Addendum 02

DOCUMENT 00 91 00

DATE: May 18, 2026

PROJECT: Morgan Township Volunteer Fire Department
7106 Big Bear Creek Road
Lucasville, Ohio 45648

PROJECT #: 25063.00

OWNER: Morgan Township Board of Trustees
Contact: Russ Montgomery
7106 Big Bear Creek Road
Lucasville, Ohio 45648

ARCHITECT: Garmann Miller
38 South Lincoln Drive
P.O. Box 71
Minster, Ohio 45865

TO: Prospective Bidders

This addendum form is a part of the Contract Documents and modifies the Construction Documents dated March 13, 2026, with amendments and additions noted below.

Acknowledge receipt of this Addendum on the Bid Form. Failure to do so may disqualify the Bidder.

This addendum consists of 2 pages, 7 re-issued drawing sheets, and 8 re-issued specification sections.

CHANGES TO THE PROJECT MANUAL

1. Section 13 34 19 Pre-Engineered Buildings, Part 2 Products, Paragraph 2.01 Manufacturers, Item A. Acceptable Manufacturers, add the following as acceptable manufacturers:

    7. Metallic Metal Buildings
    8. CECO Buildings

2. Section 27 05 26 – Issued in its entirety
3. Section 27 11 00 – Issued in its entirety
4. Section 2715 13 – Issued in its entirety

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5. Section 27 21 00 – Issued in its entirety
6. Section 27 21 33 – Issued in its entirety
7. Section 27 41 19 – Issued in its entirety
8. Section 28 16 01 – Issued in its entirety
9. Section 28 23 00 – Issued in its entirety

CHANGES TO THE DRAWINGS

1. Drawing Sheet E2.1 – Site Electrical Plan:
   a. Updated technology conduit information.
2. Drawing Sheet E3.1 – Systems and Power Plans:
   a. Added WAP type outlet on detail 1.
   b. Added Security system information on detail 1.
3. Drawing Sheet T1.1 – General Notes, Abbreviations, Legends, Diagrams, and Sheet Index:
   a. Updated cabling legend to match E1.1 detail 1.
   b. Updated Technology sheet index.
4. Drawing Sheet T1.2 – Technology Outlet Types:
   a. Updated detail 9 with proper grounding details.
   b. Updated detail 11.
5. Drawing Sheet T1.3 – Technology Diagrams:
   a. Changed detail 3 for proper CCTV clarifications.
6. Drawing Sheet T2.1 – Site Technology Plan:
   a. Added sheet in its entirety for Technology conduit clarification.
7. Drawing Sheet TCE1.1 – Technology Plan – Unit A:
   a. Updated Detail 1 to change WAP locations and add security system details.
   b. Updated detail 2 to change WAP locations.
   c. Updated Detail 4 to properly reflect Technology Rack requirements and in-room conduit.
   d. Updated Keynotes and Sheet Title.

ATTACHMENTS

The following attachments are included and are part of this addendum:

Drawing Sheets E2.1, E3.1, T1.1, T1.2, T1.3, T2.1, TCE1.1

Specification Sections 27 05 26, 27 11 00, 27 15 13, 27 21 00, 27 21 33, 27 41 19, 28 16 01, 28 23 00

END OF ADDENDUM

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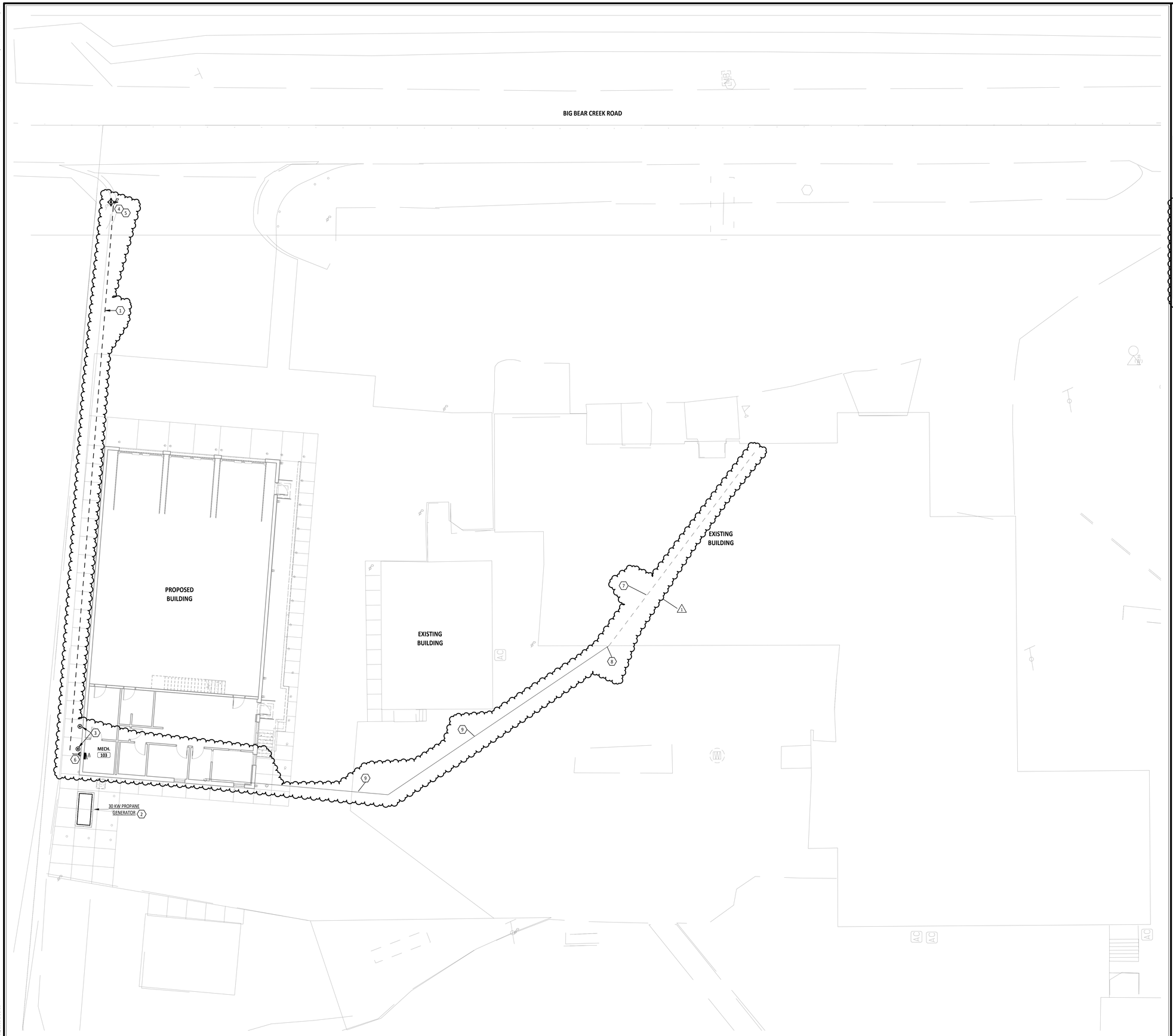


1 E2.1 **ELECTRICAL SITE PLAN**
1" = 10'-0"

UTILITY COMPANY CONTACT

AEP 708C FAIRGROUND RD, LUCASVILLE, OH 45648
IAN PARSLEY ENGINEERING ASSOCIATE
(CELL) 740.529.8830

ELECTRICAL SITE GENERAL NOTES

A SEE CIVIL SITE PLAN, AND LANDSCAPE SITE PLANS FOR EXACT LOCATION OF OTHER UTILITIES. INSTALLATION OF ELECTRICAL WORK SHALL BE COORDINATED WITH THE OTHER TRADES.
B ELECTRICAL UTILITY SERVICE CONDUITS TO BE MINIMUM OF 48" BELOW GRADE TO TOP OF CONDUITS.
C PROVIDE PULL WIRES IN ALL EMPTY CONDUITS.
D ALL UNDERGROUND CONDUIT SHALL BE 1" SCHEDULE 40 PVC, UNLESS NOTED OTHERWISE.
E COORDINATE CONSTRUCTION WITH THE ELECTRIC UTILITY COMPANY.

#	KEYNOTE DESCRIPTION
1	UNDERGROUND FEEDER FROM SECONDARY OF UTILITY COMPANY TRANSFORMER TO PANEL 'A'. REFERENCE RISER DIAGRAM FOR FEEDER INFORMATION.
2	STANDBY GENERATOR. REFERENCE GENERATOR SPECIFICATIONS FOR ADDITIONAL INFORMATION.
3	ELECTRIC SERVICE GROUND ROD(S). REFERENCE GROUNDING DETAIL FOR ADDITIONAL INFORMATION. COORDINATE LOCATION WITH OTHER EQUIPMENT IN AREA.
4	NEW UTILITY POLE AND POLE MOUNTED TRANSFORMER. TRANSFORMER FURNISHED AND INSTALLED BY UTILITY COMPANY.
5	UNDERGROUND SERVICE CONDUIT TO TURN UP AT THE BASE OF THE UTILITY POLE. PROVIDE 30'-0" OF WIRE COILED AT THE BASE OF THE POLE FOR FINAL UTILITY CONNECTIONS. COORDINATE WORK WITH THE UTILITY COMPANY.
6	PROVIDE NEW UTILITY METER. COORDINATE WORK WITH THE UTILITY COMPANY.
7	ALL CABLING/CONDUIT INSIDE OF EXISTING BUILDING BY DIVISION 27. REFER TO72.1 FOR MORE INFORMATION.
8	PROVIDE SMART LB FOR TECHNOLOGY CONDUIT TRANSITION FROM UNDERGROUND TO EXTERIOR OF EXISTING BUILDING. COORDINATE WORK WITH TECHNOLOGY CONTRACTOR AND OWNER FOR EXACT LOCATION.
9	PROVIDE ONE (1) 2" CONDUIT WITH ONE 2" 3-CELL FABRIC INNERDUCT. COORDINATE WORK WITH DIVISION 27 CONTRACTOR.

Know what's **below.** **Call** before you dig.

STATE OF OHIO
JOHN T. MUSIELEWICZ
12800
REGISTERED ARCHITECT

JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
MARION, OHIO | COLUMBUS, OHIO | INDIANAPOLIS, INDIANA | FORT WAYNE, INDIANA
mmllgroup.com

NEW BUILDING FOR
MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT BUILDING
7195 BIG BEAR CREEK RD, LUCASVILLE, OH 45648

ISSUANCES/REVISIONS

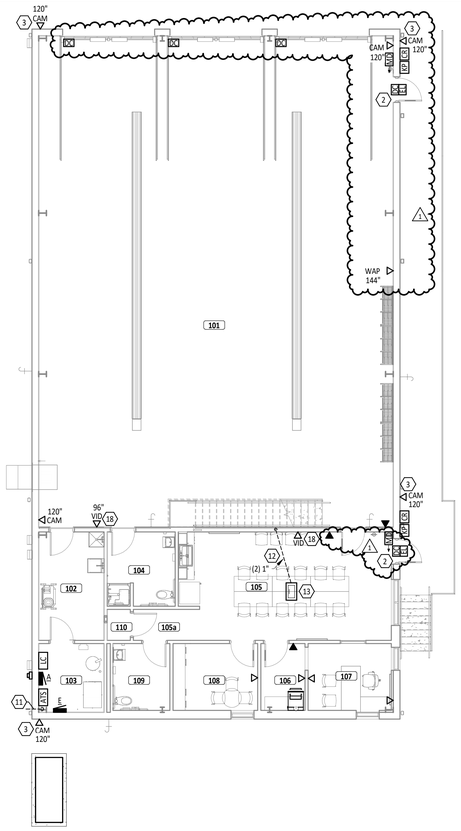
	CONSTRUCTION DOCUMENTS	03/13/2026
1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	DNS	AEM

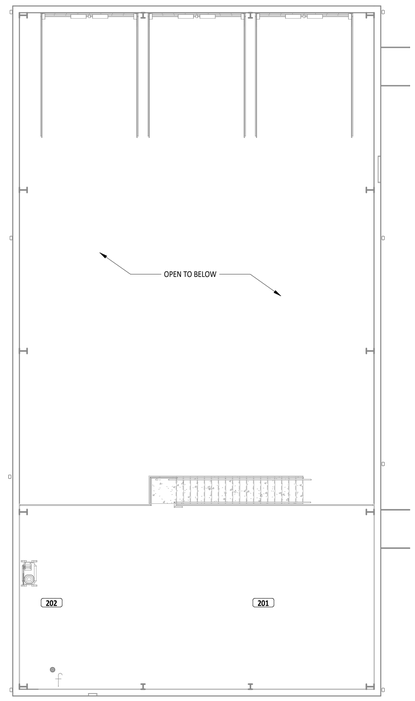
SHEET TITLE:
SITE ELECTRICAL PLAN

SHEET NUMBER:
E2.1

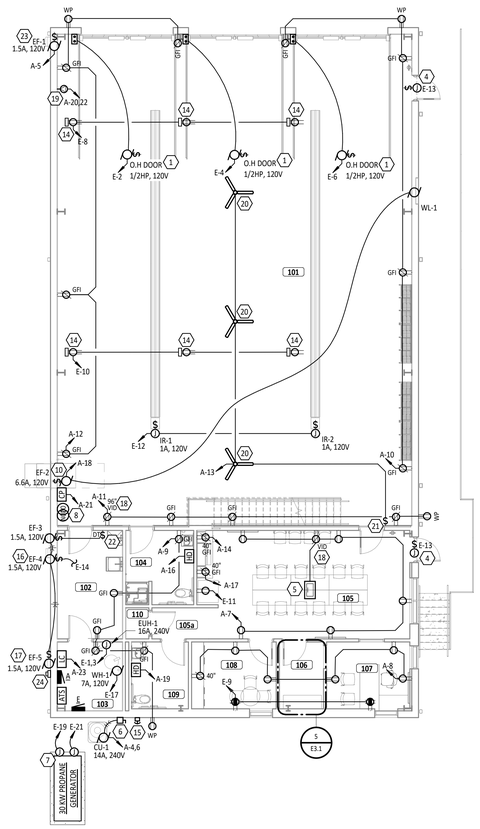
PRINTED ON: 5/18/2026 8:33:22 AM



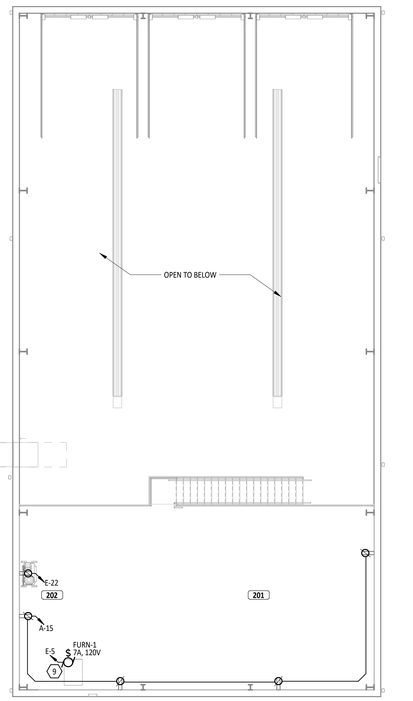
1 E3.1 **FIRST FLOOR SYSTEMS PLAN**
1/8" = 1'-0"



2 E3.1 **MEZZANINE SYSTEMS PLAN**
1/8" = 1'-0"



3 E3.1 **FIRST FLOOR POWER PLAN**
1/8" = 1'-0"



4 E3.1 **MEZZANINE POWER PLAN**
1/8" = 1'-0"

ROOM INDEX

ROOM NUMBER	ROOM NAME	AREA
101	TRUCK BAY	2,964 SF
102	WASH ROOM	121 SF
103	MECH.	77 SF
104	RESTROOM	80 SF
105	MEETING ROOM	381 SF
105a	CORRIDOR	35 SF
106	RADIO ROOM	50 SF
107	CHIEF'S OFFICE	95 SF
108	OFFICE	96 SF
109	RESTROOM	65 SF
110	CLOSET	12 SF
201	MEZZANINE	797 SF
202	EQUIPMENT PLATFORM	323 SF

POWER & SYSTEMS GENERAL NOTES

A WHERE DEVICES ARE SHOWN UNDER CABINETS, CASEWORK, FURNITURE AND THE LIKE; REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT PLACEMENT SO THAT DEVICES SHALL BE LOCATED WITHIN KNEE SPACE OR OPEN AREA.

B CASEWORK INSTALLER SHALL CUT HOLES IN CASEWORK FOR RECEPTACLES, DEVICES, ETC., UNLESS NOTED OTHERWISE.

C ALL CONDUCTORS FOR EQUIPMENT CONNECTIONS SHALL BE COPPER UNLESS NOTED OTHERWISE AND APPROVED BY THE MANUFACTURER.

D COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ALL REQUIRED CLEARANCES ABOUT ELECTRICAL EQUIPMENT WITH ACCORDANCE TO THE NATIONAL ELECTRICAL CODE.

E REFER TO MECHANICAL, PLUMBING, AND OTHER APPLICABLE DRAWINGS FOR EXACT EQUIPMENT LOCATIONS.

F MAINTAIN ALL FIRE RATINGS WHERE CONDUIT PENETRATES WALL, CEILINGS, AND FLOORS WITH ONLY U.L. LISTED FIRE ASSEMBLIES.

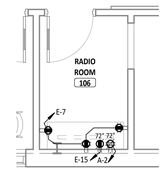
G ALL LOW VOLTAGE CABLING FOR THE SCOPE OF WORK BY DIVISION 26, 27, AND 28 IN EXPOSED CEILING SPACES SHALL BE ROUTED INSIDE CONDUIT. COORDINATE WITH INSTALLER OF EACH SYSTEM PRIOR TO ROUGH-IN. PAINT CONDUIT TO MATCH SURROUNDING AREA.

H CONDUIT IN EXPOSED CEILING SPACES SHALL BE CONCEALED INSIDE WALLS. EXPOSED CONDUIT SHALL ONLY BE ALLOWED IN JOIST SPACE NEAR ROOF.

I ALL CONDUIT ENDS FOR CABLING NOT CONNECTED TO A BOX OR FITTING SHALL BE PROVIDED WITH NYLON BUSHINGS TO PROTECT CABLING FROM DAMAGE.

J ALL MOUNTING HEIGHTS REFER TO BOTTOM OF BOX, UNO.

#	KEYNOTE DESCRIPTION
1	PROVIDE NECESSARY POWER CONNECTIONS TO MOTORIZED DOOR OPERATOR. PROVIDE POWER AND CONTROL RACEWAY AND ROUGH-IN AS REQUIRED. COORDINATE WORK WITH G.C. AND OVERHEAD DOOR INSTALLER.
2	DOOR PROVIDED WITH ELECTRIC STRIKE AND POWER PACK BY DOOR HARDWARE SUPPLIER. DIVISION 26 TO PROVIDE POWER TO POWER PACK ABOVE CEILING, BACK BOXES, RACEWAYS, BUSHINGS AND PULL STRINGS FOR CABLING FROM ABOVE CEILING/POWER PACK TO ELECTRIC STRIKE IN DOOR FRAME. CABLING BY SECURITY/ACCESS CONTROL CONTRACTOR. COORDINATE WORK WITH DOOR HARDWARE INSTALLER AND SECURITY/ACCESS CONTROL CONTRACTOR. REFERENCE POWER PLANS FOR 120-VOLT POWER REQUIREMENTS.
3	PROVIDE SINGLE GANG, FLUSH MOUNTED JUNCTION BOX ON EXTERIOR OF BUILDING WITH 1" CONDUIT STUBBED TO INSIDE. MOUNT THE BOX AND CABLE SLEEVE ABOVE THE CEILING FOR EXTERIOR CAMERA/WAP. PROVIDE PLASTIC BUSHING ON END OF CONDUIT AND WEATHERPROOF BLANK COVER FOR EXTERIOR BOX. REFERENCE TECHNOLOGY DRAWINGS FOR MORE DETAILS. COORDINATE WORK WITH TECHNOLOGY CONTRACTOR PRIOR TO ROUGH-IN.
4	PROVIDE POWER CONNECTION ABOVE CEILING FOR ELECTRIC STRIKE POWER PACK(S), TRANSFORMER(S) AND ACCESS CONTROL PANEL(S). REFER TO SYSTEMS PLAN FOR EXACT QUANTITIES.
5	FLOOR BOX TO CONTAIN TWO DUPLEX RECEPTACLES AND ONE LOCAL INPUT DATA OUTLET FOR VIDEO MONITOR. PROVIDE A BOX EQUAL TO THE LEGRAND EVOLUTION SERIES EFB4SS FLOOR BOX. PROVIDE THE PROPER COVER FOR THE ASSOCIATED ROOM FLOOR TYPE.
6	PROVIDE 30A, 240V, 1-PHASE, NON-FUSED HEAVY DUTY DISCONNECT IN NEMA 3R ENCLOSURE.
7	STANDBY GENERATOR AND CONCRETE PAD. REFER TO SPECIFICATIONS AND ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION. PROVIDE 12" THICK MINIMUM CONCRETE PAD WITH #4 RE-BAR IN A HATCH PATTERN 12" ON CENTER. PAD SHALL BE TO MANUFACTURER'S RECOMMENDATIONS. PROVIDE UNDERGROUND CIRCUITS TO FEED BATTERY CHARGER, BLOCK HEATER AND UNDERGROUND CONDUIT FOR REMOTE ANNUNCIATOR PANEL.
8	PROVIDE A SELF-CONTAINED CO/NO DETECTION SYSTEM EQUAL TO ARMSTRONG AMC-1BVC. PROVIDE AN OVERRIDE SWITCH, RELAYS AND CONTACTORS NEEDED FOR A COMPLETE SYSTEM. CONTROL PANEL SHALL BE INTERCONNECTED TO EF-2 AND LOUVER WL-1. COORDINATE WITH MECHANICAL CONTRACTOR. REFERENCE DETAIL 2/E1.2 FOR OPERATION DETAILS.
9	PROVIDE NECESSARY CONNECTIONS REQUIRED FOR UNIT. EXTEND CONTROL WIRING TO CONDENSING UNIT LOCATED ON THE EXTERIOR OF THE BUILDING. COORDINATE REQUIREMENTS WITH THE MECHANICAL CONTRACTOR.
10	EXHAUST FAN AND DAMPER TO BE CONTROLLED BY CO/NO CONTROL PANEL AND OVERRIDE SWITCH. PROVIDE ALL ELECTRICAL CONNECTIONS. SEE DETAIL 2/E1.2 FOR MORE INFORMATION. COORDINATE WORK WITH MECHANICAL CONTRACTOR.
11	PATHWAY FOR INTERNET SERVICE PROVIDER (ISP). REFER TO SHEET E2.1 FOR ADDITIONAL INFORMATION.
12	PROVIDE CONDUIT FOR TECHNOLOGY CABLING UNDER SLAB TO FLOOR BOX. REFER TO POWER PLANS FOR ADDITIONAL REQUIREMENTS.
13	REFER TO POWER PLANS FOR FLOOR BOX INFORMATION.
14	PROVIDE CORD REEL FROM ABOVE DOWN. REFERENCE DETAIL 3/E1.2.
15	GENERATOR EMERGENCY-STOP SWITCH. REFERENCE SPECIFICATIONS FOR MORE INFORMATION.
16	CIRCUIT CONTINUES TO ROOM LIGHTS. FAN TO TURN 'ON/OFF' WITH LIGHTING IN ROOM 104. PROVIDE RELAYS AS REQUIRED. COORDINATE WORK WITH DIVISION 23.
17	CIRCUIT CONTINUES TO ROOM LIGHTS. FAN TO TURN 'ON/OFF' WITH LIGHTING IN ROOM 109. PROVIDE RELAYS AS REQUIRED. COORDINATE WORK WITH DIVISION 23.
18	RECEPTACLE/ROUGH-IN FOR VIDEO MONITOR. REFERENCE DETAIL 6/E1.2.
19	RECEPTACLE FOR A 50A, 240V 1Ø POWER WASHER. COORDINATE RECEPTACLE TYPE WITH THE OWNER.
20	PROVIDE A 56" CAN-ARM CEILING FAN MODEL #CP56D OR EQUAL. COORDINATE COLOR WITH ARCHITECT.
21	PROVIDE CAN-ARM DC FAN CONTROLLER MODEL #RREM-DCQD14 OR EQUAL THAT IS COMPATIBLE WITH CEILING FAN.
22	PROVIDE A 0-4 HOUR DIGITAL TIMER TO CONTROL EXHAUST FAN. EQUAL TO INTERMATIC EI215SW.
23	EXHAUST FAN TO RUN 24/7.
24	UTILITY METER.



