



**Rochester Community Schools**  
**Purchasing Department**

## **Request for Proposal**

---

Date:	February 10, 2022	Project:	Structured Cabling
Project Number:	22.15		

---

Response Due Date and Time:	February 25 at 2:00 p.m. Local Time
Submit Response to:	All proposals, required forms, and pricing shall be submitted electronically on BidNet Direct ( <a href="https://www.bidnetdirect.com">https://www.bidnetdirect.com</a> )
Submit Questions to:	Requests for clarification shall be submitted through BidNet Direct and all responses will be released as addendum within the online posting.
Description of Procurement:	Structured Cabling

---

Estimated Project Timeline:

Notice of Advertisement in Local Newspaper:	February 10, 2022
Release of RFP:	February 10, 2022
Mandatory Site Walk-through and Pre-Bid Meeting:	Monday, February 14, 2022 at 2:00 p.m. Local Time located at 52585 Dequindre Road, Rochester, MI 48307
Online Requests for Clarification Deadline:	February 16, 2022 at 12:00 p.m. Local Time
Release of Addenda with RFC Answers:	February 17, 2022
Bid Due Date:	February 25, 2022 at 2:00 p.m. Local Time
Bid Opening and Public Reading:	February 25 at 2:00 p.m. Local Time located at 501 West University Drive, Rochester, MI 48307
Anticipated Board of Education Bid Award:	March 14, 2022
Project Completion Date:	August 31, 2022

---

→Notice: The right to modify the project timeline is held by Rochester Community Schools in absolute discretion.

---

Objective:

Rochester Community Schools, known herein as "Owner", seeks proposals from qualified firms to establish a contract for the procurement of structured cabling at the Administration Center located at 52585 Dequindre Road in Rochester, Michigan.

A complete list of project specifications is given in Attachment B – Project Specifications.

## Table of Contents

Information to Bidders.....	4
Overview .....	4
Project Purpose and Expectations.....	4
Timeline.....	4
Scope of Services.....	4
Selection Process and Owner’s Rights.....	5
Award of Contract.....	5
Bid Due Date and Proposal Submission Requirements: .....	5
Qualification of Bidder.....	5
Sole Bidder.....	6
Addenda .....	6
Unit Pricing .....	6
Bid Bond.....	6
Sales Tax.....	7
Method of Ordering .....	7
Payment .....	7
Familial Relationship Disclosure.....	7
Iran Economic Sanctions Act .....	7
Withdrawal or Revision of Bid Proposals.....	7
Acceptance and Rejection of Bid Proposals.....	7
Post-Bid Information .....	8
Bid Proposal Form.....	9
Name of Bidder .....	9
Agreements .....	9
Addenda .....	9
Legal Status of Bidder .....	10
References .....	10
Base Bid .....	11
BREAKOUT PRICING: .....	11
UNIT PRICING: .....	11
MANDATORY ALTERNATES.....	12

VOLUNTARY ALTERNATES .....	12
Additional Labor Charges.....	13
FAMILIAL DISCLOSURE AFFIDAVIT OF BIDDER .....	14
Certification of Compliance – IRAN ECONOMIC SANCTIONS ACT .....	15
Attachment A: Drawings .....	16
Attachment B: Project Specifications.....	17
PART 1 – GENERAL .....	17
PART 2 – PRODUCTS .....	23
PART 3 – EXECUTION.....	28

## Information to Bidders

### Overview

Rochester Community Schools, known herein as "Owner", seeks proposals from qualified firms to establish a contract to address all labor, materials, equipment and services of every kind necessary for the proper installation of data cabling as indicated in the Scope of Services section herein.

### Project Purpose and Expectations

Rochester Community Schools' Administration Center is relocating and seeks to solicit bids to meet the current and projected needs to outfit data cabling throughout the new location.

