months after Substantial Completion, participate in warranty review with Owner.
- B. Review:
 - 1. Telecommunications room condition.
 - 2. Cable management.
 - 3. Labeling integrity.
 - 4. Rack capacity.
 - 5. Spare pathway capacity.
 - 6. Fiber spare strand assignments.
 - 7. Known trouble reports.
 - 8. Warranty issues.
 - 9. Owner move/add/change needs.
 - 10. Renovation/addition transition issues.
- C. Correct warranty deficiencies.

END OF SECTION 27 00 00