5 E3.1 **ENLARGED RADIO ROOM POWER PLAN**
1/4" = 1'-0"

STATE OF OHIO
JOHN T. MUSIELEWICZ
12800
REGISTERED ARCHITECT

JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
MANSFIELD, OHIO | COLUMBUS, OHIO | INDIANAPOLIS, INDIANA | FORT WAYNE, INDIANA
mmillergroup.com

NEW BUILDING FOR

MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT

7595 BIG BEAR CREEK RD. LUCASVILLE, OH 45648

ISSUANCES/REVISIONS

	CONSTRUCTION DOCUMENTS	03/13/2026
1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	DNS	AEM

SHEET TITLE:

SYSTEMS AND POWER PLANS

SHEET NUMBER:

E3.1

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TECHNOLOGY CABLING SYMBOLS

REFER TO FACEPLATE ELEVATIONS FOR MORE INFORMATION ON TECHNOLOGY OUTLETS.

SYMBOL	DESCRIPTION	MOUNTING LOC.	MOUNTING HT.
D#	DATA OUTLET	WALL	16", UNO
V#D#	VOICE/DATA OUTLET	WALL	16", UNO
V#	VOICE OUTLET	WALL	44"
	'#' INDICATES NUMBER OF VOICE AND / OR DATA CABLES TO BE PROVIDED AT EACH LOCATION		
LI	LOCAL INPUT OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT.	WALL	16", UNO
IFP	INTERACTIVE FLAT PANEL OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND ONE (1) 1-1/4" CONDUIT.	WALL	44"
LVP	LARGE VENUE PROJECTOR OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT.	WALL	AS NOTED
SA	GYMNASIUM AUDIO SYSTEM OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT.	WALL	16"
SP	STAGE PRESENTER OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT.		
TPC	TEACHER PERSONAL COMPUTER OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT.		
SR	SOUND REINFORCEMENT OUTLET. 4-11/16", 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND TWO (2) 1-1/4" CONDUIT. (DETAIL X ON SHEET E.X.)	WALL	44"
VID	VIDEO MONITOR OUTLET. 2-GANG, 3.5" DEEP BOX WITH 2-GANG EXTENSION RING AND ONE (1) 1-1/4" CONDUIT.	WALL	72", UNO
CAM	CAMERA OUTLET. 2-GANG, 3.5" DEEP BOX WITH 1-GANG EXTENSION RING AND ONE (1) 1" CONDUIT.	WALL	144", UNO
WAP	WIRELESS ACCESS POINT OUTLET. 2-GANG, 3.5" DEEP BOX WITH 1-GANG EXTENSION RING AND ONE (1) 1" CONDUIT.		
CAM	20 FT OF CAT 6 CABLE COILED ABOVE ACCESSIBLE CEILING FOR FUTURE CAMERA INSTALLATION BY 28 2300 CONTRACTOR		
SS	20 FT OF CAT 6 CABLE COILED ABOVE ACCESSIBLE CEILING FOR FUTURE SECURITY SYSTEM INSTALLATION BY 28 1601 CONTRACTOR.		
WAP	20 FT OF CAT 6 CABLE COILED ABOVE ACCESSIBLE CEILING FOR FUTURE WIRELESS ACCESS POINT INSTALLATION BY 27 2300 CONTRACTOR		
	LADDER TYPE CABLE TRAY		
	BASKET TYPE CABLE TRAY		
(2)2"	CONDUIT SLEEVE(S) FOR TECHNOLOGY CABLING PROVIDED BY DIVISION 26. DIVISION 26 TO PROVIDE FIRE STOPPING WHEN PENETRATING THROUGH FIRE WALLS AS REQUIRED BY CODE.	8" ABOVE CEILING	SEE PLANS
		WALL	16", UNO

DENOTES HORIZONTALLY MOUNTED RACEWAY
DENOTES VERTICALLY MOUNTED RACEWAY

1 T1.1 TECHNOLOGY CABLING SYMBOLS LEGEND

AUDIO DEVICE SYMBOLS

SYMBOL	DESCRIPTION	MOUNTING LOC.	MOUNTING HT.
PA	PUBLIC ADDRESS SOUND SYSTEM RACK.	FLOOR	N/A
SD	STUDENT DINING SOUND SYSTEM RACK.		
GS	GYMNASIUM SOUND SYSTEM RACK.		
PR	PORTABLE SOUND SYSTEM RACK.		
MS	MUSIC/VOCAL ROOM SOUND SYSTEM RACK.		
	HANGING MICROPHONE PROVIDED BY DIVISION 27. DIVISION 26 TO PROVIDE CEILING MOUNTED JUNCTION BOX AND PATHWAY AS REQUIRED. COORDINATE WITH DIVISION 26.	CEILING	N/A
	MICROPHONE OUTLET PROVIDED BY DIVISION 27. DIVISION 28 TO PROVIDE SINGLE GANG BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	16", UNO
	AUXILIARY/MICROPHONE OUTLET BY DIVISION 27. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAYS. COORDINATE WORK WITH DIVISION 26.	WALL	96", UNO
	PUBLIC ADDRESS SYSTEM CEILING SPEAKER BY DIVISION 27.	CEILING	N/A
	CLASSROOM SOUND REINFORCEMENT SYSTEM SPEAKER PROVIDED BY DIVISION 27.		
	PUBLIC ADDRESS SYSTEM FLUSH MOUNT WALL SPEAKER PROVIDED BY DIVISION 27.	WALL	96", UNO
	PUBLIC ADDRESS HORN TYPE SPEAKER PROVIDED BY DIVISION 27.		
	SOUND SYSTEM SPEAKER PRIVIDED BY DIVISION 27. DIVISION 26 TO PROVIDE ROUGH INS AS REQUIRED FOR INSTALLATION. COORDINATE WORK WITH DIVISION 26.	VARIES	SEE PLANS
	PUBLIC ADDRESS CALL-IN SWITCH PROVIDED BY DIVISION 27. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING.	WALL	44"
	PUBLIC ADDRESS SYSTEM VOLUME CONTROL PROVIDED BY DIVISION 27. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING.		
	ADMINISTRATIVE CONTROL CONSOLE FOR THE PUBLIC ADDRESS SYSTEM BY DIVISION 27. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY AS REQUIRED FOR INSTALLATION. COORDINATE WORK WITH DIVISION 26.	VARIES	SEE PLANS

2 T1.1 AUDIO DEVICE SYMBOLS LEGEND

TECHNOLOGY EQUIPMENT SYMBOLS

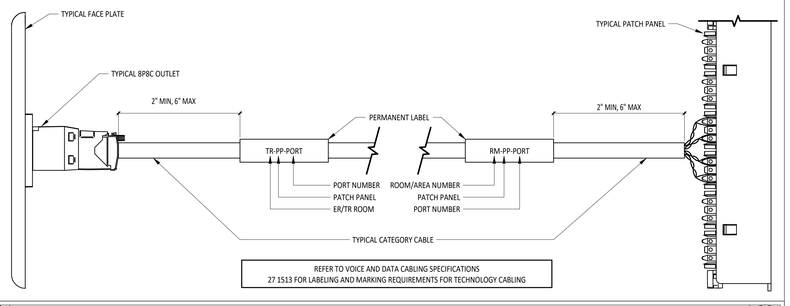
SYMBOL	DESCRIPTION	MOUNTING LOC.	MOUNTING HT.
	MULTI-SENSOR CCTV CAMERA, CABLING BY 27 1513 CAMERA BY 28 2300.	VARIES	144", UNO
	CCTV CAMERA, CABLING BY 27 1513, CAMERA BY 28 2300		
	WIRELESS ANALOG CLOCK - DUAL FACE - CEILING MOUNT	WALL	96", UNO
	WIRELESS ANALOG CLOCK - DUAL FACE - WALL MOUNT	WALL	96", UNO
	WIRELESS ANALOG CLOCK - SINGLE FACE - WALL MOUNT		
	WIRELESS ANALOG CLOCK - SINGLE FACE - WALL MOUNT WITH WIRE GUARD		
12	16" WIRELESS ANALOG CLOCK - SINGLE FACE - WALL MOUNT		
12	16" WIRELESS ANALOG CLOCK - SINGLE FACE - WALL MOUNT WITH WIRE GUARD		
12:00	WIRELESS DIGITAL CLOCK - WALL MOUNT - DOUBLE SIDED - SINGLE FACE - LEFT	WALL	96", UNO
	WIRELESS ANALOG CLOCK - WALL MOUNT DOUBLE SIDED - SINGLE FACE - RIGHT	WALL	96", UNO
12:00 12:00	WIRELESS DIGITAL CLOCK - WALL MOUNT - DOUBLE SIDED - DUAL FACE	WALL	96", UNO
12:00	WIRELESS DIGITAL CLOCK - WALL MOUNT	WALL	96", UNO
12:00	WIRELESS DIGITAL CLOCK & PA SPEAKER COMBO - WALL MOUNT	WALL	96"
	WIRELESS ACCESS POINT - CEILING MOUNTED	CEILING	
	WIRELESS ACCESS POINT - WALL MOUNTED	WALL	144", UNO
	LARGE VENUE VIDEO PROJECTOR		
	XX" IFP - INTERACTIVE FLAT PANEL DISPLAY		
	'XX' INDICATES DISPLAY SIZE DIAGONALLY IN INCHES		
	TYPICAL CLASSROOM/SMALL GROUP ROOM	WALL	MATCH WHITE BOARD
	TYPICAL CONFERENCE ROOM	WALL	42", UNO
	XX" LCD - STANDARD FLAT PANEL DISPLAY		
	'XX' INDICATES DISPLAY SIZE DIAGONALLY IN INCHES		
	TYPICAL CLASSROOM/SMALL GROUP ROOM	WALL	MATCH WHITE BOARD
	TYPICAL OFFICE AND COMMOMS AREAS	WALL	42", UNO
	TYPICAL CONFERENCE ROOM	WALL	72", UNO
	DESK MOUNT PHONE		
	WALL MOUNT PHONE	WALL	44", UNO

3 T1.1 TECHNOLOGY EQUIPMENT SYMBOLS LEGEND

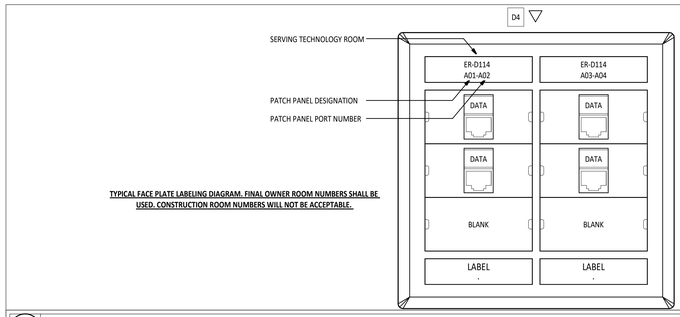
SECURITY/ACCESS CONTROL SYMBOLS

SYMBOL	DESCRIPTION	MOUNTING LOC.	MOUNTING HT.
ACP	ACCESS CONTROL SYSTEM CONTROL PANEL. DIVISION 26 TO PROVIDE 120V CONNECTION TO PANEL AS REQUIRED. COORDINATE WORK WITH DIVISION 26.	WALL	72" TO TOP
SCP	SECURITY SYSTEM CONTROL PANEL. DIVISION 26 TO PROVIDE 120V CONNECTION TO PANEL AS REQUIRED. COORDINATE WORK WITH DIVISION 26.		
EL	ELECTRONIC LOCK PROVIDED BY DIVISION 08. DIVISION 26 TO PROVIDE PATHWAYS TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 08 AND DIVISION 26	DOOR	SEE PLANS
RX	DOOR CONTACT PROVIDED BY DIVISION 28. DIVISION 26 TO PROVIDE PATHWAYS TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 08 AND DIVISION 26.		
REX	REQUEST TO EXIT DEVICE BY DIVISION 28. DIVISION 26 TO PROVIDE PATHWAYS TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 08 AND DIVISION 26	VARIES	VARIES
CR	ACCESS CONTROL CARD READER PROVIDED BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	44"
KP	SECURITY SYSTEM KEYPAD PROVIDED BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	48"
MM	HARD CEILING MOUNT MOTION DETECTOR PROVIDED BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	HARD CEILING	N/A
MM	CEILING MOUNT MOTION DETECTOR PROVIDED BY DIVISION 28. COORDINATE WORK WITH DIVISION 26.	WALL	96", UNO
	SECURITY SYSTEM ALARM BELL PROVIDED BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	80", UNO
	AUDIO ONLY INTERCOM STATION BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	48"
	AUDIO & VIDEO INTERCOM STATION BY DIVISION 28. DIVISION 26 TO PROVIDE BACK BOX AND PATHWAY TO ABOVE ACCESSABLE CEILING. COORDINATE WORK WITH DIVISION 26.	WALL	48"
DS	DESK MOUNT MASTER INTERCOM STATION PROVIDED BY DIVISION 28. COORDINATE PATHWAY REQUIREMENTS WITH DIVISION 26.	VARIES	VARIES
	ELECTRONIC DOOR RELEASE OR LOCK DOWN PUSH BUTTON PROVIDED BY DIVISION 28. COORDINATE PATHWAY REQUIREMENTS WITH DIVISION 26.		

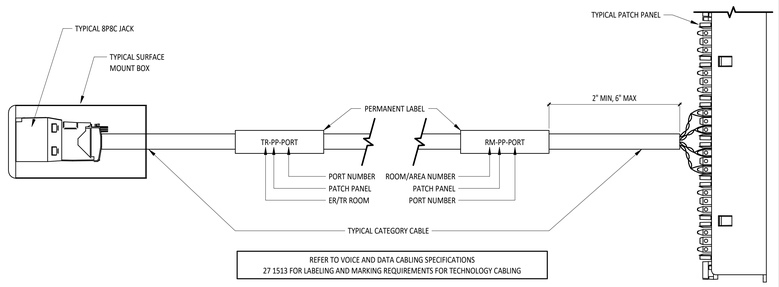
4 T1.1 SECURITY/ACCESS CONTROL SYMBOL LEGEND



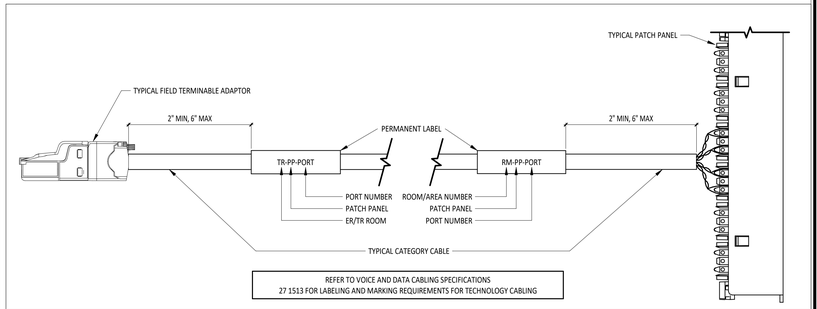
5 T1.1 CABLE LABELING SCHEMATIC - FACEPLATE TO PATCH PANEL



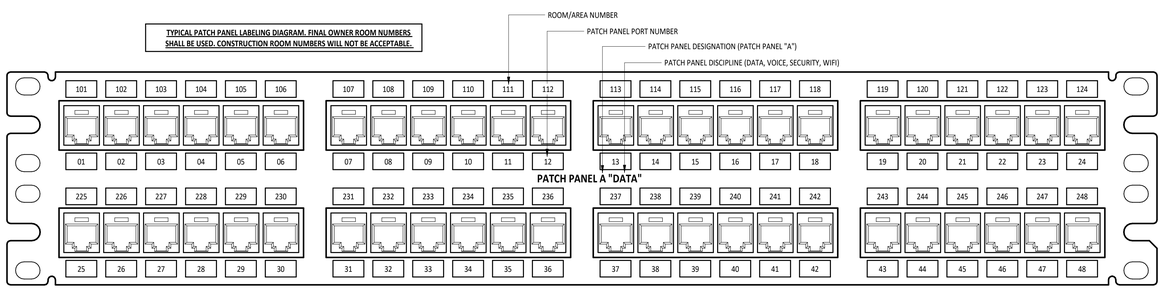
6 T1.1 TYPICAL FACEPLATE LABELING SCHEMATIC



7 T1.1 CABLE LABELING SCHEMATIC - SURFACE MOUNT BOX TO PATCH PANEL



8 T1.1 CABLE LABELING SCHEMATIC - FIELD TERMINAL ADAPTER TO PATCH PANEL



9 T1.1 TYPICAL PATCH PANEL LABELING SCHEMATIC

TECHNOLOGY CABLING AND JACK COLOR CODING

CABLE TYPE	DESCRIPTION	COLOR CABLE	COLOR JACK
CATEGORY 6	DATA NETWORK CABLE	BLUE	BLUE
CATEGORY 6	VOICE NETWORK CABLE	WHITE	WHITE
CATEGORY 6	WIRELESS DATA NETWORK CABLE	BLUE	BLUE
CATEGORY 6	SECURITY, ACCESS CONTROL, CCTV NETWORK CABLE	BLUE	BLUE
CATEGORY 6	LOCAL PEER TO PEER	ORANGE	ORANGE
CATEGORY 6	USB OVER TWISTED PAIR, HDMI OVER TWISTED PAIR	ORANGE	ORANGE
3.5MM AUDIO	SHIELDED 22AWG/2 CONDUCTOR	N/A	MATCH FACEPLATE
HDMI	ACTIVE OPTICAL HDMI	N/A	MATCH FACEPLATE

10 T1.1 TECHNOLOGY CABLING AND JACK COLOR CODING

- NOTE:

	ABBREVIATIONS USED ON THE CONTRACT DOCUMENTS, INCLUDE BUT ARE NOT LIMITED TO THOSE LISTED BELOW.

A

AC	ABOVE COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AV	AUDIO/VISUAL

C

CAM	CAMERA
CAT	CATEGORY
CCTV	CLOSED-CIRCUIT TELEVISION

D

D	DATA
DC	DIRECT CURRENT
DSD	DIGITAL SIGNAGE DISPLAY

E

E	EXISTING
EC	ELECTRICAL CONTRACTOR
ER	EQUIPMENT ROOM

G

GBE	GIGABIT ETHERNET
GPON	GIGABIT PASSIVE OPTICAL NETWORK

I

IFP	INTERACTIVE FLAT PANEL DISPLAY
ISG(N)	ISOLATED SYSTEMS GROUND
IWB	INTERACTIVE WHITE BOARD

L

LI	LOCAL INPUT
LVP	LARGE VENUE PROJECTOR

M

MM	MULTIMODE FIBER OPTIC CABLE

O

OLT	OPTICAL LINE TERMINAL
ONT	OPTICAL NETWORK TERMINAL
OREQ	OR EQUAL
OS	OPTICAL SPLITTER

P

PA	PUBLIC ADDRESS
PDU	POWER DISTRIBUTION UNIT
PoE	POWER OVER ETHERNET
POL	PASSIVE OPTICAL LAN
PON	PASSIVE OPTICAL NETWORK

Q

Q	EMPTY BOX WITH BLANK COVER

R

RU	RACK UNITS

S

SA	SOUND AMPLIFICATION
SM	SINGLE MODE FIBER OPTIC CABLE
SP	STAGE PRESENTER
SR	SOUND REINFORCEMENT
SS	SECURITY SYSTEM

T

TBB	TELECOMMUNICATIONS BONDING BACKBONE
TE	TELECOMMUNICATIONS ENCLOSURE
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BACKBONE
TPC	TEACHERS PERSONAL COMPUTER
TR	TELECOMMUNICATIONS ROOM
TYP	TYPICAL

U

UNO	UNLESS NOTED OTHERWISE

V

V	VOICE
VID	VIDEO
VOD	VIDEO ON DEMAND
VoIP	VOICE OVER INTERNET PROTOCOL
VP	VIDEO PROJECTOR

W

WAP	WIRELESS ACCESS POINT
WG	WIREGUARD; SIZED SPECIFICALLY FOR DEVICE IT IS SERVING
WP	WEATHERPROOF

X

XGS-PON-10	10 GIGABIT SYNCHRONOUS - PASSIVE OPTICAL NETWORK

TECHNOLOGY SHEET INDEX

TECHNOLOGY CABLING/EQUIPMENT GENERAL NOTES

A RACK LAYOUTS SHALL NOT BE CHANGED WITHOUT APPROVAL FROM THE ARCHITECT AND THE CONSTRUCTION MANAGER.

B ALL EQUIPMENT, OWNER OR CONTRACTOR PROVIDED, SHALL BE MOUNTED IN THE RACKS WITH THE PROPER MOUNTING HARDWARE AND WITH THE PROPER PATCH CABLE LENGTH AND COLOR.

C ALL EMPTY OR UNUSED RACK SPACE MUST BE FILLED WITH BLANK PANELS FOR PROPER HOT/COLD ISLE VENTILATION.

D TECHNOLOGY CABLING CONTRACTORS ARE RESPONSIBLE FOR PROVIDING, BUT IS NOT LIMITED TO, THE FOLLOWING FOR THEIR RESPECTIVE SPECIFICATION SECTIONS: TWO POST RACKS, FOUR POST RACKS, WALL/FLOOR MOUNT CABINETS, VERTICAL CABLE MANAGERS, HORIZONTAL CABLE MANAGERS, PATCH PANELS, FIBER ENCLOSURES AND COUPLER PANELS, BLANK PANELS, SHELVES FOR ANY OWNER EQUIPMENT OR EQUIPMENT NOT RACK MOUNTABLE, AND PAGING SYSTEM.

E TECHNOLOGY EQUIPMENT CONTRACTORS ARE RESPONSIBLE FOR PROVIDING, BUT IS NOT LIMITED TO, THE FOLLOWING FOR THEIR RESPECTIVE SPECIFICATION SECTIONS: NETWORK SWITCHES, CORE SWITCHES, FILE SERVER, NTP SERVER, VOD SERVER (DIGITAL MEDIA MANAGEMENT SYSTEM), ENCODER CHASSIS (DIGITAL MEDIA MANAGMENT SYSTEM), IP KVM, IP TELEPHONE GATEWAY, UPS UNITS, COORDINATING A-SITE EQUIPMENT INSTALLATION AND OR PROGRAMING, PATCH CABLES, AND PATCH CABLES FOR OWNER EQUIPMENT.

F REFER TO SPECIFICATIONS FOR DETAILS AND MORE INFORMATION INCLUDING MISC.MATERIALS REQUIRED TO BE PROVIDED.

G ALL EQUIPMENT, OWNER OR CONTRACTOR PROVIDED, SHALL BE MOUNTED IN THE RACKS WITH THE PROPER MOUNTING HARDWARE AND WITH THE PROPER PATCH CABLE LENGTH AND COLOR.

H TECHNOLOGY DRAWINGS COVER ALL OF DIVISION 27 AND 28 SPECIFICATIONS EXCLUDING FIRE ALARM. IT IS HIGHLY RECOMMENDED THAT THE CONTRACTOR REVIEWS DIVISION 27 AND 28 SPECIFICATIONS AND ATTENDS THE PRE BID MEETING PRIOR TO SUBMITTING BIDS..

I ALL CABLING IN EXPOSED AREAS MUST BE ENCLOSED IN A CONDUIT. PAINT CONDUIT TO MATCH SURROUNDING AREA.

J THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TECHNOLOGY SYSTEMS ROUGH-IN REQUIREMENTS, COORDINATE WITH THE SYSTEMS SUPPLIER FOR ANY VENDOR SPECIFIC REQUIREMENTS.