### Timeline

The expected timeline is as follows:

#### Estimated Project Timeline:

Notice of Advertisement in Local Newspaper:	February 10, 2022
Release of RFP:	February 10, 2022
Mandatory Site Walk-through and Pre-Bid Meeting:	Monday, February 14, 2022 at 2:00 p.m. Local Time located at 52585 Dequindre Road, Rochester, MI 48307
Online Requests for Clarification Deadline:	February 16, 2022 at 12:00 p.m. Local Time
Release of Addenda with RFC Answers:	February 17, 2022
Bid Due Date:	February 25, 2022 at 2:00 p.m. Local Time
Bid Opening and Public Reading:	February 25 at 2:00 p.m. Local Time located at 501 West University Drive, Rochester, MI 48307
Anticipated Board of Education Bid Award:	March 14, 2022
Project Completion Date:	August 31, 2022

### Scope of Services

1. Provide and install cabling as indicated on the attached as-built documentation in Attachment A.
2. Contractor is responsible for removing and replacing all ceiling tiles.
3. Contractor must first install cabling, then return and terminate cables inside pathways within new furniture.
  - 3.1. This may result in three total visits:
    - 3.1.1. Storage rack setup in computer room.
    - 3.1.2. Run cabling to offices and columns/pillars/floor boxes (terminate and test all locations).
    - 3.1.3. Run cabling through workstation furniture (terminate and test all locations).
4. All cables that are terminated in the ceilings must have the location identified by using tape or an identifying label.
5. Any low voltage wall boxes that don't have a cable installed must have a blank cover installed.

- 5.1. Contractor will have to review workstation furniture specs and provide a box that works with this furniture and the knock out opening. (ICC Furniture Model IC107FMS is an example solution, to include blank fill-in inserts for unneeded face plate openings.)
6. Any low voltage cabling that passes through a fire rated wall must have firestop compound installed in the conduit opening.
7. All cables must have a naming convention that has been approved by RCS.
8. Documentation must include data cabling pathways and have drop identifying labels included. Furnish electronic record of all structured cable drawings, in software and format selected by Owner.

### Selection Process and Owner's Rights

The Owner reserves the following:

1. To reject any or all bids without compensation to the bidders and to waive any or all variances, irregularities, or informalities in the bid package.
2. In the event that all acceptable bids exceed the owner's budget, the Owner reserves the right to negotiate a contract with the lowest and best acceptable bidder or any other one of the acceptable bidders.

### Award of Contract

Project is expected to be approved by the Rochester Community Schools Board of Education on March 14, 2022. Please note the project will not necessarily be awarded to the lowest bidder or lowest price. Rochester Community Schools reserves to award the project to the most qualified bidder based on the criteria noted.

### Bid Due Date and Proposal Submission Requirements:

1. All proposals, required forms, and pricing shall be submitted electronically on BidNet Direct (<https://www.bidnetdirect.com>) **no later than 2:00 p.m., local time, February 25, 2022** (the "Due Date".) No oral, telephonic, or facsimile proposals will be considered.
2. RCS will not consider or accept any late Bids received after the Due Date specified within the RFP. It is the sole responsibility of the Bidder to ensure their proposal is entered completely and forms are uploaded on BidNet Direct before the closing date and hour indicated within the RFP. Bidders shall plan ample time to respond to all requirements and input all requirements. RCS is not responsible for any delivery delays.

### Qualification of Bidder

1. The Owner reserves the right to request qualification information from any bidder before issuing documents, receiving bids or awarding a contract. The Owner may, at its sole discretion, accept or reject bidders as qualified. The right to waive any informalities in qualification materials is reserved by the Owner. The Bidder, in submitting his/her bid, agrees to accept the decision of the Owner as final.
2. The submitters shall provide full disclosure of all existing client relationships that currently or prospectively may give rise to conflicts of interest and disqualification as governed by the codes of rules of professional responsibility and conduct.

### Sole Bidder

1. It is the Owner's intent that this Request for proposals, permits competition. It shall be the bidder's responsibility to advise the Owner, in writing, if any language, requirements, scope specifications, etc., or any combinations thereof, inadvertently restricts or limits the requirements stated in this Proposal, to a single source. Owner shall receive such notification no later than five (5) days prior to the date set for acceptance of bids.
2. If only one bid is received in response to this invitation to bid, a cost/price analysis and evaluation and/or audit shall be performed of the cost proposal in order to determine if the price is fair and reasonable.
3. The Owner reserves the right to cancel the bid, or reschedule the bid opening, if there is only one bid received. The decision by the Owner will be final.