K CONTRACTORS SHALL PROVIDE APPROPRIATE FACEPLATES, JACKS, CONNECTORS, AND CABLING FOR EACH TECHNOLOGY ROUGH-IN INDICATED.

L CONTRACTORS SHALL PROVIDE ALL TERMINATIONS FOR CABLING INDICATED.

M CONTRACTORS SHALL LABEL ALL CABLING AS REQUIRED BY PER THE LASTEST NEC AND ANSI/TIA/EIA-606 STANDARDS.

N CABLE TIES ARE FOR OUTDOOR USE ONLY AND SHALL BE TRIMMED TO AVOID SHARP EDGES WITH FLUSH CUTTERS.

O PROVIDE BLACK NON-PRINTED VELCRO STRAPS FOR INDOOR USE. USE PLENUM WHERE REQUIRED.

P PROVIDE COVER PLATES ON ALL EMPTY TECHNOLOGY ROUGH-INS.

Q CONTRACTORS SHALL COORDINATE INSTALLATION AND GROUNDING OF TELEPHONE, CATV, AND ITC DEMARCS/SERVICE ENTRANCES.

R EACH WAP LOCATION REQUIRES ONE (1) CAT 6 CABLE.

S TYPICAL TECHNOLOGY ROUGH-INS, IN NEW WALLS, ARE 2-GANG OUTLET BOXES, 3-1/2" DEEP WITH A MIN OF 1-1/4" CONDUIT STUBBED ABOVE ACCESSIBLE CEILING. TECHNOLOGY ROUGH-INS ON EXISTING WALLS WILL BE SURFACE MOUNTED DUAL CHANNEL RACEWAY.

T ANY PENETRATION THROUGH FIRE WALLS MUST USE 2" CONDUIT AND PROPER FIRE STOPPING PER THE LASTEST CODES AND STANDARDS.

U CEILING SPACE IS USED AS A PLENUM, ALL CABLE AND INSULATION MATERIALS SHALL BE PLENUM RATED.

STATE OF OHIO
JOHN T. MUSIELEWICZ
12800
REGISTERED ARCHITECT
JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
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7106 BIG BEAR CREEK RD. | LUCASVILLE, OH 45648

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1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

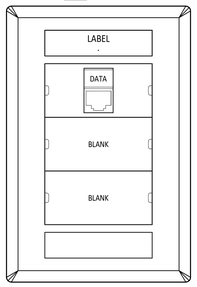
PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	JMR	GAW

SHEET TITLE:
GENERAL NOTES, ABBREVIATIONS, LEGENDS, DIAGRAMS AND SHEET INDEX

SHEET NUMBER:
T1.1

PRINTED ON: 5/18/2026 8:45:15 AM

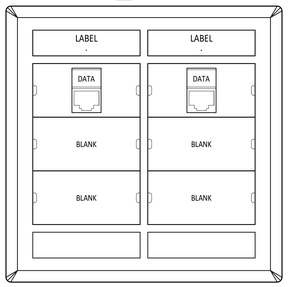
SINGLE GANG FACEPLATE CAM



TYPICAL TYPE (CAM) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (1) CAT 6 BLUE CABLE TO TR AS INDICATED ON PLANS

1 T1.2 CAMERA OUTLET (CAM)

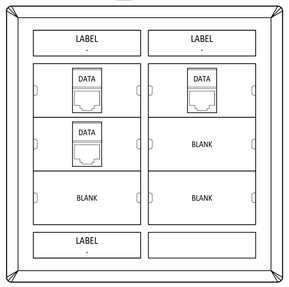
DOUBLE GANG FACEPLATE D2



TYPICAL TYPE (D2) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (2) CAT 6 BLUE CABLES TO TR AS INDICATED ON PLANS

2 T1.2 DATA OUTLET (D2)

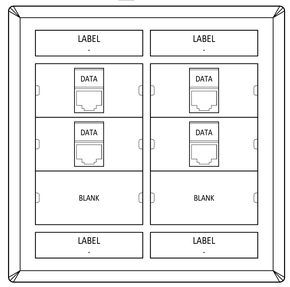
DOUBLE GANG FACEPLATE D3



TYPICAL TYPE (D3) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (3) CAT 6 BLUE CABLES TO TR AS INDICATED ON PLANS

3 T1.2 DATA OUTLET (D3)

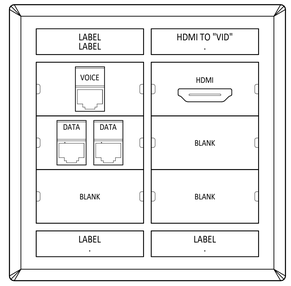
DOUBLE GANG FACEPLATE D4



TYPICAL TYPE (D4) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (4) CAT 6 BLUE CABLES TO TR AS INDICATED ON PLANS

4 T1.2 DATA OUTLET (D4)

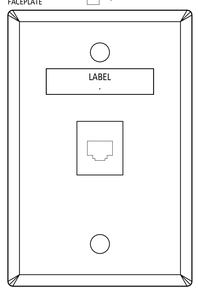
DOUBLE GANG FACEPLATE LI



TYPICAL TYPE (LI) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (1) ACTIVE HDMI TO TYPICAL "VID" TYPE OUTLET
- (2) CAT 6 BLUE CABLES TO TR AS INDICATED ON PLANS
- (1) CAT 6 WHITE CABLE TO TR AS INDICATED ON PLANS

5 T1.2 LOCAL INPUT OUTLET (LI)

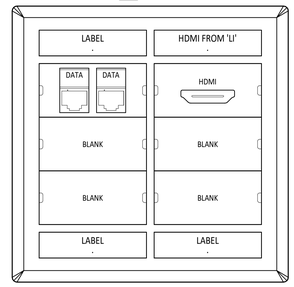
SINGLE GANG FACEPLATE V



TYPICAL TYPE (V1) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (1) CAT 6 WHITE CABLE TO TR AS INDICATED ON PLANS

6 T1.2 WALL PHONE OUTLET (V1)

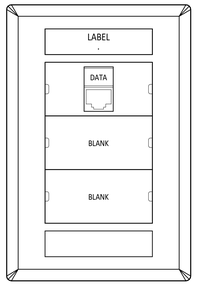
DOUBLE GANG FACEPLATE VID



TYPICAL TYPE (VID) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (2) CAT 6 BLUE CABLES TO TR AS INDICATED ON PLANS
- (1) ACTIVE HDMI FROM TYPICAL "LI" TYPE OUTLET

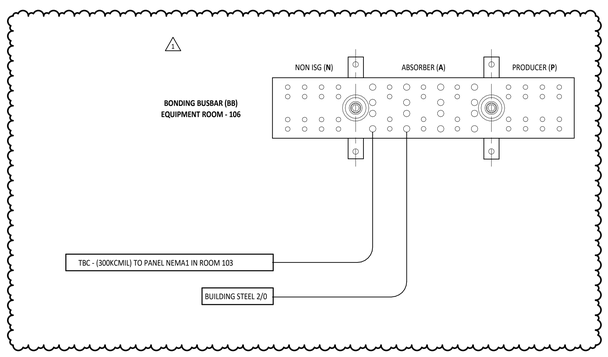
7 T1.2 VIDEO OUTLET (VID)

SINGLE GANG FACEPLATE WAP



TYPICAL TYPE (WAP) OUTLET - LABEL AS SHOWN IN DETAILS & ABOVE
- (1) CAT 6 BLUE CABLE TO TR AS INDICATED ON PLANS

8 T1.2 WIRELESS ACCESS POINT OUTLET (WAP)



BONDING CONDUCTORS TO BE CONNECTED TO APPROPRIATE SECTION

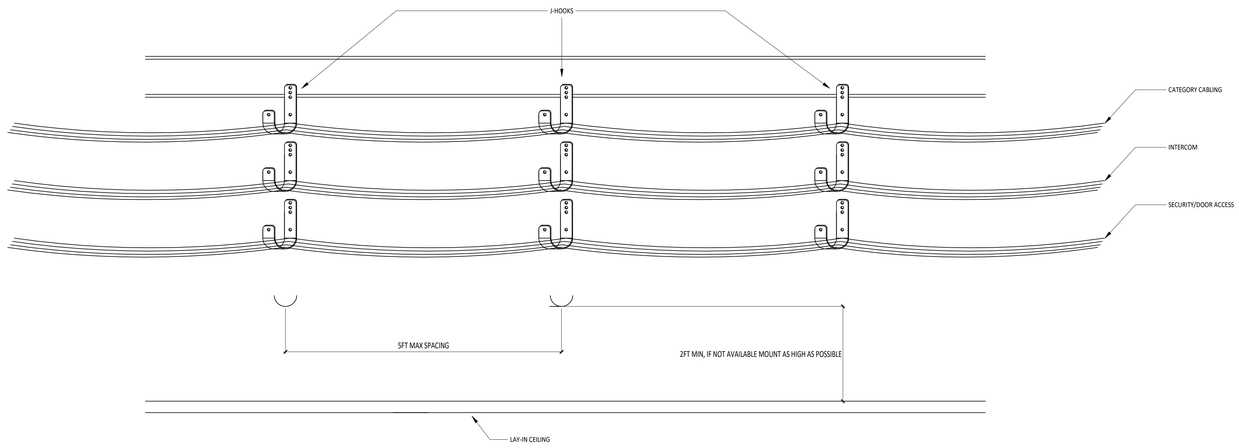
NON ISG (N) SECTION
CABLE TRAYS
EQUIPMENT CHASSIS GROUNDS
SERVER AND WIRE MGMT RACKS
ANY DATA/SERVER REFERENCE GROUNDS

ABSORBER (A) SECTION
TBC/TBB CONNECTION
BUILDING STEEL CONNECTION
BUILDING ELECTRIC GROUND/MGN CONNECTION

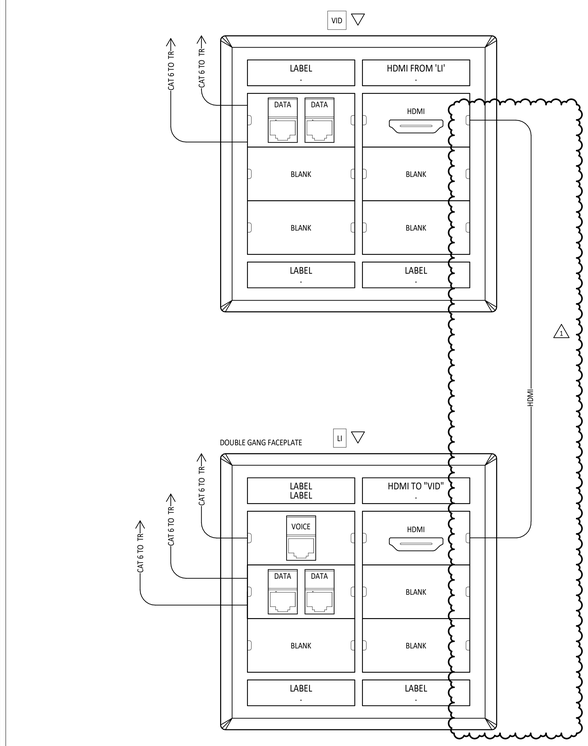
PRODUCER (P) SECTION
METALLIC CABLE SHIELDS (TELEPHONE, CATV, ETC.)
EXTERNAL ANTENNA SHIELDS
LIGHTNING ARRESTORS/PROTECTORS (COMMUNICATIONS, ALL TYPES)

REFER TO BONDING AND GROUNDING SPECIFICATIONS
27 0526 FOR GROUNDING AND BONDING REQUIREMENTS FOR
TECHNOLOGY CABLING/EQUIPMENT

9 T1.2 TELECOMMUNICATIONS GROUNDING AND BONDING BACKBONE SCHEMATIC



10 T1.2 TYPICAL CABLE SUPPORT DETAIL



11 T1.2 TYPICAL LOCAL CONNECTIVITY CABLING - LI - VID

PRINTED ON: 5/18/2026 8:33:28 AM

STATE OF OHIO
JOHN T. MUSIELEWICZ 12800
REGISTERED ARCHITECT

JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
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NEW BUILDING FOR
MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT BUILDING
7196 BIG BEAR CREEK RD. | LUCASVILLE, OH 45648

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1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

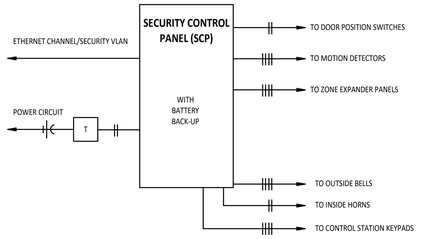
PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	JMR	GAW

SHEET TITLE:

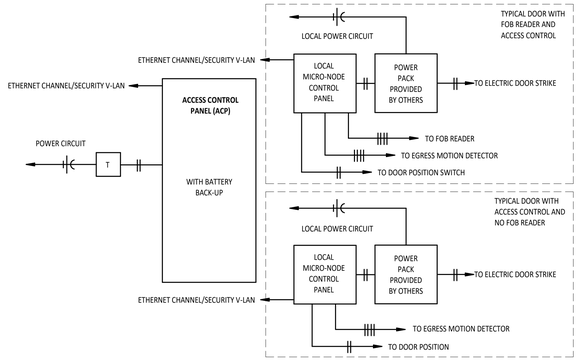
TECHNOLOGY OUTLET TYPES

SHEET NUMBER:

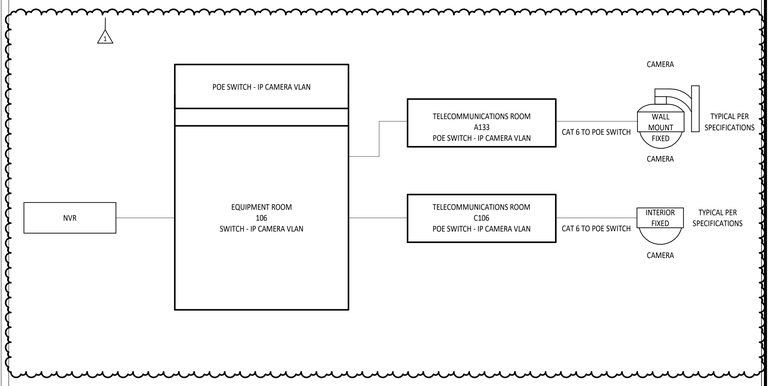
T1.2



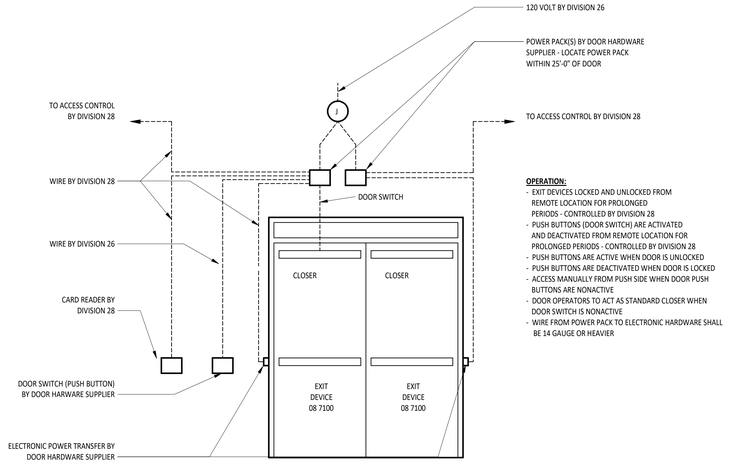
1 T1.3 **RISER DIAGRAM - SECURITY SYSTEM**



2 T1.3 **RISER DIAGRAM - ACCESS CONTROL SYSTEM**

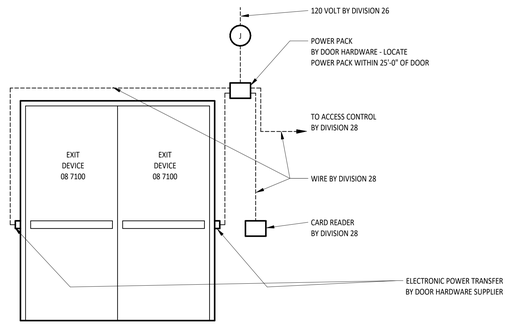


3 T1.3 **TYPICAL CCTV SCHEMATIC**

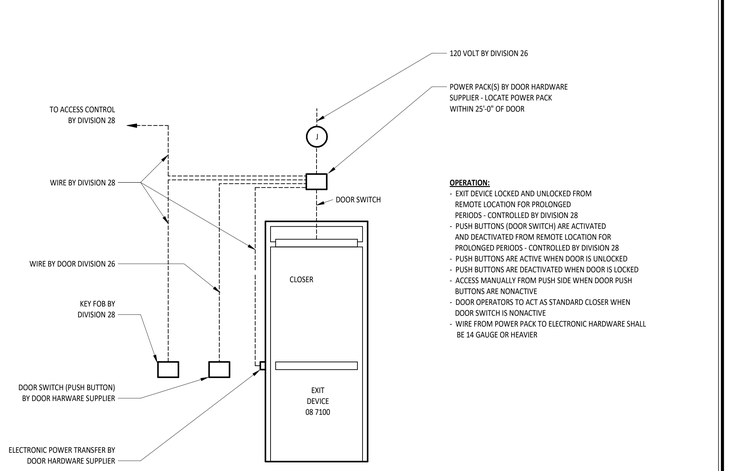


OPERATION:
- EXIT DEVICES LOCKED AND UNLOCKED FROM REMOTE LOCATION FOR PROLONGED PERIODS - CONTROLLED BY DIVISION 28
- PUSH BUTTONS (DOOR SWITCH) ARE ACTIVATED AND DEACTIVATED FROM REMOTE LOCATION FOR PROLONGED PERIODS - CONTROLLED BY DIVISION 28
- PUSH BUTTONS ARE ACTIVE WHEN DOOR IS UNLOCKED
- PUSH BUTTONS ARE DEACTIVATED WHEN DOOR IS LOCKED
- ACCESS MANUALLY FROM PUSH SIDE WHEN DOOR PUSH BUTTONS ARE NONACTIVE
- DOOR OPERATORS TO ACT AS STANDARD CLOSER WHEN DOOR SWITCH IS NONACTIVE
- WIRE FROM POWER PACK TO ELECTRONIC HARDWARE SHALL BE 14 GAUGE OR HEAVIER

4 T1.3 **ACCESS CONTROL SYSTEM SCHEMATIC WIRE DIAGRAM - DUAL DOOR WITH ADO**



5 T1.3 **ACCESS CONTROL SYSTEM SCHEMATIC WIRE DIAGRAM - DUAL DOOR**



OPERATION:
- EXIT DEVICE LOCKED AND UNLOCKED FROM REMOTE LOCATION FOR PROLONGED PERIODS - CONTROLLED BY DIVISION 28
- PUSH BUTTONS (DOOR SWITCH) ARE ACTIVATED AND DEACTIVATED FROM REMOTE LOCATION FOR PROLONGED PERIODS - CONTROLLED BY DIVISION 28
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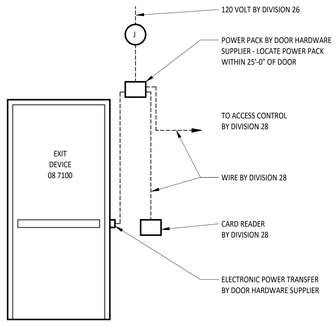
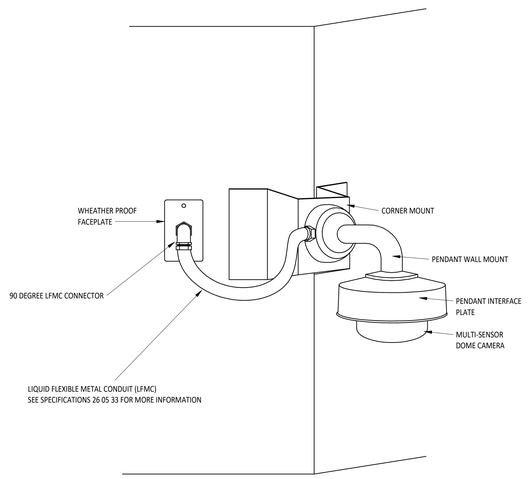
- WIRE FROM POWER PACK TO ELECTRONIC HARDWARE SHALL BE 14 GAUGE OR HEAVIER

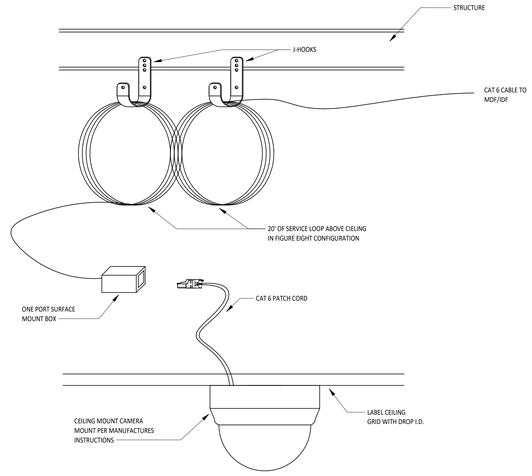
6 T1.3 **ACCESS CONTROL SYSTEM SCHEMATIC WIRE DIAGRAM - SINGLE DOOR WITH ADO**



7 T1.3 **ACCESS CONTROL SYSTEM SCHEMATIC WIRE DIAGRAM - SINGLE DOOR**



8 T1.3 **TYPICAL CCTV SCHEMATIC**



9 T1.3 **TYPICAL CEILING MOUNT CAMERA DETAIL**

STATE OF OHIO
JOHN T. MUSIELEWICZ 12800
REGISTERED ARCHITECT
JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
MARION, OHIO | COLUMBUS, OHIO | INDIANAPOLIS, INDIANA | FORT WAYNE, INDIANA
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MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT BUILDING

NEW BUILDING FOR
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25063.00	JMR	GAW

SHEET TITLE:

TECHNOLOGY DIAGRAMS

SHEET NUMBER:

T1.3

PRINTED ON: 5/18/2026 8:52:33 AM

1 T2.1 **TECHNOLOGY SITE PLAN**
1" = 10'-0"

#	KEYNOTE DESCRIPTION
1	DIVISION 26 TO PROVIDE ONE (1) 2" CONDUIT FOR TECHNOLOGY CABLING. DIVISION 27 TO PROVIDE ONE 6-STRAND OS2 FIBER CABLE FOR CONNECTIONS INTO EXISTING NETWORK. PROVIDE SC-UPC SPLICE ON CONNECTORS ON BOTH ENDS.
2	FIBER CABLING TO BE ABOVE CEILING, UTILIZING EXISTING PATHWAYS AND TERMINATING IN EXISTING TECHNOLOGY ROOM.
3	APPROXIMATE LOCATION OF EXISTING ISP LOCATION. FIELD VERIFY EXACT LOCATION AND REQUIRED EQUIPMENT FOR NEW FIBER CONNECTIONS.

1

STATE OF OHIO
JOHN T. MUSIELEWICZ 12800
REGISTERED ARCHITECT

JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

GARMANN MILLER
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NEW BUILDING FOR

MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT BUILDING

7105 BIG BEAR CREEK RD, LUCASVILLE, OH 45648

ISSUANCES/REVISIONS		
	CONSTRUCTION DOCUMENTS	03/13/2026
1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	CDT	GAW

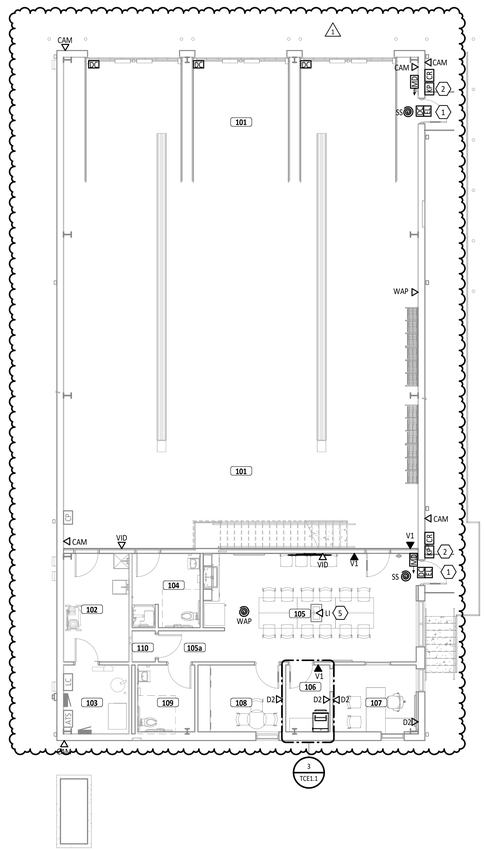
SHEET TITLE:

SITE TECHNOLOGY PLAN

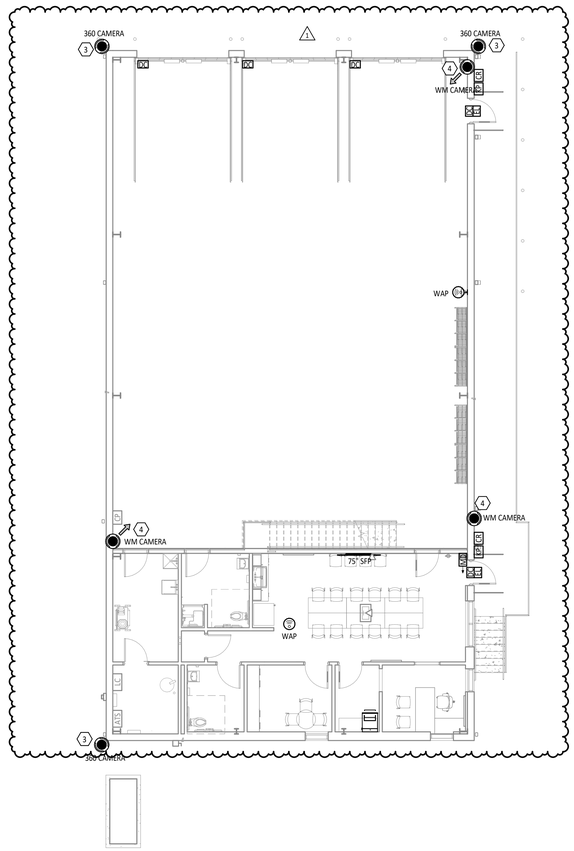
SHEET NUMBER:

T2.1

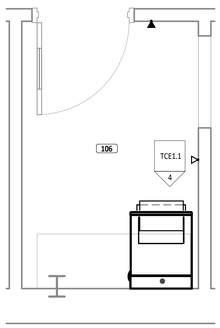
PRINTED ON: 5/18/2026 8:33:28 AM



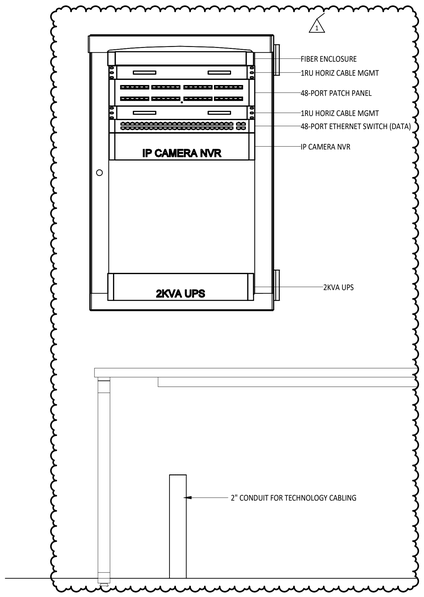
1 TCE1.1 **FIRST FLOOR TECHNOLOGY CABLING PLAN - UNIT A**
1/8" = 1'-0"



2 TCE1.1 **FIRST FLOOR TECHNOLOGY EQUIPMENT PLAN - UNIT A**
1/8" = 1'-0"



3 TCE1.1 **TECHNOLOGY ROOM ENLARGED - ROOM 106**
1/2" = 1'-0"



4 TCE1.1 **ENLARGED TECHNOLOGY RACK - TR-106 RACK 1**

ROOM INDEX

ROOM NUMBER	ROOM NAME	AREA
101	TRUCK BAY	2,964 SF
102	WASH ROOM	121 SF
103	MECH.	77 SF
104	RESTROOM	80 SF
105	MEETING ROOM	381 SF
105a	CORRIDOR	35 SF
106	RADIO ROOM	50 SF
107	CHIEF'S OFFICE	95 SF
108	OFFICE	96 SF
109	RESTROOM	65 SF
110	CLOSET	12 SF
201	MEZZANINE	797 SF
202	EQUIPMENT PLATFORM	324 SF

#	KEYNOTE DESCRIPTION
1	DOOR PROVIDED WITH ELECTRIC STRIKE BY DOOR HARDWARE SUPPLIER. DOOR HARDWARE SUPPLIER TO PROVIDE POWER PACK WITH DRY CONTACT FOR ELECTRIC STRIKE. PROVIDE WIRING FROM ELECTRIC STRIKE POWER PACK TO ACCESS CONTROL SYSTEM. COORDINATE WORK WITH HARDWARE SUPPLIER PRIOR TO ROUGH-IN. CONNECT DOOR TO ACCESS CONTROL SYSTEM TO PROVIDE INDIVIDUAL TIMED CONTROL OF THE ELECTRIC STRIKE. DIVISION 26 TO PROVIDE ALL PATHWAYS AND POWER REQUIRED FOR PROPER OPERATION.
2	ACCESS CONTROLLED DOOR WITH FOB READER AND KEYPAD TO BE ABLE TO GAIN ACCESS WITH FOB OR NUMERICAL PIN.
3	PROVIDE A CORNER MOUNT 360 DEGREE CAMERA. PROVIDE OUTDOOR LIQUID TIGHT FLEXIBLE CONDUIT FROM CAMERA TO "CAM" OUTLET WITH OUTDOOR RATED FACEPLATE.
4	PROVIDE A 180 DEGREE, MULTI SENSOR, WALL MOUNTED CAMERA.
5	TERMINATE "LI" TYPE OUTLET IN FLOOR BOX AND EXTEND A/V AND DATA CABLING TO TABLE TOP. COORDINATE WITH THE LOOSE FURNISHING CONTRACTOR.

STATE OF OHIO
JOHN T. MUSIELEWICZ 12800
REGISTERED ARCHITECT
JOHN T. MUSIELEWICZ
LICENSE #12800
EXPIRATION DATE: 12/31/2027

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NEW BUILDING FOR
MORGAN TOWNSHIP VOLUNTEER FIRE DEPARTMENT BUILDING
7196 BIG BEAR CREEK RD. LUCASVILLE, OH 45648

ISSUANCES/REVISIONS

	CONSTRUCTION DOCUMENTS	03/13/2026
1	CONSTRUCTION DOCUMENTS - ADDENDUM 02	05/18/2026

PROJECT NUMBER:	DRAWN BY:	CHECKED BY:
25063.00	JMR	GAW

SHEET TITLE:
TECHNOLOGY PLAN - UNIT A

SHEET NUMBER:
TCE1.1

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SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Bonding & Grounding

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. This Specification covers the following sections from the 2025 OSDM:
   1. 27 0526 - Grounding & Bonding for Communications Systems

1.04 SYSTEM DESCRIPTION

A. The bonding and grounding system shall be capable of supporting the ground reference

B. The system shall consist but not limited to the following:
   1. PBB - Primary Bonding Busbar
   2. RBB - Rack Bonding Busbars
   3. Bonding Conductors
   4. Bonding Connectors
   5. Telecommunications Enclosures (TEs)
   6. Labeling system

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete bonding/grounding system for telecommunications. The cabling contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Equipment Room 106
         1) Provide system in unit per Drawings, Schedules, and this Specification.

1.06 QUALITY ASSURANCE

A. All components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in network installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 CERTIFICATION

A. The contractor shall provide the services of a network cabling company and provide equipment listed by Underwriters Laboratories, Inc. The contractor shall issue an equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation are in compliance with the requirements established by ANSI/EIA J-STD-607-C, EIA/TIA 568, B.1, B.2, B.3, 569, the 2023 National Electrical Code and the BICSI 14th Edition TDMM.

1.08 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. No cabling shall be installed prior to this meeting.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.09 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
      b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      d. The contractor shall submit a schematic of the proposed bonding and grounding system outlining connectivity, landing locations of conductors on busbars, and components to be provided. Catalog cut sheets are required for busbars, bonding & grounding conductors, and all connectors (6 awg & above) used in the bonding system to the Architect/Engineer Technology Designer for review.
   2. Provide documentation of on-staff RCDD or verifiable manufacturer certification and conformance with all of Article 1.06 Quality Assurance.

B. Post Construction
   1. Provide a complete wiring diagram of the system. Typicals, and the like, will not be acceptable. Include 1/8 inch = 1'-0" scale Drawings of the system layout. These diagrams shall conform to Article 1.06 Quality Assurance.
   2. Include three (3) printed copies of all test data for the bonding & grounding system. Also, provide two (2) CD ROMs/digital copies containing the test data with any utility programs that may be necessary to view the data.
   3. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect's technology designer.
   4. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.

1.10 WARRANTY

A. Components, parts, and assemblies supplied by the cabling contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 20 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.11 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

1.12 EXTRA MATERIALS

A. Maintenance Stock
   1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. 12AWG equipment Bonding jumpers and compression connectors with tool.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 RACK BONDING BUSBARS

A. Provide a copper horizontal bonding busbar kit for each rack from the rack manufacturer. Provide a 6 AWG bonding connection from the each busbar to a C-Type compression Tap to the aisle bonding conductor. Land the 6 AWG conductor on bonding busbar with a 2-hole connector.

B. Provide Products compatible with the rack manufacturers provided by 27 1100 Communication Equipment Room Fittings :

2.02 ZONE BOXES (KNOWN AS TELECOMMUNICATIONS ENCLOSURES (TE'S))

A. Provide Bonding/Grounding kits for Zone Boxes to used to install permanent link fibers, Optical Network Terminals (ONTs), and DC distribution cabling for PON network.
   1. Ceiling and Wall Zone boxes
      a. Shall include bonding and grounding kits and be bonded as defined in the Bonding/Grounding section of this specification.
   2. Label Zone Box bonding/grounding connections per the ANSI/TIA 606-B labeling standards.

2.03 BONDING AND GROUNDING DEVICES

A. Telecommunications Bonding Conductor (TBC)
   1. Bonding to the service equipment (power) ground
      a. The bonding conductor for telecommunications shall bond the PBB to the service equipment (power) ground.
   2. Sizing the bonding conductor for telecommunications
      a. The bonding conductor for telecommunications shall be, as a minimum, the same size as the main electrical system earth grounding conductor. For PBBs located more than 100 feet from the Main Electrical busbar where the primary earth ground is located, refer to drawings for sizing.

B. The Backbone Bonding Conductor (BBC) - Provide unit pricing for each BBC section from the Main Equipment Room to each Telecommunications room.
   1. The BBC is a conductor that interconnects all SBBs with the PBB. The BBC's basic function is to reduce or equalize potential differences between telecommunications systems bonded to it. The BBC is not intended to serve as the only conductor providing a ground fault current return path.
   2. A pathway is provided by the electrical contractor between the 106 and each Telecommunication Room for BBC installation.
   3. The BBC shall not be installed until testing (Article 3.10) is completed.
   4. Provide a BBC bonding conductor between the Main Equipment Room and Telecommunications Room(s) where the DC resistance between the PBB and SBB is greater than 0.1 ohms as measured with a two point earth ground resistance tester. Refer to Article 3.10 Testing - Bonding System.
   5. Provide a deduct equal to unit pricing for all BBC sections not required.
   6. The BBC originates at the PBB, extends throughout the building using the dedicated telecommunications bonding backbone pathways, and connects to the SBB(s) in all Telecommunications Rooms and Equipment Rooms. Provide unit pricing to provide BBC (per T1.1 Bonding & Grounding detail) for each of the following BBC bonding conductor sections:
   7. Bonding and sizing of BBC
      a. The BBC shall be an insulated copper conductor (plenum rated if required by pathway utilized).
      b. All BBC Connections to be made with double-bolted, compression style, grounding lugs.
      c. The BBC shall be a minimum of No. 3/0 AWG insulated copper bonding conductor for distances up to 100 feet.
         1) For sizing of BBCs (lengths greater than 100 ft) - Refer to Drawings

C. The Primary Bonding Busbar (PBB) serves as the dedicated extension of the building grounding electrode system for the telecommunications infrastructure. The PBB also serves as the central attachment point for Backbone Bonding Conductor (BBC) and equipment, and shall be located such that it is accessible to telecommunications personnel.
   1. Provide a PBB in Room 106
      a. The PBB shall:
         1) Be a predrilled copper busbar provided with standard BICSI bolt hole sizing and spacing for the type of connectors to be used, and
         2) Be sized in accordance with the immediate requirements of the application and with consideration of future growth, and
         3) Have minimum dimensions of 1/4inch thick x 4 inches wide and 24 inches in length.
         4) Approved Manufacturers:
            (a) Erico TMGB - A24L33PT

(b) Harger TGBI14424TMGB
(c) Panduit GB4B1028TPI-1

5) The busbar shall be electrotin plated for reduced contact resistance.

b. Bonding Conductor Connectors

1) BBC conductors to utilize 2-hole compression type connectors with 7/16" holes, 1" apart (center to center). Use the last 7/16" hole to land the TBC. Provide connectors, 3/8" stainless steel bolts, washers and locknuts to land connectors on the busbars.

2) Remaining BBC conductors, Building Steel Bonding conductor, cable tray bonding conductor, and aisle (Racks) bonding conductor to utilize 2-hole compression type connectors with 5/16" holes, 5/8" apart (center to center). Provide connectors, 1/4" stainless steel bolts, washers, and locknuts to land connectors on the busbars.

D. Bonding/Grounding for Telecommunications Enclosures (TEs)

1. Provide a bonding/grounding kit and conductors for each Telecommunications Enclosure.

a. The bonding/grounding kit shall:

1) Be a predrilled copper busbar with bolt hole sizing and spacing for the type of connectors to be used.

2) Be connected to building steel via a 6 AWG copper bonding conductor connection with the bonding kit at the enclosure and an exothermic weld to the building steel, or universal beam grounding clamp. (Panduit GUBC500-G or equal).

b. Bonding Conductor Connectors

1) Building Steel Bonding conductor to utilize 2-hole compression type connectors with 1/4" holes, . Provide connectors, 1/4" stainless steel bolts, washers, and locknuts to land connectors on the enclosure bonding connection/busbar.

PART 3 EXECUTION

3.01 CABLE PULLING AND INSTALLATION

A. The equipment racks shall be completely installed before any cables are pulled.

B. Cable pathways outside of the cable tray must be supported by "J" hooks or an approved support for category cabling. "O" rings will not be acceptable. The distance between cabling supports shall not exceed 48".

C. Bonding /Grounding Conductors shall be segregated from communications cabling 27 1513 Horizontal Communications Cabling at a minimum of 6" or by a physical barrier of the same manufacture as the cable tray. Separate pathways are preferred which may be attached to the cable tray.

D. Contractor shall take measures to avoid unsupported bundles of cables hanging over unprotected edges of cable trays etc. during all phases of construction.

E. No cable may be pulled between the holes of the cable tray. Cables must exit over the top of the side rail of the cable tray. Provide waterfall devices to maintain bend radius.

F. Cables are not to be run through conduits or sleeves without bushings installed. Any cabling pulled through conduit or sleeves without bushings must be removed and a new cable pulled.

G. It is not recommended to install cabling in rooms where painting is incomplete. Cabling contractor is responsible to take protective measures to assure cabling is not painted. Any cable found to have paint must be cleaned in its entirety or be replaced.

H. Cable installed in areas with exposed ceilings must be concealed within conduit. Technology rooms are the only exception.

I. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

J. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

K. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

3.02 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

3.03 GROUNDING AND BONDING PRACTICES

A. All systems installed under these contracts shall comply fully with ANSI EIA/TIA J-STD 607-C or the most recent revision at time of release of bid documents and the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual) as they relate to bonding and grounding systems.

B. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).

C. All bonding conductors shall be insulated and copper. The minimum bonding conductor size shall be a No. 6 AWG. Refer to Drawings for details.

D. Bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place bonding conductors in ferrous metallic conduit, the conductors shall be bonded to each end of the conduit with a conductor sized as a No. 6 AWG, minimum.
   1. All metallic duct or sleeve banks shall be bonded together with No. 6 AWG bonding conductors if any sleeve or duct is a part of the bonding system.

E. Labels, Color-Coding, and Markings
   1. Each telecommunications bonding conductor shall be labeled. Labels shall be located on conductors as close as practicable (i.e., ease of access to read the label) to their point of termination. Labels shall be nonmetallic and include the information below:
      a. Far end Type Termination
         1) PBB-Room Number
         2) SBB - Room Number
      b. Near End (at Busbar) Type Termination
         1) BLDN Steel
         2) For SBBs, BBC -PBB Room Number
         3) For PBBs, BBC - SBB Room Number
         4) TBC for electric bonding conductor for PBB
         5) MGN - Panel Number for SBBs
         6) Rack Number for Telecommunications Racks
         7) TEL for Telephone Lightning Arrestors
         8) CATV for Cable static discharge block
         9) ANT-system name, i.e. NTP GPS, clock xmitter, Channel 1, DAS, etc.)
   2. Refer to ANSI/TIA/EIA 606-B for additional labeling requirements.
   3. Each telecommunications bonding conductor shall be marked appropriately by a distinctive green color.

F. It is the responsibility of this contractor to provide grounding and bonding of the technology racks and cabling system to comply with the BICSI guidelines in the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).
   1. Provide a PBB in the Main Equipment Room and associated bonding conductors.
   2. Provide a SBB in each Telecommunications Room and associated bonding conductors.

3. All PBBs and SBBs shall have a layer of Anti Corrorsion Conductive Lubricant between each connector and busbar.

3.04 TELECOMMUNICATIONS BONDING CONDUCTOR (TBC)

A. Bonding to the service equipment (power) ground
   1. The bonding conductor for telecommunications shall bond the PBB to the service equipment (power) ground.

B. Sizing the bonding conductor for telecommunications
   1. The bonding conductor for telecommunications shall be, as a minimum, the same size as the BBC. Refer to Drawings for sizing.

3.05 TESTING - BONDING AND GROUNDING SYSTEM

A. The telecommunications grounding and bonding system shall be tested with an earth ground resistance tester using the Two Point Test Method.

B. The following will be needed to test the grounding and bonding.
   1. An earth ground resistance tester with the attachments.
   2. All testing should be done with the entire building in operation. Nothing needs to be shut down to test the grounding and bonding with this tester.
   3. If the resistance value is less than 0.1 Ohm between the two test points the bonding is adequate.

C. Tests to be conducted:
   1. The installer / technician conducting these tests must be certified in the use of the Earth Ground Resistance Test equipment.
   2. Test between the PBB and the service equipment (power) ground. - TBC Test
   3. Test between the PBB and each SBB in the system.
   4. Test between the PBB/SBB and:
      a. Data racks
      b. Cable tray
   5. Tests shall be conducted with the systems in operation.
   6. Tests shall be recorded and submitted to the Architect/Engineer Technology Designer.

3.06 BACKBONE BONDING CONDUCTOR (BBC) INSTALLATION CONSIDERATIONS

A. BBC conductors shall be installed and protected from physical and mechanical damage.

B. BBC conductors should be installed without splices, where practicable. Where splices are necessary they should be minimal and shall be accessible and located in telecommunications spaces. Joined segments of a BBC shall be connected using irreversible compression-type connectors, exothermic welding, or equivalent. All joints shall be adequately supported and protected from damage.

C. Telecommunications Room (TR) may share a BBC conductor provided the BBC is sized for the most distant TR from the PBB and the primary BBC conductor is c-tapped with a non-reversible "C" type tap cable of the correct size (without cutting the primary BBC conductor) at any additional TRs.

3.07 THE PRIMARY BONDING BUSBAR (PBB)

A. Bonding to a panel board for telecommunications
   1. The panel board for telecommunications serving the space where the PBB is located, that panel board’s Alternating Current Equipment Ground (ACEG) bus (when equipped) or the enclosure shall be bonded to the PBB.
   2. The PBB shall be as close to the panel board for telecommunications as practicable and shall be installed to maintain clearances required by applicable electrical codes.

B. Connections to the PBB

1. The connections of the bonding conductor for telecommunications and the BBCs to the PBB shall utilize listed 2-hole compression connectors.
2. The connection of conductors for bonding telecommunications equipment to the PBB must utilize 2-hole compression connectors.

C. All metallic raceways for telecommunications cabling located within the same room or space as the PBB shall be bonded to the PBB.

D. Installation Considerations
1. The PBB shall be insulated from its support. A 50 mm (2 in) separation is recommended.
2. A practical location for the PBB is to the side of the panel board (where provided). The vertical location of the PBB should take into consideration whether the grounding and bonding conductors are routed in an access floor or overhead cable tray.
3. Provide bend radius protection conforming to the ANSI J-STD 607-C standard.

E. As a minimum, bond PBB to following:
1. Building Steel, (minimum No. 2/0 AWG insulated copper bonding conductor). CAD Weld Bonding Conductors to Building Steel.
2. Main Electrical Service Grounding Electrode System (minimum - match grounding electrode conductor using an insulated copper bonding conductor) unless larger is specified in the T Drawings.
3. Local Service Panel Ground (minimum No. 6 AWG insulated copper bonding conductor).
4. Backbone Bonding Conductor (BBC) that connects PBB to other
   a. As required by test results and Drawings.
5. Associated Telecommunications Cable Tray(s) (No. 6 AWG insulated copper bonding conductor).
6. Telecommunications Conduit(s) Entering TR (minimum No. 6 AWG insulated copper bonding conductor).
7. No. 2 AWG Aisle insulated copper bonding conductor for each aisle of telecommunication racks.

3.08 BONDING TO THE METAL FRAME OF A BUILDING

A. All bonding conductors and connectors for bonding the metal frame of a building shall be listed for the purpose intended and approved by a NRTL.

B. Each PBB and SBB shall be bonded to the metal frame within the room using a No. 2/0 AWG conductor via an exothermic weld.

C. When practicable because of shorter distances and other considerations, and where horizontal steel members are permanently electrically bonded to vertical column members, TGBs may be bonded to these horizontal members in lieu of the vertical column members.

3.09 BONDING OF CABLE TRAYS

A. All metallic cable tray/basket sections shall be bonded with a no. 6 AWG bonding conductor secured via either exothermic weld or through bolted with a grounding kit designed for this purpose (metal surfaces at bonding connection shall be bare metal prior to connection and coated after connection).

B. Cable tray bonds from the manufacturer shall be UL listed.

3.10 TRAINING

A. Provide as a part of this contract/bid a total of (4) four hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
1. Bonding/Grounding methods and maintenance.
2. Labeling schemes

3. All points of grounding/bonding in the system.

END OF SECTION

SECTION 27 11 00
COMMUNICATION EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Wall Mount Cabinets

B. Horizontal Cable Management

C. Vertical Cable Management

D. Power Strips (Four Post)

E. Power Strips (Two Post)

F. Blank Panels

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Division 01 for Alternates that may affect the Work of this Section.

C. This Specification addresses Technology Room Fitting required by equipment in the following sections from the 2025 OSDM:
   1. 27 2100 - Data Network Equipment
   2. 27 2133 - Wireless Data Communication Equipment
   3. 27 3150 - Telephone System
   4. 27 4119 - Video Display Equipment
   5. 27 4125 - Video On-Demand System
   6. 27 5123 - Central Sound and Paging System
   7. 27 5313 - Clock System
   8. 28 1601 - Access Control/Intrusion Detection
   9. 27 2300 - CCTV Camera System

1.04 SYSTEM DESCRIPTION

A. The communication room fittings products provide the basic structure for mounting and installation of communication equipment.

B. The Communication equipment room fittings system shall consist but not limited to the following:

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete system. The contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Main Equipment Room 106
         1) Provide Main ER Fittings system in unit per Drawings, Schedules, and this Specification.