### Addenda

1. Each bidder shall ascertain prior to submitting their bid that they have received all addenda issued.
2. Addenda notices will be sent to all who are known by the Owner to have a set of contract documents. Copies of addenda will be made available for inspection wherever contract documents are on file for that purpose.

### Unit Pricing

1. Each bidder must include in proposal pricing inclusive of the specifications detailed in Attachment B.
2. Bids are considered irregular and may be rejected if unit prices contained in the bid proposal are obviously unbalanced either in excess of, or below, reasonable cost analysis values.
3. Any unit price that, in the sole opinion of the Owner, is unbalanced or excessive may be rejected without effecting the validity of the bid or other unit prices. An entire bid may be rejected if, in the sole opinion of the Owner, rejection of individual unit prices materially affects the bid.

### Bid Bond

1. Bid Bond: Bidders must submit with its Bid, bid security in the form of a Bid Bond issued by a qualified surety or certified check in an amount of five percent (5%) of the Bid ("Bid Security"). Failure to include this Bid Security with Bidder's Bid will result in the rejection of your Bid. If a Bid Bond is posted by a Bidder, it shall be from a Treasury Surety licensed to do business in the State of Michigan, and the attorney-in-fact who executes the Bid Bond on behalf of the Bidder shall attach a certified, current copy of its power of attorney. In the event a certified check is submitted, it shall be made payable to "Rochester Community Schools" The School District shall not be liable for any interest earned thereon. The Bid Security shall be forfeited as liquidated damages, and not as a penalty, if the Bidder withdraws its Bid after the Due Date for submission of Bids or, upon acceptance of its Bid by the School District, Bidder fails to execute the form of Contract acceptable to the School District, substantially evidencing and incorporating this RFP and its Bid and fails to provide the required Performance Bond and/or Payment

Bond, if any, and the required insurance certificates, within fifteen (15) days of an award of a Contract to the Bidder.

2. The proposed bonding company of the bidder shall be acceptable to the Owner. The Owner shall be listed as obligated on the bond.

### Sales Tax

1. Owner is exempt from all taxes. A tax exemption certificate will be issued upon request.

### Method of Ordering

1. Issuance of a written purchase order by the Purchasing Department is the method of ordering product or services. All vendor invoices and packing/delivery tickets must include the purchase order number.

### Payment

1. Payment to be made from Vendor's invoice, and a copy of the signed delivery invoices, submitted to cover items received and accepted during the billing period. Invoices must contain the bid number under which the contract is awarded.
2. Pricing shall be F.O.B. delivered to RCS at 52585 Dequindre Road, Rochester MI 48307, unloaded, and installed.

### Familial Relationship Disclosure

1. All bidders shall provide familial disclosure in compliance with MCL 380.1267 and attach this information to the bid proposal. The bid proposal shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the bidder or any employee of the bidder, and any member of the Board of Education of the school district, or the Superintendent of the school district. The District will not consider a bid proposal that does not include this sworn and notarized statement.

### Iran Economic Sanctions Act

1. Each bid must be accompanied by a sworn and notarized statement certifying that the Contractor is not an "Iran linked business" within the meaning of the Iran Economic Sanctions Act.

### Withdrawal or Revision of Bid Proposals

1. A bid may not be modified, withdrawn or cancelled by the bidder for ninety (90) calendar days following the time and date designated for the opening of bids, and bidder so agrees in submitting his/her bid.

### Acceptance and Rejection of Bid Proposals

1. Low bid price is not always the determining factor in the awarding of the bid. Other factors considered may include, but not be limited to, the following: delivery and/or completion time, judged quality of product, past performance, inventory availability, financial stability, and references.
2. The Owner shall have the right to waive any informality or irregularity in any bid received and to accept bids which, in their judgment, are in their own best interest.