1.06 QUALITY ASSURANCE

A. All components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in computer network cable installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

H. All equipment Racks and Cabinets shall comply with the latest ANSI/EIA-310 Cabinets, Racks, Panels and Associated Equipment Standard.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. No cabling shall be installed prior to this meeting.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. 75% Project Completion
   1. Begin holding one (1) hour Division 27 weekly project progress meeting On-Site or Remote.
      a. Attendance required:
         1) Division 27 Contractor and contractor's on-site project manager
         2) Related Subcontractors
         3) Garmann Miller Technology Designer
         4) Construction Manager
      b. Topics of Discussion
         1) Any and all lead time issues.

2) Any issue that would prevent project from being completed on scheduled project completion date. All issues not correctable by Division 27 but other Divisions must be submitted in writing to General Contractor (GC) and or Construction Manager at Risk (CMR) within 24 hours of meeting ending.
3) All outstanding issue from previous week.

2. Refer to Division 1 Front-End documents for additional requirements.

1.08 SUBMITTALS

A. Prior to commencement of work.
1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction
1. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
2. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.09 WARRANTY

A. Components, parts, and assemblies supplied by the contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 20 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.10 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) in addition to the requirements under Front-End requirements. Upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

B. Utilize a combination of server grade cabinets, deep equipment cabinets, 4-post racks and 2-post relay racks as required to support the telecommunications equipment.

C. Equipment racks and cabinets shall have full height vertical cable organizers on both the left and right sides.

D. Equipment racks and cabinets shall be provided with rear vertical cable organizers on both the left and right sides.

E. Consider the use of horizontal cable manager panels to organize and route associated patch cabling.

F. 4-post Equipment racks are the preferred enclosure for equipment that is deep, heavy, or requires

G. Equipment racks and cabinets are to be configured with appropriate ventilation options to accomplish the designed cooling configuration for the space.

H. All equipment racks and cabinets shall be UL listed, and where required, seismically braced.

I. All racks/cabinets shall be provided with labeling including name of MER/TR, Room number, and an identifier to indicate position within room.

J.

PART 2 PRODUCTS

2.01 HORIZONTAL CABLE MANAGEMENT

A. Provide horizontal wire management in racks as indicated on the Drawings.

B. Horizontal cable manager shall be front & rear, 2RU with covers per Drawings. 19 in. rack system width.

C. Approved Manufacturers: Same manufacturer as racks.

2.02 VERTICAL WIRE MANAGEMENT

A. Provide wire management as indicated on Drawings.
   1. Vertical wire management
      a. Approved Manufacturers:
         1) Panduit PRV6 with wire management covers (front & rear), Panduit PRSHD6
         2) Hoffman ECC6DF45UA (Black) with wire management covers (front & rear), Hoffman ECC6CVL45UB
         3) Chatsworth 13912-703 (cover is incl)
      b. All cabling shall be supported within the wire management.

2.03 POWER STRIPS (FOUR POST)

A. Provide two vertical power strips on each rack. Mount one power strip on each post with one plugged into rack convenience outlet and the second plugged into the UPS Outlet. Power strips to be 20-24-outlets, NEMA 5-15R. Power strips to be equipped with a minimum 10’ power cord with NEMA L5-20P and 20A circuit breaker and NEMA L5-30P and 30A breaker for UPS loads. (Provide extension/adapters as required). Power strip shall be equipped with an AC current meter.
   1. One strip to be connected to each rack's 20A convenience outlet.
   2. Second strip to be connected to output of Rack UPS (provided by the Data Network Equipment Contractor).
   3. Approved Manufacturers 20A Power Strip:
      a. Tripp-Lite PDUMV20
      b. APC 7830
      c. Cyberpower PDU20MV20F
   4. Approved Manufacturers 30A Power Strip
      a. APC 7832
      b. Tripp-Lite PDUMV30
      c. Cyberpower PDU30MVT24F
   5. Label Power Strip inputs with ANSI-606-B compliant labels as "UPS (30A)" and "Gen Only (20A)".

2.04 POWER STRIPS (WALL MOUNT CABINETS)

A. Provide two horizontal power strips on each rack. Mount power strips near midpoint in the rack with one plugged into rack convenience outlet and the second plugged into the UPS Outlet. Power strips to be 12-14-outlets, NEMA 5-15R. Power strips to be equipped with a minimum

10’ power cord with NEMA L5-20P and 20A circuit breaker and NEMA L5-30P and 30A breaker for UPS loads. (Provide extension/adapters as required). Power strip shall be equipped with an AC current meter.

1. One strip to be connected to each rack's 20A convenience outlet.
2. Second strip to be connected to output of Rack UPS (provided by the Data Network Equipment Contractor).
3. Approved Manufacturers 20A Power Strip:
   a. Tripp-Lite PDUMH20
   b. APC AP7801B
   c. Cyberpower PDU20M2F10R
4. Approved Manufacturers 30A Power Strip
   a. APC AP7802B
   b. Tripp-Lite PDUMH30
   c. Cyberpower PDU15B2F12R
5. Label Power Strip inputs with ANSI-606-B compliant labels as "UPS (30A)" and "Gen Only (20A)".

2.05 WALL MOUNT CABINETS

A. Wall-mount cabinets manufactured from steel sheet. Non-seismic applications - Maximum equipment weight of 300 lb when secured to the structural wall with standard anchors.

B. EIA compliant 19” cabling wall mount rack with a useable depth of 30inches.

C. Weight capacity shall be 200 lbs minimum.

D. Center section and back pan shall be 16-gauge steel minimum, phosphate pre-treated and finished in a black textured powder coat and lockable.

E. Rackrail shall be constructed of 11-gauge steel with tapped 12-24 mounting holes in universal EIA spacing with black powder coat finish.

F. Rack shall include cable management.

G. Rack shall have ½”, 2” and 3” electrical knockouts on the top and bottom of the back pan.

H. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Large opening on back pan shall have a 12-1/2” x 12-1/2” cutout for electrical pull-box.

I. Top and bottom side vents to accommodate a fan cooling kit.

J. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with bonding kit.

K. Be manufactured by an ISO 9001 and ISO 14001 registered company.

L. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.

M. Rack shall have a lockable tempered glass or plexi glass door.

N. Provide fan kit.
   1. By the same manufacture.
   2. Fan Kit shall feature a minimum of two fans and diplace a minimum of 95CFM of free air.

O. Rack shall have 26RU of rack space and a usable depth of 30 inches.

P. Provide grounding and bonding kit and bond to the TMGB.

Q. Approved Manufactures
   1. Basis of design: Chatsworth Products - 11840-736
   2. Equals by: Panduit PanZone, Middle Attlantic, Tripp Lite, Great Lakes

PART 3 EXECUTION

3.01 INSTALLATION

A. Floor treatment must be installed in Telecommunications rooms prior to rack installation.

B. The equipment racks shall be completely installed before any cables are pulled.

C. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

D. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

E. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

F. Coordinate with HVAC contractor for hot/cold aisle configuration.

G. Coordinate with the 27 0526 Bonding and Grounding Contractor.

H. Coordinate with the electrical contractor for lighting/cable tray within racks, and AC outlets on racks and communication backboards.

3.02 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall mark all racks with appropriate permanent printed adhesive labels approved by the Architect/Engineer Technology Designer in accordance with Owner's requirements and Drawings. In addition to adhesive labels, the jacks shall be color coded as directed.

C. Refer to T Drawings for approved rack, outlet & patch panel labeling scheme.
   1. Coordinate with CM and Owner so room numbers in labeling scheme match final room numbers.

3.03 TRAINING

A. Provide as a part of this contract/bid a total of (2) two hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
   1. Labeling Scheme
   2. Product use and product features

END OF SECTION

SECTION 27 15 13
HORIZONTAL COMMUNICATIONS CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Horizontal twisted pair copper cable

B. Jacks, cover plates, and associated components

C. Audio/Video cable

D. Bonding & Grounding

1.03 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions and the sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Division 01 for Alternates that may affect the Work of this Section.

C. This Specification covers the following sections from the 2025 OSDM:
   1. 27 1513 - Communications Copper Horizontal Cabling

D. This Specification addresses horizontal cabling required by equipment in the following sections from the 2025 OSDM:
   1. 27 2100 - Data Network Equipment
   2. 27 2133 - Data Communication Wireless Access Points
   3. 27 3150 - Telephone System
   4. 27 4119 - Video Display Equipment
   5. 27 4120 - Interactive Audio-Video Equipment (Classroom Interactive White Boards)
   6. 27 5127 - Classroom Sound Reinforcement System
   7. 28 1601 - Access Control
   8. 27 2300 - CCTV Camera System

1.04 SYSTEM DESCRIPTION

A. The Ethernet System shall be capable of supporting 10/100/1000Mbps full-duplex transmission via 4-pr. Category 6 cable. The system must comply with EIA/TIA 568-B-5 standard and 568B.1, B.2, B.3 requirements for color-coding.

B. The voice and data cabling system shall consist but not limited to the following:
   1. Category 6 UTP Cabling
   2. Patch Panels
   3. Modular Jacks
   4. Telecommunications Bonding and Grounding System

1.05 DESCRIPTION OF WORK

A. Provide labor, material, equipment, and accessories necessary for operation of a complete network system. The cabling contractor shall furnish the equipment, accessories, and necessary materials as described herein and system Drawings.
   1. There are one (1) Telecommunications Rooms
      a. Main Equipment Room 106

1) Provide wiring system in unit per Drawings, Schedules, and this Specification.

B. The Technology work for cabling shall include, but not limited to, the following:
   1. Provide all horizontal UTP, shielded cabling, and audio-visual cable.
   2. Provide copper patch panels.
   3. Provide modular jacks and cover plates for system.
   4. Provide and terminate cabling within each room and in the data racks.

C. The modular computer/data eight-position jack shall match the color code EIA-568B as follows:
   1. Pair 1: Pin 4 - Blue; Pin 5 - White/Blue
   2. Pair 2: Pin 1 - White/Orange; Pin 2 - Orange
   3. Pair 3: Pin 3 - White/Green; Pin 6 - Green
   4. Pair 4: Pin 7 - White/Brown; Pin 8 - Brown

1.06 QUALITY ASSURANCE

A. All cabling components and equipment shall be listed by Underwriters Laboratories, Inc. for network use, and the components shall bear the UL label. The system shall be installed in accordance with requirements set by the 2023 National Electrical Code.

B. Installing contractor must have a minimum of 5 years experience in computer network cable installations and utilize data cable installation technicians.

C. The contractor shall employ on his staff at least one Registered Communications Distribution Designer (RCDD) registered with the Building Industries Consulting Services International (BICSI) or be certified by the manufacturer of the cable solution for both copper and fiber systems.

D. The contractor shall submit with his bid the name, registration number, and seal of the RCDD on the contractor's staff or provide certificates from manufacturer of the cable solution for both copper and fiber systems.

E. The RCDD or factory trained designer shall review all design documents including these bid Specifications and provide in writing with the contractors bid, certification of this review, and shall note any and all discrepancies that the RCDD believes are of material concern to the completion of a fully operating system.

F. The RCDD or factory trained designer shall certify the final installation in writing and provide written verification that he/she has inspected the completed installation and that the installation meets the terms and conditions of this Specification, design requirements of the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual), and all EIA/TIA, NFPA, NEC, and all local codes and Specifications related to this work.

G. All design documents, submittals, as-built Drawings, test results, and other documentation provided by the contractor shall bear the name, registration number, and seal of the RCDD responsible for this bid.

1.07 CERTIFICATION

A. The cabling contractor shall provide the services of a network cabling company and provide equipment listed by Underwriters Laboratories, Inc. The cabling contractor shall issue an equipment certification stating that the equipment and connected wiring and devices which form the specified system, together with installation have a 20-year Application Assurance Product Warranty for a Gigabit (Standard) and/or 10 Gigabit Ethernet Solution, and are in compliance with the requirements established by EIA/TIA 568, B.1, B.2, B.3, 569, and BICSI Standards.
   1. Category 6 Channel & Component Warranty

1.08 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section. No cabling shall be installed prior to this meeting.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.09 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. The contractor shall be responsible for furnishing engineering Drawings which indicate the interlocking of equipment and wiring external to the various patch panels. These Drawings shall be included in the submittal to the Architect/Engineer Technology Designer for approval.
      b. Complete and comprehensive shop Drawings shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      d. The contractor shall submit a schematic of the proposed bonding and grounding system outlining connectivity, landing locations of conductors on busbars, and components to be provided. Catalog cut sheets are required for busbars, bonding & grounding conductors, and all connectors (6 AWG & above) used in the bonding system to the Architect/Engineer Technology Designer for review.
   2. Provide documentation of on-staff RCDD or verifiable manufacturer certification and conformance with all of Article 1.06 Quality Assurance.
   3. Provide sample of weekly inspection log to be placed on the wall of each telecommunications space. Log to include inspection date, room condition, name of inspector, and action taken.

B. Post Construction
   1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least two weeks prior to commencement of training sessions.
   2. Provide a complete wiring diagram of the system. Typicals, and the like, will not be acceptable. Include 1/8 inch = 1'-0" scale Drawings of the system layout. These diagrams shall conform to Article 1.06 Quality Assurance.
   3. Include three (3) printed copies of all test data for the cabling system. Also, provide two (2) CD ROMs/digital copies containing the test data with any utility programs that may be necessary to view the data.
   4. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect's technology designer.
   5. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
   6. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.10 WARRANTY

A. Components, parts, and assemblies supplied by the cabling contractor/manufacturer shall be guaranteed against defects in materials and workmanship for a period of 15 years, commencing upon system start-up and beneficial use, provided such defects are not caused by a misuse, abuse, neglect, unauthorized tampering, equipment modifications, or acts of God. Warranty services shall be provided by the installer of the equipment manufacturer during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site. An adequate supply of repair parts shall be maintained by the branch office. The manufacturer shall not be liable for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.
   1. Category 6 Channel & Component Warranty

1.11 ADDITIONAL REQUIREMENTS

A. Provide three copies of Record Drawings (As-builts) in addition to the requirements under section 270510. Upon completion (with no more than a month after completion) of the project, the Record Drawings shall be submitted to the Architect/Engineer Technology Designer for approval.

1.12 EXTRA MATERIALS

A. Maintenance Stock
   1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. Patch-Panel Units: The greater of one (1) or 10% of total quantity of each type.
      b. Connecting Blocks: The greater of one (1) or 10% of total quantity of each type.
      c. Device Plates: The greatest of ten (10) or 2% of total quantity of each type.
   2. Provide one (1) Metro DataVac (model MDV-3TCA) or equal in each Telecommunications Room for the purposes of maintaining Telecommunications room cleanliness through the construction period by technology contractors and by the Owner thereafter.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The installation shall be an end to end solution utilizing the following approved manufacturers:
   1. Category 6 Cabling:
      a. ADC AMP/Tyco - TrueNet series Components
      b. Commscope - SYSTIMAX GigaSPEED CAT6
      c. Panduit - MiniCom, and TX6 Series Components
      d. Leviton/Remee - Extreme series
      e. Hubbell - NEXTSPEED CAT 6 series components or Hubbell-Hitachi
      f. Superior Essex - Superior Essex DataGain Cat6
      g. Pangen -(includes General Cable) - PanGen 6 Enhanced
      h. Berk-Tek/Leviton - LANmark 6
   2. Note: Other combinations of approved termination and cabling manufacturers may be submitted provided all specifications, warranties, and drawing requirements are met

2.02 DATA CABLE

A. Approved Manufacturers: Refer to Article 2.01

B. Category 6 Cable
   1. The computer/data cable shall be four twisted pair unshielded (UTP), 23 AWG, solid bare CU, FEP insulation for all 4 pairs to reduce skew (skew shall be less than 18 nsec). UL listed CMP with transmission characteristics that meet and exceed those of FCC-68/EIA/TIA, 568 and EIA/TIA TSB-155 performance(up to 37 meters) and NEMA low loss,

extended frequency, jacket shall be sequentially marked at 2 foot intervals and must be plenum rated. UL listed 1459 and 1863. Pairs twisting must be maintained to meet the category 6 performance. Maximum category 6 untwisting allowed is one half (1/2) inches, cable diameter .30 inches or less.

C. All cable shall be plenum rated UNO.

D. For cable runs terminating in first floor floor boxes, provide wet location certified cabling from floor box to the nearest ceiling mounted consolidation point. Transition from wet location cabling to conventional plenum cabling from the consolidation point to the serving technology room.

E. Cable shall be component certified.

F. Cable jacket color shall be:
   1. Data Network serving data outlets - Blue
   2. IP Telephone Network serving telephone outlets - White
   3. Wi-Fi Network serving Wi-Fi Access points - Blue
   4. IP Camera/Security serving IP cameras/Security/Access Control - Blue
   5. Local A/V cabling (in-room) - Orange

G. Standards:
   1. Category 6 - Design bandwidth - 250 MHz cable bandwidth, standard data rate 1000 Mbps

H. Color Code
   1. Pair #1 - White/Blue and Blue
   2. Pair #2 - White/Orange and Orange
   3. Pair #3 - White/Green and Green
   4. Pair #4 - White/Brown and Brown

I. Testing Standard:
   1. Category 6 - Cable to be tested using a Level-IIIe Cable Certification Unit.

2.03 COPPER PATCH PANELS

A. Provide 48 and/or 24 port 8P8C modular patch panels as required for termination of all UTP cables with front and back cable management.

B. Standards:
   1. Category 6 - Patch panels must meet or exceed all transmission performance for Category 6 as outlined in EIA/TIA-568 C.2 and be component certified.

C. Each 8P8C jacks will be terminated with 4 pair of UTP wire and shall be wired to meet EIA/TIA 568B (color code).

D. Provide a rear-mounted strain relief bar on each patch panel.

E. For shielded patch patch panels - Patch Panel must be bonded to TMGB or TGB via direct connection or rack bonding mechanism (provided that rack is bonded with a 6 AWG conductor to the TMGB or TGB) with the maximum size conductor supported by the panel (6 AWG maximum, 12 AWG minimum)

F. For multi-pair copper backbone terminations provide a 110 style, Cat 5e rated, backboard mounted 110 cross connect field.

G. Approved Manufacturers: Refer to Article 2.01

2.04 DATA JACKS

A. Provide a flush mounted, modular data jack 8P8C to fit in a two gang 3-1/2 inch deep box or floor box as shown on the Drawings and as specified herein.

B. Data jacks shall be 8-position configurations and shall meet all the transmission performance of cabling standards required.

C. Standards:
   1. Category 6 - The data jacks must be UL listed and must meet EIA/TIA 568 B.2.1, TSB-155 to 37 meters Category 6a channel requirements and be component certified.

D. The data jacks to be wired to EIA/TIA 568B (color code).

E. All terminations shall also terminate cable shields when shielded cabling is utilized.

F. Modular data jacks shall be mounted in modular wall plates for below ceiling jacks and one/two port surface mount boxes for above ceiling jacks.

G. Individual jack colors shall be:
   1. Data Network - Data outlets - Blue
   2. IP Telephone Network Telephone outlets - White
   3. Wi-Fi Network outlets Wi-Fi Access points - Blue
   4. IP Camera/Security serving IP cameras/Security - Blue
   5. Local A/V cabling (in-room) - Orange
   6. Colored flag tags matching the scheme above shall be used for Field Terminable Plugs

H. Approved Manufacturers: Refer to Article 2.01

2.05 MODULAR WALL PLATES

A. Provide modular cover plates with number of modular data jack/telephone jacks as shown on the Drawings and as specified in this section.

B. Match color of Electrical cover plates.

C. Approved Manufacturers: Refer to Article 2.01

2.06 HORIZONTAL WIRE MANAGEMENT

A. Provide horizontal wire management in racks as indicated on the Drawings.

B. Horizontal cable manager shall be front & rear, 2RU per Drawings. 19 in. rack system width.

C. Approved Manufacturers: Same manufacturer as racks provided by section 27 1100 contractor.

2.07 EQUIPMENT RACKS - PROVIDED BY 27 11 00 COMMUNICATION EQUIPMENT ROOM FITTINGS

2.08 VIDEO CABLE

A. HDMI – Type A connector – High Speed HDMI with Ethernet and support for HDMI 2.0b

B. For HDMI connections longer than 25 feet, an active optical HDMI cable must be used.

C. All HDMI cabling provided by this project must support 4K video @ 60Hz 4:4:4 HDMI 2.0 HDCP 2.2 with an 18.2 Gb/s data rate.

D. All open cable above ceiling must be plenum rated.

E. Approved Manufacturers: Refer to Article 2.01.

2.09 AUDIO CABLE

A. Stereo audio cables - 22 gauge, tinned copper, 4 conductor cable with 100% overall shield, black jacket.

B. All open cable above ceiling must be plenum rated.

C. Approved Manufacturers: Extron, Belden, CommScope, WestPenn, Superior Essex.

PART 3 EXECUTION

3.01 CABLING TYPES

A. The facility shall incorporate a combination of shielded twisted pair (F/UTP) and unshielded twisted pair (UTP).

3.02 TWISTED PAIR CABLE (UTP & F/UTP)

A. The computer eight-position modular jack wiring Pin/Pair assignment shall match the EIA-568B as follows:
   1. Pair 1: Pin 4, Blue; Pin 5, White/Blue
   2. Pair 2: Pin 1, White/Orange; Pin 2, Orange
   3. Pair 3: Pin 3, White/Green; Pin 6, Green
   4. Pair 4: Pin 7, White/Brown; Pin 8, Brown

B. Termination of the Category 5e 6 and Category 6a F/UTP cabling shall consist of the following:
   1. The data outlet shall consist of 8P8C modular jacks. Each 8P8C jack will be terminated with 4 pairs of F/UTP wire as indicated above.
   2. Provide 24 and/or 48 port 8P8C patch panels as required by Drawings. Each 8P8C jack will be terminated with 4 pairs of UTP wire.
   3. Provide wire management in rack as indicated on the Drawings.
   4. For shielded cables bond shield drain wire at patch panel end and patch panels to the existing rack busbar.

C. Maximum pulling force is 25 lbs or as recommended by the manufacturer.

3.03 TESTING

A. The Contractor shall be responsible for testing each cable "end-to-end" at Architect/Engineer Technology Designer direction and verifying, in writing, that the cabling is in proper working condition. The Contractor is required to test the cable after its installation and to provide Architect/Engineer Technology Designer with written and test equipment generated documentation verifying test results. Each test results shall be labeled as it is in the field with the serving technology room number, patch panel number/letter and patch panel port number. The field test shall be for Category 5e (Standard), Category 6, or Category 6a standards/requirements.
   1. Category 6 - must meet ANSI/EIA/TIA 568 B.2.1, TSB-155 to 37 meters Category 6a channel requirements and be component certified.

B. All installation work shall be done in a neat, high quality manner and in conformity with local and federal building codes.

C. Cables shall be placed with sufficient bending radius so as not to kink, shear, or damage outer jacket. Any cables damaged from exceeding bend radius limits shall be replaced.

D. It is the responsibility of the Contractor to calculate all actual cable footage required.

E. Provide cable certification summary report for all test results on 8-1/2 by 11 sheets.

F. It is the responsibility or the contractor to verify the labeling at the faceplate while testing to ensure ALL work area outlets are labeled correctly. If it is found that more than 5% of the cables are incorrectly labeled the contractor will be required to retest ALL cabling and correct labeling.

G. Basic Link Testing
   1. Category 6 - Testing of all installed “Basic Links” shall be performed using a Level IIIe hand-held tester with latest software version and performed to the latest revision of TIA/EIA TSB-67, TIA/EIA TSB-155 to 100 meters, and ANSI/TIA/EIA-568-B.2-10. All reports shall be recorded and presented to the Owner before acceptance

H. Testing Standards:

1. Category 6 - Testing of cabling shall be performed prior to system cut-over, 100 percent of the UTP horizontal and copper backbone pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. UTP voice and data horizontal wiring pairs shall be tested to TIA/EIA 568B Addendums 1, 2 and TSB-67, TSB -155 to 37 meters, and TIA/EIA-568B.2-1 from the information outlet to the TC and from the TC to the information outlet. In addition, all assigned circuits shall be tested from the information outlet/building control device to the MDF. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
2. For all cables terminated with Field Terminable Plugs, a TIA-568-C.2, Clause C.5.2 compliant Patch Cord Test Adapter shall be utilized.
3. All reports shall be recorded and presented to the Architect/Engineer Technology Designer and Owner before acceptance.
4. If horizontal cable contains bad conductors, remove and replace cable.
5. Submit printout for each cable tested.
6. Submit a CD with test results and any program required to view results.

I. Where any portion of system does not meet the Specifications, correct deviation and repeat applicable testing at no additional cost to the Owner.

3.04 FIELD QUALITY CONTROL

A. Employ Job superintendent or project manager during the course of the installation to provide coordination of work of this Specification, of other trades, and provide technical information when requested by other trades.
   1. This person shall be responsible for quality control during installation, equipment set-up, and testing.
   2. This person shall attend both the technology kick-off meeting and subsequent progress meetings.

B. Installation personnel shall meet approved manufacturer’s training and education requirements for implementation of extended warranty program.

C. Copies of BICSI Technician, Installer and Apprentice certifications and approved cabling systems warranty provider certificates for copper and fiber optic systems shall be available upon request, for primary and/or subcontract personnel.

D. Provide an Inspection of all tech rooms weekly and vacuum if needed once any permanent cabling termination is made.

E. Maintain weekly inspection log on the wall of each telecommunications space. Log to include inspection date, room condition, name of inspector, and action taken. Provide Log sample with product submittals.

3.05 CABLE PULLING AND INSTALLATION

A. The equipment racks shall be completely installed before any cables are pulled.

B. Cable rollers shall be used when pulling cable. Cable pulleys must be used when pulling cable around bends and corners of wire ways. Pulleys shall have a minimum diameter of 6 inches.

C. Cable rollers used for pulling in cable shall be mounted close to wire way supports and shall be placed at the beginning of the run and spaced every 25 feet along the run.

D. Contractor shall use basket grips wherever possible and exercise care while pulling cable as not to exceed the maximum allowable pulling strength of the cable. Break away swivels rated at no more than 300 lbs shall be utilized for all fiber pulls (or 10% below the cable's maximum installation tensile rating. Excessive fiber twisting (as determined by jacket labeling having rotated 360 degrees in less than 5 linear feet) shall be considered evidence that a swivel was not used and the entire section **must** be replaced.

E. Cable pathways outside of the cable tray must be supported by "J" hooks or an approved support for category cabling. "O" rings will not be acceptable. The distance between cabling supports shall not exceed 48".

F. Category cables, security/access control, and paging cables shall be separated from one another in the wire mesh cable tray at a minimum of 6" or by a physical barrier of the same manufacture as the cable tray.

G. Contractor shall economize on the use of cable by limiting excess length on runs to 6 inches at the jack/outlet (2'6" above ceiling) and 3 feet at the distribution panels (9 feet above rack).

H. Contractor shall take measures to avoid unsupported bundles of cables hanging over unprotected edges of cable trays etc. during all phases of construction.

I. No cable may be pulled between the holes of the wire mesh cable tray. Cables must exit over the top of the side rail of the cable tray.

J. Cables are not to be run through conduits or sleeves without bushings installed. Any cabling pulled through conduit or sleeves without bushings must be removed and a new cable pulled.

K. It is not recommended to install cabling in rooms where painting is incomplete. Cabling contractor is responsible to take protective measures to assure cabling is not painted. Any cable found to have paint must be replaced.

L. Cable installed in areas with exposed ceilings must be concealed within conduit. Technology rooms are the only exception.

M. Cable ties and tape are NOT permitted for securing cable coils or supporting cabling in any way during installation, be it temporary or permanent, on any indoor cabling.

N. Cable ties may only be used to secure cabling outdoors. Cable tie ends shall be cleanly cut with flush cutters.

O. Cables shall be bound with non-printed Velcro straps. Plenum rated Velcro must be used above ceiling.

3.06 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall mark all patch panels, jacks, cables, and cover plates with appropriate permanent printed adhesive labels approved by the Architect/Engineer Technology Designer in accordance with Owner's requirements and Drawings. In addition to adhesive labels, the jacks shall be color coded as directed.

C. Contractor shall install labels as follows:
   1. One label at each end of each cable at the end of the cable sheath, after stripping.
   2. One label on the inside of each outlet box (vacant), plus one label on the outside of each face plate in the space provided.
   3. One label at the end of each cable, where it enters the connector in back of the distribution panel, plus one label on the front of the distribution panel, plus one label on the front of the distribution panel centered below each associated cable connector.
   4. All markings shall be carefully done so as to present a neat, professional appearance.

D. Provide means to identify locations of above ceiling outlets (Wi-Fi and IP CCTV camera) from below the ceiling.

E. Refer to T Drawings for approved outlet & patch panel labeling scheme.
   1. Coordinate with CM and Owner so room numbers in labeling scheme match final room numbers.

F. It is the responsibility or the contractor to verify the labeling at the faceplate while testing to ensure ALL work area outlets are labeled correctly. If it is found that more than 5% of the

cables are incorrectly labeled the contractor will be required to retest ALL cabling and correct labeling.

3.07 CABLE SEPARATION FROM POWER WIRING

A. Between the cabling system and any fluorescent, neon, incandescent, or high intensity discharge lamp fixtures, the minimum distance shall be 6 inches.

B. Cable may be installed closer to lighting and convenience outlet power cable (single phase, 120V, 20A maximum), in metal cable channels for limited distances if the following guidelines are observed:
   1. Coincident (parallel) runs of no more than 15 feet are permissible if a 1 inch separation between the power cable and the cabling system cable is maintained by separators or suitable retention hardware. If necessary, the separation may be less than 1 inch for a run of up to 6 inches if no contact between the cabling system cable and the power cable occur.
   2. Coincident runs of no more than 30 feet are permissible if a 2 inch separation is maintained. The separation may be less than 2 inches for a run of up to 12 inches, if no contact occurs between the cabling system cable and the power cable.

3.08 GROUNDING AND BONDING

A. All systems installed under these contracts shall comply fully with ANSI TIA J-STD-607-C, the most recent revision at time of release of bid documents and the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual) as they relate to bonding and grounding systems.

B. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).

C. All bonding conductors shall be insulated and copper. The minimum bonding conductor size shall be a No. 12 AWG. Refer to Drawings for details.

D. Bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place bonding conductors in ferrous metallic conduit, the conductors shall be bonded to each end of the conduit with a conductor sized as a No. 6 AWG, minimum.
   1. All metallic duct or sleeve banks shall be bonded together with No. 6 AWG bonding conductors if any sleeve or duct is a part of the bonding system.

E. Labels, Color-Coding, and Markings
   1. Each telecommunications bonding conductor shall be labeled. Labels shall be located on conductors as close as practicable (i.e., ease of access to read the label) to their point of termination. Labels shall be nonmetallic and include the information below:
      a. Far end Type Termination
         1) TGMB-Room Number
         2) TGB - Room Number
      b. Near End (at Busbar) Type Termination
         1) BLDN Steel - For reference only
         2) For TGBs, TBB -TMGB Room Number - For reference only
         3) For TGMBs, TBB - TGB Room Number - For reference only
         4) BCT for electric bonding conductor for TMGB - For reference only
         5) MGN - Panel Number for TGBs - For reference only
         6) Rack Number for Telecommunications Racks - For reference only
         7) TEL for Telephone Lightning Arrestors
         8) CATV for Cable static discharge block
         9) ANT-system name, i.e. NTP GPS, clock xmitter, Channel 1, DAS, etc.)
   2. Refer to ANSI/TIA/EIA 606-B for additional labeling requirements.

3. Each telecommunications bonding conductor shall be marked appropriately by a distinctive green color.

F. It is the responsibility of this contractor to provide grounding and bonding of the technology cabling system to comply with the BICSI guidelines in the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

3.09 TRAINING

A. Provide as a part of this contract/bid a total of (10) ten hours of on-site training and demonstration of the new system to the Owner's staff.

B. Demonstrate and explain:
1. Labeling Scheme
2. Use of Data Vac
3. Bonding/Grounding methods for shielded horizontal cabling
4. Fundamentals of Structured Cabling (patch cable routing, patch cable selection, rules to maintain channel warranty, etc)

END OF SECTION

SECTION 27 21 00
DATA NETWORK EQUIPMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Network Switches
   1. POE 24/48 port PoE switches

B. Patch cables

C. Uninterruptible power supplies (UPS's)

1.03 SYSTEM DESCRIPTION

A. The Local Area Network (LAN) Electronics shall be a fully switched 10/100/1000 Ethernet Network System. The individual edge switch size shall be 24 or 48 ports. Individual switches shall be connected into a switch stack. Each switch stack will be equipped with two (2) full duplex fiber 10Gbase uplinks to the main core switch located in the Main Equipment Room.

B. The network core switch at each school shall consist of a minimum of a 256 Gigabit switching capacity, layer-3 core switch for termination of the fiber 10Gbase links from the individual switch stacks, and GigE links for WAN links and file servers. The network core switch shall be equipped with dual power supplies.

C. There are a total of one (1) Telecommunications Rooms.
   1. Main Equipment Room - 106

1.04 DESCRIPTION OF WORK

A. Provide labor, material, equipment and accessories necessary for a complete operable network system. The contractor shall furnish the equipment, accessories and necessary material as described herein.

B. The contractor shall include programming and complete testing of the Ethernet network system (with all devices connected to it, as computers, printers, etc.). Network configuration of the Ethernet network system shall be per Owners requirements.

C. The new equipment shall consist of the following: Ethernet switches, network management software, and associated material, and hardware necessary for a complete, satisfactorily installed operating system which meets specified requirements.

D. The computer/network eight-position modular jack wiring Pin/Pair assignment shall match the EIA-T568B as follows:
   Pair 1: Pin 4, Blue; Pin 5, White/Blue
   Pair 2: Pin 1, White/Orange; Pin 2, Orange
   Pair 3: Pin 3, White/Green; Pin 6, Green
   Pair 4: Pin 7, White/Brown; Pin 8, Brown

E. In each Telecommunications Room, the fiber optic 50/125 multimode and single mode cabling is terminated with “SC-UPC” ceramic tip type connectors. Multimode connectors shall be aqua in color, single mode connectors shall be blue in color.

F. Provide as part of this contract on-site training, teaching and demonstration of the system to a number of people as indicated and selected by the school.

1.05 QUALITY ASSURANCE

A. All computer equipment and peripheral shall be listed by Underwriters Laboratories, Inc. and shall bear the UL label. The system shall be installed in accordance with requirements set by National Electrical Code, and shall comply with FCC rules for its own application.

B. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment installation practices shall comply with the local electric code.

D. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

E. All equipment and Installation Practices shall comply with the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, and 862 standards.

1.06 CERTIFICATION

A. Contractor shall provide the services of a computer network company and shall be 100 percent certified by the manufacturer. The computer network system contractor shall perform all work in compliance with the requirements established by EIA/TIA 568, 569, IEEE 802.3, and BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual) standards.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.08 SUBMITTALS

A. Pre-Construction
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. Provide catalog cuts of products for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents. NOTE: If submittals do not contain complete information causing the Architect/Engineer Technology Designer to perform more than two (2) reviews with respect to any section submittal, the Contractor shall be liable for costs to the Owner resulting from the additional Architect/Engineer Technology Designer submittal reviews. The Owner may withhold from sums due or coming due the Contractor to cover such costs and expenses.
      b. Provide schematic Drawings indicating the network configuration for review and approval before starting the final programming and connections of the system.
      c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction
   1. Provide list of all devices provided complete with location (building, room number, rack number & rack position), model numbers, serial numbers, and administrative passwords in

both hard copy and electronic spreadsheet (MS Excel compatible) to the Owner and Architect/Engineer Technology Designer.

2. Provide signed (by attendees & trainer)& dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
3. Operation & Maintenance Manuals
   a. Provide complete O & Ms. One hard copy and PDF format.
   b. Both formats shall be fully indexed with tabs by Section Name/System/Device.
4. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.09 WARRANTY

A. The data network equipment and all associated software shall be warranted by the contractor for a period of three (3) years from date of project completion. Provide advanced replacement for all Data Network Equipment and business hours standard technical support, 7 X 24 emergency technical support and software support (including revisions, fixes and upgrades) for the three (3) year period.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.10 EXTRA MATERIALS

A. Maintenance Stock
   1. Provide patch cables for connecting end user devices to permanent links, including owner equipment.
   2. Provide factory certified 10% spare patch cables for extra stock. Vary the lengths equally of 7 foot and 15 foot.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 POWER OVER ETHERNET (POE) 24/48 PORT DATA SWITCHES

A. Provide powered manageable Ethernet network rack mounted switches where indicated on the Drawings.

B. Switches shall be rated 10/100/1000 Base-T Ethernet/Fast Ethernet, Layer 2 manageable switch.

C. Switches shall comply with IEEE 802.3.at-2009, ISO 8802/3.

D. Switches must provide 802.3.at Type 2 (PoE+) power on all ports simultaneously. Standard 30 watts per port.

E. Provide additional internal or external power supplies and appropriate length power cables to connect switch to provide required power per port. Manufacturer to be the same as switch manufacturer.

F. Switches shall be 24 Port
   1. If use of uplink ports detracts from usable ports, provide additional ports equal to the number of uplinks ports in each tech room.

G. Stacking capability is a requirement. Each stack will be connected to the core with two (2) 10Gbase fiber uplinks per stack. Provide stacking modules and stacking cables necessary to complete fully redundant stacks. A maximum of 8 switches may be in one stack.

H. Switches to be full duplex to core switch.

I. Switches shall support IGMP snooping v1, v2 and v3.

J. Provide patch cables (channel approved or component certified) needed from patch panel to switch per Drawings to activate ports. Patch cables must match category of channel which will be:
   1. Category 6

K. The switches shall be “non-blocking” and support a minimum forwarding bandwidth equal to the number of switch ports x 1 Gbps.

L. Provide support for IP v6 addressing.

M. The network switches shall support advanced services including:
   1. Building Management Systems
   2. IP Telephony
   3. Video Streaming
   4. Wireless Networking

N. Approved Manufacturers:
   1. Cisco Catalyst C9300-48P
   2. Ruckus - ICX7450-48
   3. Extreme Networks Summit X440-48p-10G

O. Provide unit pricing.

2.02 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Provide dual conversion UPS units for each Telecommunications Room electronics and for the file server, provide sufficient protection from power anomalies.

B. Provide any adapters for existing rack mounted power strips and connected to the UPS units. Locate the power strips in the equipment racks and on the equipment backboards powering all electronics systems in each Telecommunications Room.

C. Provide shutdown connections from the UPS to servers for graceful power down in the event of a power failure.

D. Equip the UPS units with a twist-lock power cable and SNMP management card.

E. Connect each UPS SNMP management to the management VLAN.

F. UPS equipment sizing must be calculated by each bidder for the equipment bid.

G. UPS equipment to be rack mountable.

H. Coordinate with electrical contractor to install UPS AC outlets.

I. Uninterruptible Power Supply (UPS)
   1. Connected to building emergency generator system
   2. Provide UPS backup of all switches in each Telecommunications Room and for the file servers in the Main Equipment Room. Each Telecommunications Room rack to have a 3000VA UPS. Main Equipment Room to have a 10kVA UPS.
   3. Main Equipment Room
      a. Vertiv/Liebert GXT5-10000RT208 - provide one UPS.
         1) Equals by Tripp Lite SU10000RT3U2TF, APC SURT10000RMXLT6U
      b. Provide all internal batteries for main UPS unit and external battery units as required to provide 30 Minutes runtime at full load. Provide additional external battery units - as required.
      c. Provide all internal batteries for external battery units.
         1) Approved Manufacturers:
            (a) Vertiv/Liebert GXT5-288RTVBATT
            (b) Tripp Lite BP240V10RT3U
            (c) APC SURT192RMXLBP3U

d.
e. Provide power distribution unit (PDU) with connectors for managed power strips.
f. Provide rack mounting kit for each UPS.
g. Provide management card for each UPS.
    1) Approved Manufacturers:
        (a) Vertiv/Liebert OCWEBCARD Intellislot 10/100 Mbit Ethernet SNMP Kit
        (b) Tripp Lite SNMPWEBCARD
        (c) APC AP9631
h. Provide UPS Management Software for control, alerts, and reporting of all UPS's provided.
    1) Approved Manufacturers:
        (a) Vertiv/Liebert MLADV - Multilink advance shutdown software
        (b) Tripp Lite POWERALERT12
        (c) APC PowerChute Business Edition Deluxe
    2) Provide one (1) environmental monitoring unit for the UPS in the Main Equipment Room to measure room temperature. Provide automated exception (over temperature) reporting through management software

J. Managed power strip- provide two - power strip 27 NEMA 5-15/20 (T-slot) outlets; 30A/120VAC/10' cord/ locking NEMA input plug - 1 for server rack and 1 for switch rack.
    1. Approved Manufacturers:
        a. Vertiv VP8932
        b. Tripp Lite PDUMV30NETLX
        c. APC AP8932

K. Power servers, wireless management server, bulletin board server, security server, IP KVM w/ single LCD monitor, and PoE telephony switches from this unit. All other switches/devices to be powered from generator protected power strips. The IP telephony server and associated components will have a separate UPS supplied by the telephone system contractor.

L. Provide one (1) environmental monitoring unit for one UPS in each Telecommunications Room to measure room temperature. Provide automated exception (over temperature) reporting through management software

M. Patch Cables
    1. Patch Cable Jacket Colors
        a. Standard data patch cables shall have a blue jacket.
        b. Voice over IP patch cables shall have a white jacket.
        c. IP Security/Camera patch cables shall have a blue jacket.
        d. Wireless network patch cables shall have a blue jacket.

PART 3 EXECUTION

3.01 INSTALLATION

A. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

B. Install file server and setup basic user accounts and network configuration.

C. No fiber optic cable shall be connected to a patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

D. Install data network Ethernet switches and validate connectivity throughout. Establish all VLAN's, QoS, IP routing and IP subnets.

E. Provide the following VLAN's and QoS:
    1. Administration (802.1p level 3)

2. HVAC (802.1p level 4)
3. Network Management (802.1p level 7)
4. Point of Sale (802.1p level 3)
5. Student (802.1p level 0)
6. Video (802.1p level 4)
7. Voice (802.1p level 6)
8. Wireless - Configure EAP authentication for wireless network with existing school authentication platform. Coordinate with Owner. (802.1p level 0)
9. CCTV (802.1p level 5)
10. Note: Submit copy of list of configured VLANs to Architect/Engineer Technology Designer and the School Technology Coordinator derived from the configuration file of each core switch. For PoE switches, no mixing of IP Voice, Wireless, or IP Camera/security is permitted within the same 24 port switch.

F. Coordinate network installation and integration with other systems connected to the network with District's and applicable ITC-Site's technical and operational requirements.

G. System time shall be synchronized from the District’s designated network time protocol server(s).

H. Coordinate with and support the A/V contractor to set up switching network to distribute the owner's IP video headend.

I. Install and setup UPS units and establish power down procedures.

J. Connect system to ITC-Site WAN links and configure as per ITC-Site requirements.

K. Program and configure any State of Ohio Educational Network switches required to access the ITC-Site or the State of Ohio IVDL Network.

L. Patch cords
1. It is this contractor’s responsibility to install all patch cords needed to activate ports indicated in the Drawings. The contractor is responsible for determining the length and quantity of patch cords for a neat and clean installation. Typically, 3 foot patch cords will be sufficient to patch data switches to patch panels in racks. Provide longer patch cords as needed. Match cord category to the existing horizontal cabling channel category.
2. Patch cords are not to be run in front of/across other equipment.
3. Zig-zagging patch cords in wire management will not be permitted.

M. Miscellaneous Equipment
1. Provide all miscellaneous equipment such as identification tags, cable tie, wiring harnesses, patch cables, Cat 6a and fiber complete for a complete system.

N. Initiate communication & coordinate with electrical contractor to install appropriate outlet for UPS provided.

O. The equipment racks shall be completely installed before any equipment is installed.

3.02 TESTING

A. The contractor shall be responsible for energizing and testing each run "end-to-end" at Architect/Engineer Technology Designer direction and verifying, in writing, that the data network system is in proper working condition.

B. After installation is complete, the system shall be tested and copies of the testing records shall be marked post measurements and supplied to the Architect/Engineer Technology Designer and Owner.

C. Verify and demonstrate to Architect/Engineer Technology Designer proper operation of all switches, access points, VLAN's, QoS levels, routing, and WAN connectivity.

D. Contractor shall demonstrate operation of management interfaces to the Architect/Engineer Technology Designer and the Owner for the Core switch/edge switches and UPS Management for all UPS's.

3.03 LABELING AND MARKING

A. Contractor shall follow the 2023 National Electrical Code and the ANSI/TIA/EIA-606-B Standard for labeling.

B. Contractor shall provide a typed schedule of all data ports on the patch cables and on the switches and according to each related room jack designation for all distribution switches, in accordance with Owner's requirements.

C. Switches shall be labeled with VLAN network name (Refer to Part 3.01 paragraph C) VLAN ID and IP address.

D. Label all power cables at the point of connection to powers strips with an identifier that corresponds with the device label on the front of the rack.

3.04 TRAINING

A. Provide a minimum of two (2) hours of training for the District's personnel on the operation and maintenance of the systems.

B. Refer to submittals section of this Specification for information on training syllabus requirements.

C. Contractor shall provide one (1) video copy of all training.

3.05 QUANTITIES

A. Refer to Drawings and this Specification for active data port/quantity requirements.

END OF SECTION

SECTION 27 21 33
WIRELESS DATA COMMUNICATIONS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the work of this section.

1.02 SECTION INCLUDES

A. Wireless Data Communications System - Owner Managed
   1. Wireless Management Server
   2. Wireless Controllers
   3. Indoor Access Points

1.03 DESCRIPTION OF WORK

A. Owner Managed Wireless Data Communications System
   1. Provide labor, material, equipment and accessories necessary for a complete operable wireless data communications system. The contractor shall furnish the equipment, accessories and necessary material as described herein.
   2. The contractor shall include programming and complete testing of the wireless data communications system (with all devices connected to it, as computers, printers, etc.). Network configuration of the Ethernet network system shall be per Owner's requirements.
   3. Make available business hours standard technical support, 7 X 24 emergency technical support and software support (including revisions, fixes and upgrades) upon expiration of the three year warranty period for all hardware and software purchased in this section.

1.04 QUALITY ASSURANCE

A. All equipment shall be UL Listed.

B. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment Installation Practices shall comply with the Local Electric Code.

D. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

E. All equipment and Installation Practices shall comply with the BICSI 14th Edition TDMM.

F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.
   1. All equipment shall provide protection and containment of unwanted wireless signals and prevent student access to unwanted networks and content, in accordance with CIPA requirements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.06 SUBMITTALS

A. Prior to Commencement of Work
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
      a. Provide catalog cuts of products in PDF format for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents. Final copies shall be electronic and hard copy.
      b. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      c. Provide Schematic Drawings indicating the network configuration for review and approval before starting the final programming and connections of the system.
      d. Provide schematic Drawings showing the following based on a preliminary wireless design of the building with proposed equipment: Access point locations to assure coverage as outlined in this Specification Section. Wi-Fi maps showing the anticipated performance and signal coverage at each standard to include 802.11 a/g/n/ac/ax.

B. Post Construction
   1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   2. Complete Drawings indicating the interconnection of all equipment.
   3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.
   4. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed by Section Name/System/Device.

1.07 WARRANTY

A. The Wireless Data Communications and all associated equipment shall be warranted by the contractor for a period of three (3) years from date of substantial completion. Provide advanced replacement for all Wireless Data Communications for the three (3) year period.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.08 EXTRA MATERIALS

A. Maintenance Stock
   1. Turn over any accessories to the Owner as attic stock.

B. In addition to the access points indicated on drawings provide two, (2) spare internal access points.

C. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 WIRELESS DATA COMMUNICATIONS - OWNER MANAGED

A. Approved Manufacturers
   1. Cisco
   2. Meraki
   3. Ruckus
   4. Extreme Networks
   5. Ubiquiti

B. General - Wireless Data Communication System

1. Provide Centrally Powered, 802.11a/g/n/ax Wireless Access Points and associated. Wireless Network Controller(s), to support wireless Network Devices and Phones throughout the building and the associated campus.
2. Connect the APs (Access Points) to the IP network via an 802.3af/at Power over Ethernet (PoE) switch port.

C. Provide minimum of -65dB signal level at all locations in building for 802.11a/g/n/ax coverage.

D. Supply sufficient quantity of access points to provide for expected throughput and load sharing.

E. Provide wireless management server software onto the Virtualized Server provided by the 27 2100 Data Network Equipment Contractor
1. Integrate AutoCAD building Drawings into the Wireless Management System for graphical system management and location.
2. Approved Management Application Manufacturers:
    a. Cisco Prime
    b. Meraki- Cloud Based Software Application
    c. Ruckus Smartzone
    d. Extreme Networks Management Center

F. Wireless Controllers And Location Tracking
1. Equip with a wireless controller and associated location tracking appliances.
2. These devices shall be directly attached to the associated L-3 Network Core Switch via Gigabit interfaces as required.
3. These devices shall provide dynamic channel assignment, interference detection and avoidance, load balancing across multiple access points, guest networking, Voice over WLAN (VoWLAN) Support, layer-2 and layer-3 roaming support, coverage hole detection and avoidance, dynamic power control, user location and tracking services, and real-time rogue access point detection and containment.
4. The wireless network controllers and associated location tracking devices shall be controlled via a centrally located wireless management system console.
    a. Wireless LAN controller
        1) Morgan Township Volunteer Fire Department - Main Equipment Room - Room 106 - Provide wireless controller(s) licensed for 100 access points with a minimum of 8 Gigabit uplink ports equipped in a trunked configuration or if controller carries only management traffic, provide redundant gigabit ports. Provide controller(s) with appropriate interfaces to connect to the owner's core switch. Note:5 year cloud controller packages are an acceptable substitute for on-site controllers.
        2) Approved Manufacturers:
            (a) Cisco 5520 Wireless Controller
            (b) Meraki 5 year controller package
            (c) Ruckus - Smartzone 100
            (d) Extreme Networks C5210

G. Wireless Access Points
1. Provide centrally powered IEEE 802.11 a/g/n/ax Wireless Access Points (AP's) equipped for maximum bandwidth.
2. Provide support for 802.11ax standard.
3. The AP's shall provide for rapid traffic forwarding capabilities that will enable the Access Points to support real-time voice, video and data services.
4. Each AP shall be aware of neighboring access points, enabling effective real-time, and air traffic-management through load balancing.
5. Clients shall be routed around a failed access point to the closest available alternative on a real-time basis without manual intervention.

6. Each Access Point shall support a minimum of 14 VoWLAN Phones and dynamically throttle back non-VoIP traffic.
7. The AP's shall conform to the following for IEEE 802.11a/g/n/ac/ax operation:
   a. 802.11a
      1) Data rate: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps
      2) Frequency band: 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.725 - 5.850 GHz
      3) Orthogonal Frequency Division Multiplexing (OFDM)
      4) Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
      5) Non-overlapping channels: 13
      6) Typical receiver sensitivity: -72dBm at 54Mbps, -73dBm at 48Mbps, -78dBm at 36Mbps, -82dBm at 24Mbps, -83dBm at 18Mbps, -85dBm at 12Mbps, -88dBm at 9Mbps, -90dBm at 6Mbps
      7) Transmit Power: 5.150 to 5.250 GHz, 50 mW, 5.250 to 5.350 GHz, 50 mW, 5.725 to 5.850 GHz, 50 mW
      8) Typical coverage: 130ft (40m) at 11Mbps, 350ft (107m) at 1Mbps
   b. 802.11g
      1) Data rate: 1, 2, 5.5, 11, 12, 18, 24, 36, 48 and 54 Mbps
      2) Frequency band: 2.4 - 2.4835 GHz
      3) Direct Sequence Spread Spectrum
      4) Orthogonal Frequency Division Multiplexing (OFDM)
      5) Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
      6) Non-overlapping channels: 3
      7) Typical receiver sensitivity: -72dBm at 54Mbps, -76dBm at 48Mbps, -82dBm at 36Mbps, -85dBm at 24Mbps, -88dBm at 18Mbps, -90dBm at 12Mbps, -92dBm at 9Mbps, -92dBm at 6Mbps
      8) Transmit Power: 100mW (20dBm), 50mW (17dBm), 30mW (15dBm), 20mW (13dBm), 5mW (7dBm), and 1mW (0dBm)
   c. 802.11n Data Rates

MCS Index	Spatial Streams	Data Rate Mb/s			
		20 MHz Channel		40 MHz Channel	
		800ns GI	400ns GI	800ns GI	400ns GI
0	1	6.5	7.2	13.5	15
1	1	13	14.4	27	30
2	1	19.5	21.7	40.5	45
3	1	26	28.9	54	60
4	1	39	43.3	81	90
5	1	52	57.8	108	120
6	1	58.5	65	121.5	135
7	1	65	72.2	135	150
8	2	13	14.4	27	30
9	2	26	28.9	54	60
10	2	39	43.3	81	90
11	2	52	57.8	108	120
12	2	78	86.7	162	180
13	2	104	115.6	216	240

14	2	117	130	243	270
15	2	130	144.4	270	300

d. 802.11ac Data Rates

MCS	Mod. Type	Coding Rate	20 MHz Channel		40 MHz Channel		80 MHz Channel		160 MHz Channel	
			800 ns GI	400 ns GI	800 ns GI	400 ns GI	800 ns GI	400 ns GI	800 ns GI	400 ns GI
0	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65
1	QPSK	1/2	13	14.4	27	30	58.5	65	117	130
2	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195
3	16-QAM	1/2	26	28.9	54	60	117	130	234	260
4	16-QAM	3/4	39	43.3	81	90	175.5	195	351	390
5	64-QAM	2/3	52	57.8	108	120	234	260	468	520
6	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585
7	64-QAM	5/6	65	72.2	135	150	292.5	325	585	650
8	256-QAM	3/4	78	86.7	162	180	351	390	702	780
9	256-QAM	5/6	na	na	180	200	390	433.3	780	866.7

8. All Power over Ethernet devices shall be IEEE 802.3at compliant.
9. Provide lockable surface mount access point enclosures (keyed alike) for all access points in locker rooms and gymnasiums or as noted on Drawings. Must accommodate access point and surface mount cabling outlet. Approved Manufacturers: Panduit - Panzone, Oberon - Multi Vendor Wall Enclosure, or access point manufacturer enclosures.
10. Provide channel approved or component certified patch cables and pass-through couplers to connect each access point to horizontal cabling (match jacket color and category of horizontal cabling). Provide plenum rated jacket if required by the 2023 National Electrical Code.
11. Standard for indoor access points: Dual-band controller-based 802.11a/g/n/ax MU-MIMO 4X4:4 Access Points. Approved Manufacturers:
    a. Cisco Catalyst 9115 Series Wi-Fi 6 Access Points
    b. Meraki - MR44- Dual band Access Point
    c. Ruckus -R750- Dual Band Controller Based 802.11ac
    d. Extreme Networks AP410i/e Access Point
12. Telecommunications Rooms
    a. Morgan Township Volunteer Fire Department - Main Equipment Room - Room 106
13. Provide indoor access points per Unit Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

B. Perform an RF Survey to verify complete coverage.

C. Install outdoor wireless access points above accessible ceiling where required (Typically APs serving outdoor antennas) - access points to be controlled through network.

D. Coordinate VPN, firewall and security settings/requirements with Owner - EAP authentication required.

E. No fiber optic cable shall be connected to a fiber patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

F. Provide coverage for entire building and perimeter area.

G. Coordinate with local Law Enforcement and safety forces regarding their requirements for remote and wireless access into building security and energy management systems. Law Enforcement and Safety Forces are responsible for providing their own remote access equipment.

H. Provide external antennas and appropriate lightning protection.

I. The building floor plans and site plans shall be entered into the wireless management system.

J. The wireless management system floor and site plans shall be calibrated after installation has been performed.

K. Balance wireless access points to insure complete coverage with minimal service degradation.

L. Setup wireless access security - Guest, Student & Staff SSIDs, VLANs and EAP authentication (Enterprise mode). Coordinate with ITC site on authentication items. Configure the wireless management server and integrate with the owner’s existing domain server(s).

M. Determine the optimum location of all devices in the wireless LAN coverage areas and consider the access point density and location.

N. Locate all internal access points below the ceiling tile grid wherever possible.

O. Connect the external antennas to AP's mounted inside the building.

P. System time shall be synchronized from the District’s designated network time protocol Server(s).

Q. Velcro straps (neutral color) shall be used to dress all exposed cabling.

3.02 TESTING

A. Perform a complete site survey after system placement and verify coverage, MCS and throughput.
   1. There shall be at least three test points in each room. (Recommendation only for ITC Site)
   2. Coverage to be surveyed for 2.4 GHz and 5 GHz bands.

3.03 LABELING AND MARKING

A. Cables, jacks, system components, etc. shall be labeled according to ANSI/EIA/TIA-606 Specifications and in coordination with the Owner & Architect/Engineer Technology Designer. APs shall have a label visible from occupied space and a matching label on the patch panel & switch port.

B. All AP cables shall be equipped with a self-laminating, wrap-around, machine printed label at both ends of the cable.

C. APs shall be labeled with a distinct AP ID number, This same number shall appear on serving switch port and the Wireless Management system. Labels shall be printed per Section 3.03 Article A.

3.04 TRAINING

A. Contractor shall provide a minimum of one (1) 1-hour, end user system training class. Training shall be provided to all staff and shall be scheduled in advance with the District.
   1. Refer to Submittals section of this Specification for Training Syllabus requirements.
   2. Contractor shall provide two (2) video copies of all training.

3.05 QUANTITIES

A. Refer to Drawings, and this Specification for requirements/quantities.

END OF SECTION

SECTION 27 41 19
VIDEO DISPLAY EQUIPMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. The provisions of the General Conditions, Supplementary Conditions and the Sections included under Division 1, General Requirements are included as a part of this Section as though bound herein.

B. Refer to Section 01 2300 for Alternates that may affect the Work of this Section.

1.02 SECTION INCLUDES

A. Video Display Equipment
   1. LCD TV/Digital Flat Panel Units
   2. TV/Flat Panel Mounts

1.03 QUALITY ASSURANCE

A. All equipment shall be UL listed.

B. All equipment and installation practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

C. All equipment installation practices shall comply with the local electric code.

D. All equipment and installation practices shall comply with the latest BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

E. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.05 SUBMITTALS

A. Prior to commencement of work.
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures. Submit shop Drawings including product data sheets and wiring diagrams and shall include the following:
      a. A complete bill of materials with model and part numbers and reference to the Specification paragraph number.
      b. Complete and comprehensive shop Drawings of all equipment shall be submitted to the Architect/Engineer Technology Designer for review.
      c. Complete and comprehensive Equipment Catalog Specification Sheets of each component provided.
      d. Each Drawing shall have a descriptive title and all subparts of each name of the project, architect and electronics contractor in the title block.

B. Post Construction

1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
2. Operation & Maintenance Manuals
    a. Provide complete O & Ms. One hard copy and PDF format.
    b. Both formats shall be fully indexed by Section Name/System/Device.
3. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.06 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period of three (3) years from date of completion.

B. All repairs shall be made with new components. No refurbished equipment is permitted.

1.07 EXTRA MATERIALS

A. Maintenance Stock
    1. Loose items like remote controls, pointers, mount adjustment tools etc.

B. Obtain Owner's signature acknowledging receipt of extra stock.

PART 2 PRODUCTS

2.01 LCD TV/FLAT PANELS

A. Provide the following monitors in quantities as indicated on Drawings.
    1. 32", 55", "65", 70", and 86" Flat Panels shall have the following features:
        a. LCD, HD TV
        b. 16:9 Aspect ratio
        c. Minimum native resolution of 1366 x 768 (32"), 3840 x 2160 (55","65", "70"&"86")
        d. 2 x HDMI Video Inputs
        e. 1 rear RCA composite video and stereo audio input
        f. 60 Hz refresh rate
        g. NTSC Video System
        h. 120 VAC 60Hz powered
        i. Provide with Ethernet connection for stream apps
        j. Stereo sound internal speakers
        k. Internal 181 channel tuner
        l. ATSC/Digital Cable Ready
        m. 16:9 wide screen Format
        n. 1 A/V output
        o. Built-In Closed Caption Decoder
    2. 70-75" LCD/LED FLAT PANELS
        a. LG NANO75UP 75" Class HDR 4K UHD Smart NanoCell LED TV
        b. Sony X900H 75" Class HDR 4K UHD Smart LED TV
        c. Sony X80J 75" Class HDR 4K UHD Smart LED TV
        d. Samsung TU8000 75" Class HDR 4K UHD Smart LED TV
        e. Provide Unit Pricing.
    3. 86" LCD/LED FLAT PANELS
        a. LG NANO75UP 86" Class HDR 4K UHD Smart NanoCell LED TV
        b. Sony X85J 85" Class HDR 4K UHD Smart LED TV
        c. Samsung TU8000 85" Class HDR 4K UHD Smart LED TV

B. Provide all video distribution premium certified HDMI and category 6 component certified blue data network patch cables to connect flat panels.

C. Provide two (2) 3.5 mm audio patch cables.

2.02 LCD/LED FLAT PANEL MOUNTS

A. Provide type mounts for each TV monitor based on unit Drawings.

B. Utilize security/theft-deterrent mounting hardware on all mounts.

C. For each monitor provide the following wall mount bracket, unless noted otherwise:
   1. Large Screens 50”-86”
      a. Approved Manufacturers:
         1) Chief XTM1U | Fusion Wall-Tilt Series
         2) Premier CTM-MS3
         3) Peerless STP680 - SmartMount® Universal Portrait Tilt Wall Mount
   2. Black in color
   3. Three pivot points with up to 180 degree swivel (for 32" to 55" mounts).
   4. Adjustable Tilt - 10 degree forward and 5 degree backward
   5. Arm extends to minimum 20"
   6. Easy leveling adjustment
   7. Provide shelf/mount for set top box.
   8. Provide all necessary mounting hardware and mount per the manufacturer’s requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount projectors and Flat Panels using manufacturer's recommended hardware. Note: If data, A/V, or electrical outlets are not correctly positioned per the drawings, do not install the display/projector...notify the Construction Manager, A/E Project Manager or Technology Designer of the room number(s) where this issue was encountered.

B. Connect devices to IP network for central control and operation.

C. Adjust all projectors for proper focus, keystone correction and display size.

D. Install all associated software monitoring and control programs.

E. No cable ties are permitted in exposed areas to dress cabling. Velcro straps only in neutral color (plenum).

3.02 TESTING

A. Verify picture quality on all A/V inputs.

B. Test all associated software control programs.

3.03 TRAINING

A. Provide two (2) hours training for the owner's personnel on the operation and the maintenance of the system in one (1) hour training installments beginning at substantial completion for each six month period until the warranty expires.

B. Refer to Submittal section of this Specification for training syllabus requirements.

C. Contractor shall provide two (2) video copies of all training.

3.04 QUANTITIES

A. Refer to Drawings for more information on quantities and where noted in this Specification.

END OF SECTION

SECTION 28 16 01
SECURITY/ACCESS CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Provide a complete addressable intrusion detection system and complete access control system.

1.02 RELATED DOCUMENTS

A. Refer to “Instructions to Bidders, General Conditions, and General Requirements,” which form a part of this Specification.

1.03 DESCRIPTION OF WORK

A. Provide an alarm monitoring system as shown on the Drawings.

B. The Intrusion Detection System shall include, but not be limited to, the following:
   1. System Controllers
   2. Door Contacts
   3. Keypads
   4. Egress Motion Detectors
   5. Motion Detectors (Ceiling and Wall Mounted Detectors)
   6. Various relay outputs (Distributed Antenna System monitoring-reporting)
   7. Installation, inspection, and testing

C. The Access Control System shall include, but not be limited to, the following:
   1. System Controller
   2. Software for Access Control system (Server and clients)
   3. Distributed IP based Access Control Hubs/Controllers
   4. FOBs or Access cards (per owner preference)
   5. Card Readers
   6. Installation, inspection, and testing

D. This must be an Integrated Security and Access Control System

E. This system must integrate with the CCTV system division 28 2300 using ONVIF standards.

1.04 QUALITY ASSURANCE

A. All equipment and installation practices shall comply with the latest ANSI/NFPA-70 National Electrical Code.

B. All equipment installation practices shall comply with the 2023 National Electrical Code and local electric code.

C. All equipment shall comply with the latest ANSI-J-STD-607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

D. All equipment and installation practices shall comply with the BICSI 14th Edition TDMM (Telecommunications Distribution Methods Manual).

E. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607 and 862 standards.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer

d. Construction Manager
e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.06 SUBMITTALS

A. Prior of Commencement of Work
1. Shop Drawings -Refer to Section 01 3000 - Administrative Requirements, for submittal procedures.
a. Provide catalog cuts of products for review in the format required by the project front-end Specifications. All products provided must be clearly identified in submittal documents.
b. Complete and comprehensive Equipment Catalog Specification Sheets of each component provided.
c. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.
d. If a product is manufacturer discontinued, provide the manufacturer recommended direct replacement cut sheet and note as "Replacement for discontinued item".

B. Post Construction
1. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
2. Complete record Drawings indicating the interconnection of all equipment.
3. Operation & Maintenance Manuals
a. Provide complete O & Ms. One hard copy and PDF format.
b. Both formats shall be fully indexed by Section Name/System/Device.
4. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.07 WARRANTY

A. Components, parts, and assemblies supplied by the manufacturer shall be warranted against defects in materials and workmanship for a period of three (3) years from date of completion. Warranty services shall be provided during normal working hours. The representative shall be based in a fully staffed branch office and located within a reasonable distance from the job site.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

1.08 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Security:
1. Digital Security Controls Ltd. (DSC)
2. Ademco Systems
3. Bosch

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following for Access Door Control:
1. Kantech Systems - Basis of Design
2. I/O Prox
3. H.I.D. Corp.
4. S2 Security
5. RS2
6. Axis A1001

PART 2 PRODUCTS & OPERATION

2.01 INTRUSION DETECTION SYSTEM

A. Security System Controller
   1. System controller shall be microprocessor-based with battery backup to allow a minimum of 24 hours of data integrity. System shall have 16 zones expandable to a minimum of 64, definable user codes, 12 multiple levels of authority, 128 event minimum history log, and ability to connect up to 8 supervised keypads. All zones shall be fully supervised and programmable. Panel shall be complete with integral power supply and supervised battery charger, auxiliary power for powering security detection devices, integral supervised digital alarm communicator, supervised bell/siren output, and two general purpose programmable outputs which can be programmed as general purpose outputs or as the systems addressable loops. The system shall be capable of reporting all alarms, trouble, and system status information by combinations of all communication methods installed including: digital communicator, a cellular transmitter, SMS messaging and DVAC.

B. System Printer
   1. The system shall be capable of including a serial output for a hard copy printer installed anywhere on the Communications bus. All system events, alarms, and restorals shall be printed and each event shall include the partition, date, and time.

C. Provide a concealed Panic button at each administrative entrance (two) capable of summoning law enforcement.

D. System Keypads
   1. The system shall accommodate up to 8 LCD keypads, which are powered from the base panel. LCD keypads shall have a display capacity of at least 32 alphanumeric characters with adjustable brightness and contrast. Keys shall be backlit for low light level ease of use. Keypads shall include individual "Armed," "Ready," and "Trouble" indicators, three keypad activated alarm keys, and five programmable "function" keys.

E. User Codes
   1. The system shall provide for 1,000 user codes selectable as either 4 or 6 digits. For Access Control, user codes shall be assignable to 1 of 64 access levels. User codes shall be assignable to one of multiple partitions.

F. Partitions
   1. The system shall be programmable for up to 8 fully independent partitions each partition shall have its own account code. Keypads shall be assignable as "partition" keypads or "global" keypads. Integrate with Access. Each zone in the system shall be assignable to one or more partitions.

G. Central Station Reporting/Digital Communicator
   1. The system shall provide high speed 20 bps 1400/2300 Hz. handshake, contact ID and SIA reporting formats and shall be capable of being programmed to call up to 3 telephone numbers. The system shall also allow communication to a pager. The telephone numbers shall be programmable for 'backup' dialing should the primary number fail. The system shall be programmable for split reporting such that alarms/restorals, openings/closing and miscellaneous events can be sent to different telephone numbers. The system shall report a separate account code for each partition and for non-partition (system) events.
   2. The system shall be capable of including up to 144 low power outputs with each output able to supply 50 mA at 12 VDC. Outputs shall be added in increments of 16 and may be added anywhere on the Communications bus.
   3. System shall have a digital communicator with phone lines to send alarm status to a central monitoring station. SMS messaging capability is also required.

H. Motion Detectors

1. Corridor/Room Motion Detectors shall be Addressable Wall Mount Motion Detector. 2 Wire Addressable AMB 300.
2. Gym motion detectors to be wall mounted 2 wire addressable detectors. Mounting height to be 10' as per layout and have a wire guard protective cover. Detectors shall be AMD-300
3. Egress Motion Sensors shall be DSC-T.REX Exit Motion Detectors.

I. Door Contacts
1. Door contacts shall be 3/4" concealed for new doors.
2. Surface door contacts shall be screw mount type for existing doors.
3. Overhead garage doors shall have armor cable, surface mount, wide gap type contacts.

J. Alarm Horns
1. Alarm horns shall be dual tone output, tamper proof and weather resistant Amseco Corp.
2. Provide alarm bells in locations as indicated on the Drawings.

K. Supervision
1. Each zone in the system shall be supervised. The base panel and any remote panel with its own AC in put shall be supervised for AC loss. Batteries for the base panel and all remote panels shall be supervised for low power and be short circuit protected. Each addressable device and each wireless input device shall be supervised for its presence. The Combus bus shall be supervised for low voltage and the presence of each enrolled module and keypad. Digital alarm communicators shall be supervised for telephone line trouble and failure to communicate and the system shall report and cellular communication panel trouble.

L. Internal Clock
1. The system clock shall derive its time from the owner's NTP server. Provide all ports accessories and connections required to integrate to the NTP server. Coordinate work with the video contractor installing the NTP server.

M. Relay contacts for Distributed Antenna System (DAS) Monitoring
1. Provide cabling and contact interfaces for up to eight (8) alarm contacts from the radio enhancement system (DAS) in the Main Equipment Room.

2.02 ACCESS CONTROL SYSTEM

A. Access Control
1. Provide web based software, Enterprise Security Management System, that allows access from any internet connection. The system supports the addition of up to 512 card readers. Card access panels shall be mounted above each access controlled door and shall be connected via Ethernet.
2. Provide a rack-mount PC server with system software loaded. (Enterprise System). Mount server in rack that is provided by others. Provide a cable to the IP KVM (KVM provided by others). Provide initial programming per Owner's direction. Provide complete programming, hardware and software required for remote web access to system. This installation and setup shall conform to the owner's IP security scheme for firewalls and virus software. Coordinate with the owner's technology department.
    a. NOTE: A virtual machine on a new infrastructure server will be available to install Access Control software systems with one (1) VM available for this purpose. The PC server requirement is waived provided the contractor successfully implements the system onto this virtual machine, The contractor will be required to provide their own Windows Operating system. The only physical interface permitted is the Ethernet interfaces on the primary hardware.
3. Access control modules shall accept proximity readers, magnetic stripe readers, and 26 bit Wiegand readers.

4. Access control shall allow users to arm/disarm the security system while locking/unlocking the doors from outside the protected space. Users may use a valid card to disarm the system automatically while unlocking the door, to arm the system in combination with the arm pushbutton while locking the door, and to postpone autoarm in combination with the autoarm pushbutton.
5. Provide software and hardware so the system shall be capable of a triple swipe/double tap feature (of Event Access control reader by authorized users) to unlock and secure preprogrammed venues.
    a. Gymnasium Events
    b. Sports Practices
    c. Auditorium/Auditeria Events
    d. Emergency unlock facility-wide exterior doors (for Fire and LEO AHJs)
6. Provide a scheduling application which permits the creation of 255 unique access control door scenarios with unlimited naming and copying of schedule events that trigger one or more door scenarios.
    a. Provide unlimited number of scheduled actions. Expired scheduled actions are removed automatically
7. Provide appropriate length patch cables and pass-through couplers to connect to the horizontal cabling. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2017 National Electrical Code.

B. Card Readers
1. Entrance readers shall be indoor/outdoor with multiple card type ability, compatible with the system. Provide at locations shown on the Drawings. Default Color shall be black.
2. Event access control readers shall be indoor/outdoor with multiple card type ability, compatible with the system. Default Color shall be white.
3. Provide twenty five (25) key chain fobs compatible with the system and readers.

C. Electric door strikes and associated power packs will be provided by others. Voltage shall be 24VDC. The electrical contractor shall connect from the power pack to the access control system.

D. Internal Clock
1. The system clock shall derive its time from the owner's NTP server. Provide all ports, accessories and connections required to integrate to the NTP server. Coordinate work with the Clock System contractor installing the NTP server.

E. Electronic Door Strikes and associated power packs to be provided by others. Voltage shall be 24VDC. Electrical Contractor shall connect from the power pack to the Access Control System.

F. Access control software shall be an integral component of the base software and shall provide the following functions:
1. Capacity for 10,000 cards
2. Unlimited access levels
3. 365 individual daily schedules with 255 events per schedule
4. Holiday scheduling for a two year period. Note: Holiday scheduling applications are not acceptable for use as event scheduling applications.
5. Individual door unlock schedules with automatic daylight saving time adjust for all schedules. Timed unlock/lock schedules shall operate as required by owner.
6. Access software shall have capability of both operating and administering multiple sites
7. Access control system shall be supplied with a windows based badging system for future use.

2.03 NETWORK WIRING

A. Wiring shall conform to manufacturer's recommendations and meet 2023 National Electrical Code and NFPA standards.

B. Provide appropriate length patch cables and pass-through couplers to connect to the horizontal cabling. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2017 National Electrical Code.

PART 3 EXECUTION

3.01 INSTALLATION

A. A complete, satisfactory operating security system shall be installed and tested to ensure proper operation.

B. All wiring inherent to, or used in conjunction with, the access control subsystem, the alarm monitoring subsystem and the system processor shall be in accordance with the National Electrical Code and all local electrical codes governing installation.

C. Manufacturer's representatives shall fully instruct personnel in all phases of equipment operation and maintenance upon completion of installation.

D. The access control system shall be managed by the Access Control Server.

E. The horizontal communications cabling provided will be terminated with field terminable adaptors. Provide patch cables and pass-through couplers if devices do not except field terminable adaptors.

F. Any patch cabling and or pass-through couplers needed for a complete and operational system is the responsibility of this contractor. Patch Cables and pass-through couplers provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color

3.02 PERFORMANCE REQUIREMENTS

A. Security System
   1. In addition to Equipment Specifications this system shall perform to the following Specifications:
      a. All exterior doors equipped with egress motion detectors to exit the building without causing a "Forced Door Alarm. These are typically provided as a part of the door hardware. Coordinate with the door hardware provider for cabling requirements.
      b. All exterior doors shall cause a "Forced Door Alarm" if the door is opened without proper use of an access reader. Doors without readers shall provide a "Forced Door Alarm" in the event it is opened
      c. All Input Points on the security system shall be uniquely identified to the system. The only exception to this rule will be a location where you have a double entrance door. In this location one identification point shall be considered acceptable for these two doors.
      d. The system shall be capable of having points disabled to prevent "Forced Door Alarms" or "Door Ajar Alarms".
      e. The computer network shall be configured to work with Security/Access Control System for remote maintenance and history reports. Provide a web-based system.
      f. Access Control and security system shall have the software capability to be remotely programmed by security contractor.
   2. Due to the nature of this system being for the sole purpose of security, bidder will NOT be allowed to subcontract work. All labor will be performed with the bidders own forces.

Bidder will demonstrate that they are actively in the security business and have service 24 hours a day, 365 days a year. The exception to this Specification shall allow for electrical contractor to subcontract to the security system provider. However; security system provider shall not subcontract any portion of their bid package to Electrical Contractor to another contractor.

B. Access Control
   1. In addition to Equipment Specifications this system shall perform to the following Specifications:
      a. The system shall require the use of an authorized proximity card at entry doors equipped with access readers.
      b. System shall be supplied with multi user client software for scheduling at no additional charge to customer, user access and other major access control. All software must include at least one Full version of each software component.
      c. Access Control and security system shall have the software capability to be remotely programmed by security contractor.
      d. Required Access Groups - Minimum
         1) Administration
         2) Teachers
         3) Custodian
         4) Maintenance
         5) Student
         6) Visitor - Commons
         7) Visitor - All access
         8) Additional groups as required by owner
      e. Implement Triple swipe/double tap feature for event door control
         1) Gymnasium Events
         2) Sports Practices
         3) Auditorium/Auditeria Events
         4) Emergency unlock facility-wide (for Fire and LEO AHJs upon AHJ request)
      f. Due to the nature of this system being for the sole purpose of security, bidder will NOT be allowed to subcontract work. All labor will be performed with the bidders own forces. Bidder will demonstrate that they are actively in the security business and have service 24 hours a day, 365 days a year. The exception to this Specification shall allow for electrical contractor to subcontract to the security system provider. However; security system provider shall not subcontract any portion of their bid package to Electrical Contractor to another contractor.

3.03 TRAINING

A. Provide a total of five (5) hours training for owner's personnel on the operation, programming and maintenance of the system. 1 hour at project turnover/completion,1 hour at 3 months, 1 hour at 6 months, 1 hour at 1 year, 1 hour at 2 years.

B. Manufacturer's representatives shall fully instruct personnel in all phases of equipment operation and maintenance upon completion of installation for at least 8 hours of the required training interval.

C. Provide two (2) video copies of all training.

END OF SECTION

SECTION 28 23 00
CCTV CAMERA SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section shall include all labor, equipment, materials, and services required to furnish and install a complete IP based CCTV security system for the building project. 25063.00 Morgan Township Volunteer Fire Department Building . The equipment shall consist of but not limited to the following:
   1. Fixed Exterior Cameras and all Associated Wiring
   2. IP Interior Cameras
   3. Network Video Recorder
   4. Client Software

B. All work specified here within shall be an IP based system running on building's network, and shall be viewed over the customer's Ethernet system. All exterior cameras to be mounted per drawings on light poles or the building and wiring to these are the responsibility of this contactor.

C. This system must integrate with the Security and Access Control Systems Division 28 1601.

1.02 CODES AND STANDARDS

A. All raceways and wiring shall be installed in accordance with the 2023 National Electrical Code.

B. The system installation shall comply with all other codes and authorities having jurisdiction.

1.03 SUBSTITUTIONS

A. This Specification lists the manufacturers name and catalog numbers of equipment to be provided. All model numbers specified are from the manufacturers below and will be accepted as an equal provided all Specifications are met.
   1. Samsung
   2. Axis Communications/exacq Technologies
   3. Sony
   4. Avigilon

B. CCTV installers intending to use substitutes shall provide a reference list of at least 2 installations within 1 hour ground travel from the project site using the proposed substitute equipment. The reference list shall include a one paragraph narrative of each sites system, as well as the name, address, telephone, and title of contact person and date system was placed into acceptable service by the Owner.

C. Requests for substitution must be accompanied by a matrix of products (from this Specification) and the manufacturer/model of each substituted product with cut sheets so the equality of the substitution(s) may be evaluated. Any product(s) were a substitution request is not made are assumed to be from the approved manufacturers/models with full compatibility with substituted products.

D. It is the contractor’s responsibility to meet the entire intent of these Specifications. Deviations from the specified items shall be at the risk of the bidder until the date of final acceptance by the Architect/Engineer Technology Designer, and Owners representative. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the bidding contractor.

E. For equipment other than that specified, the bidder shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Contractor shall be responsible for all costs incurred for re-submittals due to non-compliance of these Specifications.

F. All equipment must be from one manufacturer to insure complete system compatibility unless otherwise indicated in this Specification.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Technology Kick-Off Meeting: Participate in a technology kick-off meeting at least two (2) weeks prior to the start of the work of this section.
   1. Attendance required
      a. Contractor and contractor's on-site project manager
      b. Related Subcontractors
      c. Garmann/Miller Technology Designer
      d. Construction Manager
      e. Morgan Township Trustees - Technology Coordinator

B. Refer to Division 1 Front-End documents for additional requirements.

1.05 RELATED REQUIREMENTS

1.06 SUBMITTALS

A. Prior to Work Commencement
   1. Shop Drawings - Refer to Section 01 3000 - Administrative Requirements, for submittal procedures. Provide specification sheets for all equipment and components to be installed for approval. Submittals shall be manufacturers printed project data, catalog cuts, and description of any special installation procedures. Provide sample if requested.
   2. Provide list of rack mounted components and mount height in rack units (RUs) so the final rack layout can be coordinated by the Architect/Engineer Technology Designer.
   3. Provide a complete bill of materials with model and part numbers and reference to the Specification paragraph number.

B. Post Construction
   1. Contractor to submit training syllabus to the Architect/Engineer Technology Designer for approval at least 2 weeks prior to commencement of training sessions.
   2. Provide signed (by attendees & trainer) & dated training syllabus for each completed training session to the Architect/Engineer Technology Designer.
   3. Operation & Maintenance Manuals
      a. Provide complete O & Ms. One hard copy and PDF format.
      b. Both formats shall be fully indexed by Section Name/System/Device.
   4. Complete record Drawings indicating the interconnection/location of all equipment, IP and MAC addresses assigned to networked equipment
   5. The Architect/Engineer Technology Designer may require operational demonstration of any products and systems to verify Execution/Installation/Configuration requirements are met.

1.07 WARRANTY

A. Contractor shall guarantee the complete system for a period of three (3) years after date of final acceptance. Contractor shall repair or replace, as approved, any defective part or material, during the guarantee period at no cost to the Owner.

B. All repair and replacement parts shall be new from the manufacturer during the warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Samsung, AXIS Communications/exacq Technologies, Sony, Avigilon

2.02 OUTDOOR 180/270/360 DEGREE DOME CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be ONVIF compliant.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum (180 degree) and 8 megapixel (270/360 degree).

D. The camera shall be equipped with a varifocal lens 2.8mm -10mm minimum range

E. The dome shall use compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

F. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

G. The dome shall be configurable remotely from network digital video recorders and master workstations.

H. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

I. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

J. Museum search feature shall scan hours of video in minutes.

K. MD5 128-bit algorithm video authentication shall ensure data integrity.

L. The LAN interface shall be 1000 Mbps, TCP/IP unicast.

M. Video bandwidth shall be less than 10 Mbps (per video stream), nominal.

N. Adjustment of fps according to network performance capability shall not sacrifice quality.

O. An embedded self-supported OS shall be provided.

P. Provide appropriate wall or pole mount camera enclosures with heater/blower per manufacturer recommendations with mounting brackets (wall, corner, or pole mount as required).

Q. Where cameras require corner mounts; provide Liquid Flexible Metal Conduit (LFMC) conduit from the back box to the camera. See specifications section 26 05 33 for more information.

R. Approved Manufacturers 180 degree cameras:
   1. Samsung/Hanwha Techwin PNM-9084RQZ1
   2. AXIS Communications - AXIS Q3819-PVE
   3. Avigilon Avigilon 9C-H4A-3MH-180 with wall-pendant H4AMH-AD-PEND1
   4. Equal by Sony

S. Approved Manufacturers 270/360 degree cameras:
   1. AXIS P3717-PLE
   2. Samsung/Hanwha Techwin PNM-9084RQZ1
   3. Avigilon Avigilon 9C-H4A-3MH-260 with wall-pendant H4AMH-AD-PEND1
   4. Equal by Sony

2.03 OUTDOOR FIXED CAMERA DOME CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be an ONVIF registered unit.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum.

D. The dome shall use compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

E. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

F. The dome shall be configurable remotely from network digital video recorders and master workstations.

G. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

H. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

I. Museum search feature shall scan hours of video in minutes.

J. MD5 128-bit algorithm video authentication shall ensure data integrity.

K. The LAN interface shall be 100 Mbps, TCP/IP Unicast.

L. Video bandwidth shall be less than 12 Mbps (per video stream), nominal.

M. Adjustment of fps according to network performance capability shall not sacrifice quality.

N. An embedded self-supported OS shall be provided.

O. Alarm inputs shall be individually programmable for their functional state (enabled or disabled), reporting state (report on or off), active state (high or low), acknowledge mode (manual, momentary or automatic), automatic acknowledge dwell time control, set and reset action (action when triggered or reset) and displayed title text. The relay output shall be programmable for its power-on state (on or off), output type (momentary or latching) and displayed title text.

P. Provide appropriate wall or pole mount camera enclosures with heater/blower per manufacturer recommendations with mounting brackets (wall, corner, or pole mount as required). The combined assembly shall have an IK10 vandal resistance (impact) rating.

Q. Approved Manufacturers:
   1. Samsung QNV-7082R
   2. AXIS Communications - P3267-LVE
   3. Avigilon H5A Camera
   4. Equal by Sony

2.04

2.05 MINIATURE FIXED POSITION CAMERA DOMES FOR INDOOR FIXED CAMERAS

A. The IP camera dome shall transmit high quality video across the network for remote viewing and recording. It shall be an ONVIF registered unit.

B. The dome shall have a video transmission rate of 22 fps at 1280 X 800 pixels and capable of up to 30 fps.

C. 4 megapixel minimum.

D. The dome shall use optimized compression based on H.264/MPEG4 that optimizes data and maximizes picture quality.

E. Simultaneous transmission of multiple channel video across the LAN and WAN (Internet) to connected network digital video recorders and master workstations shall be provided.

F. The dome shall be configurable remotely from network digital video recorders and master workstation.

G. Single channel audio for communications and recording shall be provided.
   1. Full time audio recording of every administrative reception area shall be provided in each building capturing and public reception area sound at a minimum. At the Owner's

direction, this audio may be disabled if such recording is in conflict with written Owner privacy policy. Testing of audio recording functionality is still mandatory.
2. Provide cabling and connection to central sound system and provide full time audio recording of announcements.

H. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

I. Museum Search (Smart Search) feature shall scan hours of video in minutes.

J. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.

K. MD5 128-bit algorithm video authentication shall ensure data integrity.

L. The LAN interface shall be 100 Mbps, TCP/IP unicast

M. Video bandwidth shall be less than 12 Mbps (per video stream), nominal.

N. Up to 16 cameras shall be able to be displayed on a remote workstation.

O. Adjustment of fps according to network performance capability shall not sacrifice quality.

P. Control of operation and recording from a macro shall be available.

Q. Levels of user authorization for different functions shall be provided.

R. Remote software updates for the camera dome and the IP version shall be available.

S. Watch dog option shall cause a reboot when system is not responding.

T. Alarm report shall be able to run a response macro. External alarms shall be provided.

U. DHCP support shall be provided.

V. Definition of movement in a specific area (region-of-interest) from a workstation shall available.

W. Video motion detection shall be provided.

X. An embedded self-supported OS shall be provided.

Y. A smoked polycarbonate dome shall be included and all cameras provided must be vandal resistant with an IK10 rating.

Z. Approved Manufacturers:
1. Samsung QNV-7080R
2. AXIS Communications - P3267-LVE
3. Avigilon H4A Dome
4. Equal by Sony

2.06 NVR NETWORK VIDEO RECORDER

A. NVR requirements:
1. Provide sufficient hard drive video storage space for 15 days of recording (50% motion) of ALL cameras at 22 fps using H.264 standard or 30 days of recording (50% motion) at 10 fps using H.264 standard (provide whichever is greater system capacity) plus another 15% in vacant capacity for future expansion. 40 TB minimum.
2. Drive array shall be RAID 5
3. Support ONVIF compliant cameras and fully support ONVIF standards.
4. Rack-mounted
5. DVD/CD drive
6. Provide KVM cabling and connect system to the existing 32 port IP KVM (provided by Data Network Equipment Contractor).
7. NVR system bandwidth - Shall be capable of recording 115% of all cameras simultaneously with 100% motion.

8. Provide one (1) per building.
9. Approved Manufacturers:
    a. Samsung WRR-P-S202W1
    b. Avigilon NVR4 Standard
    c. exacq Technologies - exacqVision Z series IPZ-XXTB-R2-RAID
10. Provide additional NVR units if the quantity of cameras, bandwidth constraints, or manufacturer limitations prevent full implementation of all cameras on technology Drawings and this Specification.

2.07 IP SOFTWARE PACKAGE

A. The digital video recording and management network software shall meet the requirements of business and government surveillance applications. The software shall power a line of digital video recorders, servers and workstations. The software shall be available on CD-R format and provide a complete and comprehensive application for the operation and maintenance of the video surveillance system. It shall provide full live digital video and audio surveillance over a standard 1000Base-T network by the use of a GUI incorporating video display areas, toolbars, control palettes, and site/device trees.

B. The software shall also be preloaded in the network video recorder and security workstation. This workstation shall be a preconfigured state-of-the-art PC ready to review and record video over the LAN and WAN (Internet), with proper registration.

C. The software shall offer network connectivity to other family components that share all video and control data over the Ethernet network. The number of network-connected components is only limited to the number of assigned IP addresses.

D. Provide at a minimum one full version of the software for each building. Lite software versions may be used in other monitoring locations provided Specifications are met.

E. The software, without any degradation to video quality, shall simultaneously offer:
    1. 16-Channel continuous video playback.
    2. 16-Channel video playback transmission to the Ethernet network.
    3. User selectable video archiving of pre-existing recording.

F. The operating system of the software shall be Microsoft Windows 10 Professional or the newest supported Windows Operating System and including any operating system required licensing (streaming, etc).

G. Network Setup: Standard network protocol type using IP addressing scheme.

H. Site Authorization: Workstation can be setup using remote recorder or workstation GUI. Site name and authorization can be established by user and group. Permissions can be assigned for all system functions.

I. Macro Create & Edit: System macros can be added, edited, and deleted using the recorder’s cameras and detectors. In addition, within macros, alarms can be sent and remote macros run.

J. Alarm Setup: Recorder alarms can be established by adding detectors and configuring motion detection on video. The triggering of the recorder’s detectors is used to send alarms to remote units. In addition, detectors can be edited and deleted.

K. Device Settings: The system’s cameras, microphones and sensors can be named.

L. Authentication: The video from the recorder’s cameras can be enabled to view the Authentication status symbol (A) on the displayed video.

M. The software shall employ a compression algorithm based on:
    1. H.264 High Definition encoding.
    2. User selectable resolution (quality) not requiring a need to restart the application or the digital video recorder. It shall be selectable using a 4-position bar, from the Main Screen.

There shall be 4 levels of resolution (Frame, Field, CIF, and HCIF) with 2 levels of compression (Normal, Full) comprising 8 quality levels total, which shall be accessible from the Setup menu selections.

N. The networked system shall be comprised of:
   1. The software platform
   2. Recorders
   3. Workstations
   4. Access Control and Security System - Coordinate with Access Control Contractor.

O. The software installed in both recorders and workstations shall be similar in:
   1. Graphical User Interface, therefore an operator shall need to learn only one interface for both control and programming of the system.
   2. Functions, offering the ability to remotely configure most system components from any recorder or workstation.

P. The software shall offer features including the simultaneous display, playback, distribution and archive of multiple channel video and audio. It shall collect multiple channels of analog video and digitize them for the purpose of display, archive and requested distribution across the Ethernet network. Cameras, microphones and sensors shall be the primary analog input devices. Each channel of video and audio data shall have the capability of being displayed, played back, distributed and archived simultaneously across several servers and clients across the network. Each sensor channel shall support a NO or NC device. The software shall also have full WAN and Internet capability, offering expandability beyond a corporate LAN.
   1. The software shall allow for remote PC access via a high-speed Internet connection. Contractor shall assist the Owner in setting up remote access.
   2. Approved Manufacturers:
      a. Samsung - Wisenet Wave - - Full version plus lite versions as required.
      b. Avigilon ACC 7 Server Software
      c. exacq Technologies-exacqVision - - Full version plus lite versions as required.

2.08 ACCESSORIES

A. Equipment shall be installed in a locking floor mounted rack supplied by others Refer to layout for specific locations.

B. Unlimited Remote User Software for Viewing and Playback.

C. Provide appropriate length patch cables to connect system components to the network equipment in telecommunications spaces. Patch Cables provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide plenum rated jacket when when required by the 2023 National Electrical Code.

D. Provide appropriate length patch cables to connect the camera to the horizontal cabling at the camera locations. Patch Cables provided shall be channel approved or component certified to match the existing horizontal cabling channel category with a yellow jacket color. Coordinate channel manufacturer with the electrical contractor or section 27 1513 cabling contractor. Provide **plenum** rated jacket when when required by the 2017 National Electrical Code.

PART 3 INSTALLATION

3.01 INSTALLATION

A. All cameras are to be set to record on motion unless noted otherwise.

B. The contractor's commencement of equipment installation indicates acceptance of the telecommunications infrastructure and conditions.

C. No fiber optic cable shall be connected to a patch cable or other device without a prior inspection by an IEC 61300-3-35 compliant indirect microscope and obtain a passing test result.

D. The entire system shall be installed in a workmanlike manner and in accordance with approved manufacturers wiring diagrams. The Contractor shall furnish all conduit, wiring, and outlet boxes, relays transformers junction boxes, receptacles, cabinets and similar devices necessary for the complete installation. All wiring shall be type recommended by the manufacturer. Install head-end equipment in racks with all interconnecting wiring as required.

E. All penetration of floor slabs and firewalls shall fire stopped in accordance with all local fire codes.

F. All wiring shall meet the 2023 National Electrical Code standards. All camera system related patch cables shall be yellow in color and be channel approved.

G. The horizontal cabling provided will be terminated with 8P8C modular jacks mounted in surface mount boxes at the camera locations. Provide patch cables of the same color and category to connect to the horizontal cabling.

H. Field quality control: The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the functions as specified.

I. Power requirements determined by actual equipment used.

J. Provide required power outlets, interconnecting cables, hardware and equipment for a complete and operable system.

K. Power is PoE only.

L. Each cable shall be individually home run from the device to the control room.

M. Install cameras in the general vicinity of locations indicated on Drawings at final locations defined by camera location test.

N. Wiring for all head end devices (matrix switcher, digital recorder, etc.) shall be Velcro strapped so that all connectors in a bundle can be removed and re-installed without the possibility of cross connecting.

O. All device mounting shall be of a mechanically secure permanent nature. Double-sided foam tape shall not be used to secure any terminal boxes, relay bases or circuit boards, etc.

P. All excess length AC cords are to be tied out of the way with Velcro straps (neutral color)

Q. Cable ties to be trimmed with flush-cut type pliers to avoid sharp edges (outdoor use only).

R. All rack-mounted equipment and blank panels are to be installed using the black nylon washers provided with the mounting screws.

S. Exposed wires that run to wall mounted cameras will be tie-wrapped (outdoor) or Velcro strapped (indoor) to the mount or fed through the tubing mount to present a neat appearance.

T. System time shall be synchronized with the Owner's designated NTP server(s).

3.02 TESTING

A. Provide demonstration of the system for the Owner and Architect/Engineer Technology Designer for the following:
   1. Count of installed cameras - verify video on each camera
   2. Ability to generate copies of video captured 15 days prior to test into file form and secure disk (with viewer application)
   3. Reception area audio & video monitoring demonstration.
   4. Demonstrate reception area audio file capture playback from 1 day and 15 days prior to test.

3.03 TRAINING

A. Training to be arranged with District personnel. 4 hours should be spread out over the length of the warranty.
   1. 1 hour at project turnover/completion, 1 hour at 3 months, 1 hour at 6 months, 1 hour at 1 year point.

B. Refer to Submittal section of this Specification for training syllabus requirements.

C. Provide two (2) video copies of all training.

3.04 QUANTITY

A. Provide cameras as indicated on the Drawings and where noted in this Specification.

B. Provide outdoor cameras per technology Drawings.

END OF SECTION