3. The Owner shall have the right to accept or reject alternates in any order or combination and to determine the apparent low bidder on this basis.

**Post-Bid Information**

1. After the bids are received, tabulated, and evaluated by the Owner, the apparent lowest qualified bidder(s) shall meet with the Owner at a post-bid meeting if requested by Owner.
2. The Owner reserves the right to request additional information from bidders for evaluation criteria as needed.



## Bid Proposal Form

### Name of Bidder

Firm Name:	
Address:	
Telephone:	Fax:

### Agreements

The undersigned understands that the Owner reserves the right to reject any and all bids and to waive informalities and irregularities in bidding.

Owner also reserves the right to withhold bids for a period of time (90 days) from bid closing date.

The Owner reserves the right to accept or reject any or all Bids in whole or in part, or to waive any informalities therein. If in the Owner opinion it is in their best interest, the contract may be awarded to other than the lowest bidder, for reason of establishing uniformity, delivery time, etc.

If award is made to us under this proposal, we agree to enter into an Agreement with Rochester Community Schools to furnish products and/or services, in strict accordance with this proposal, bid documents and all pertinent portions of plans, drawings and specifications.

### Addenda

The undersigned acknowledges receipt of the following addenda:

Addendum Number:	Dated:
Addendum Number:	Dated:
Addendum Number:	Dated:

My signature certifies that the proposal as submitted complies with all Terms and Conditions as set forth in this RFP.

My signature also certifies that the accompanying proposal is not the result of, or affected by, any unlawful act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud. Furthermore, I understand that fraud and unlawful collusion are crimes under Federal Law, and can result in fines, prison sentences, and civil damage awards.

My signature also certifies that this firm has no business or personal relationships with any other companies or persons that could be considered as a conflict of interest or potential conflict of interest to Rochester Community Schools, and that there are no principals, officers, agents, employees, or representatives of this firm that have any business or personal relationships with any other companies or persons that could be considered as a conflict of interest or a potential conflict of interest to Rochester Community Schools, pertaining to any and all work or services to be performed as a result of this request and any resulting contract with Rochester Community Schools.

I hereby certify that I am authorized to sign as a Representative for the Firm:

#### Legal Status of Bidder

1. A Corporation organized and existing under the laws of the State of \_\_\_\_\_.
2. Name, title, and signature of individual duly authorized to execute contracts:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Signature: \_\_\_\_\_

#### References

Include (or attach) the names of three references to your bid, preferably school districts.

NAME OF DISTRICT: \_\_\_\_\_

CONTACT PERSON: \_\_\_\_\_ PHONE NO: \_\_\_\_\_

NAME OF DISTRICT: \_\_\_\_\_

CONTACT PERSON: \_\_\_\_\_ PHONE NO: \_\_\_\_\_

NAME OF DISTRICT: \_\_\_\_\_

CONTACT PERSON: \_\_\_\_\_ PHONE NO: \_\_\_\_\_

**Base Bid**

**BASE BID:** Bid to furnish all labor, material, equipment and services necessary to complete the Bid **Structured Cabling** project in accordance with the Base Bid Category descriptions, including all addenda, for the amount as follows:

<b>TOTAL (BASE BID)</b>	<div style="text-align: right;">\$ _____</div> <div style="text-align: right;">_____ Dollars</div>
-------------------------	--

\*Prices are not to include any state or local taxes.

**BREAKOUT PRICING:**

Please provide base bid breakout pricing as follows:

	Labor	Material	Cost
Category 6 Cabling	\$	\$	\$
Category 6A Cabling	\$	\$	\$
Fiber Cabling	\$	\$	\$
<b>Sub-total</b>	\$	\$	\$

**UNIT PRICING:**

Please provide unit pricing information. These unit costs, which shall be considered firm pricing during the contract period and not subject to change, will be used to determine costs (inclusive of all labor and material) for additions and deletions during the contract period. The Owner reserves the right to adjust any or all quantities at any time:

	Item	Labor	Material	Unit Price
UP1	Category 6 UTP drop, terminated and tested	\$	\$	\$
UP2	Category 6A UTP drop, terminated and tested	\$	\$	\$

UP3	Category 6 UTP 2 drops to a single location, terminated and tested	\$	\$	\$
UP4	Category 6 UTP 3 drops to a single location, terminated and tested	\$	\$	\$
UP5	Category 6 UTP 4 drops to a single location, terminated and tested	\$	\$	\$
UP6	Relocate existing Category 6 UTP drop, terminate and test	\$	\$	\$
UP7	Relocate existing Category 6a UTP drop, terminate and test	\$	\$	\$
UP8	24-port Category 6 patch panel	\$	\$	\$
UP9	24-port Category 6A patch panel	\$	\$	\$
UP10		\$	\$	\$
UP11		\$	\$	\$

### MANDATORY ALTERNATES

**Mandatory Alternate 1:** Will you hold and honor the unit pricing within your response through September 1, 2023?

Yes ☐ No ☐

**Mandatory Alternate 1:** \$\_\_\_\_\_

**Mandatory Alternate 2:** \$\_\_\_\_\_

### VOLUNTARY ALTERNATES

Whenever any material or equipment is specified by patent or proprietary name or by the name of the manufacturer, such specification shall be considered as if followed by the words "or acceptable equal". The Bidder may offer material or equipment with equal or better qualities and performance in substitution for those specified which it considers would be in the Owner's interest to accept. The Bidder shall include sufficient specification data that will, together with any other data the Owner may require, enable the Owner to assess the acceptability of the material or equipment.

Voluntary Alternates:

\$ \_\_\_\_\_

\_\_\_\_\_ Dollars

Description of Voluntary Alternate:

\_\_\_\_\_  
\_\_\_\_\_

### Additional Labor Charges

(List if any...)

After hours labor: \_\_\_\_\_ Holidays: \_\_\_\_\_

Weekends: \_\_\_\_\_ Other: \_\_\_\_\_

## FAMILIAL DISCLOSURE AFFIDAVIT OF BIDDER

The undersigned, owner or authorized officer of \_\_\_\_\_ (the bidder/contractor), pursuant to the familial disclosure requirement provided in the Request for Proposals, hereby represent and warrant, except as provided below, that no familial relationships exist between the bidder/contractor or any employee of the bidder/contractor, and any member of Rochester Community Schools Board of Education, the Superintendent and/or any Rochester Community Schools Administrator.

☐ The following are the bidder's familial relationship(s) with Rochester Community Schools:

Bidder/Contractor Employee Name Related to:

1 \_\_\_\_\_

2 \_\_\_\_\_

(Attach additional pages if necessary to disclose all familial relationships.)

☐ There is no familial relationship that exists between the bidder/contractor and/or any employee of the bidder and any member of the Rochester Community Schools Board of Education, Superintendent, or Administration.

Bidder: (Company Name)

By:

(Signature)

(Title)

\_\_\_\_\_  
This instrument was acknowledged before me, a Notary Public, in and for \_\_\_\_\_ County,  
\_\_\_\_\_ on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_ SS:

(Notary Public Signature)

My Commission expires: \_\_\_\_\_

Acting in the County of: \_\_\_\_\_

**Certification of Compliance – IRAN ECONOMIC SANCTIONS ACT**  
(MICHIGAN PUBLIC ACT NO. 517 OF 2012)

The undersigned, the owner or authorized officer of the Below named Bidder (the "Bidder"), pursuant to the compliance certification requirement provided in the Rochester Community Schools' (the "School District") Request for Bid, hereby certifies, represents and warrants that the Bidder (Including its officers, directors and employees) is not an "Iran linked business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event Bidder is awarded a contract as a result of the aforementioned RFB, the Bidder will not become an "Iran linked business" at any time during the course of performing the Work or any service under the contract.

The Bidder further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more the \$250,000.00 or 2 times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the School District's investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for bid for three (3) years from the date that it is determined that the person has submitted the false certification.

\_\_\_\_\_  
Name of Company

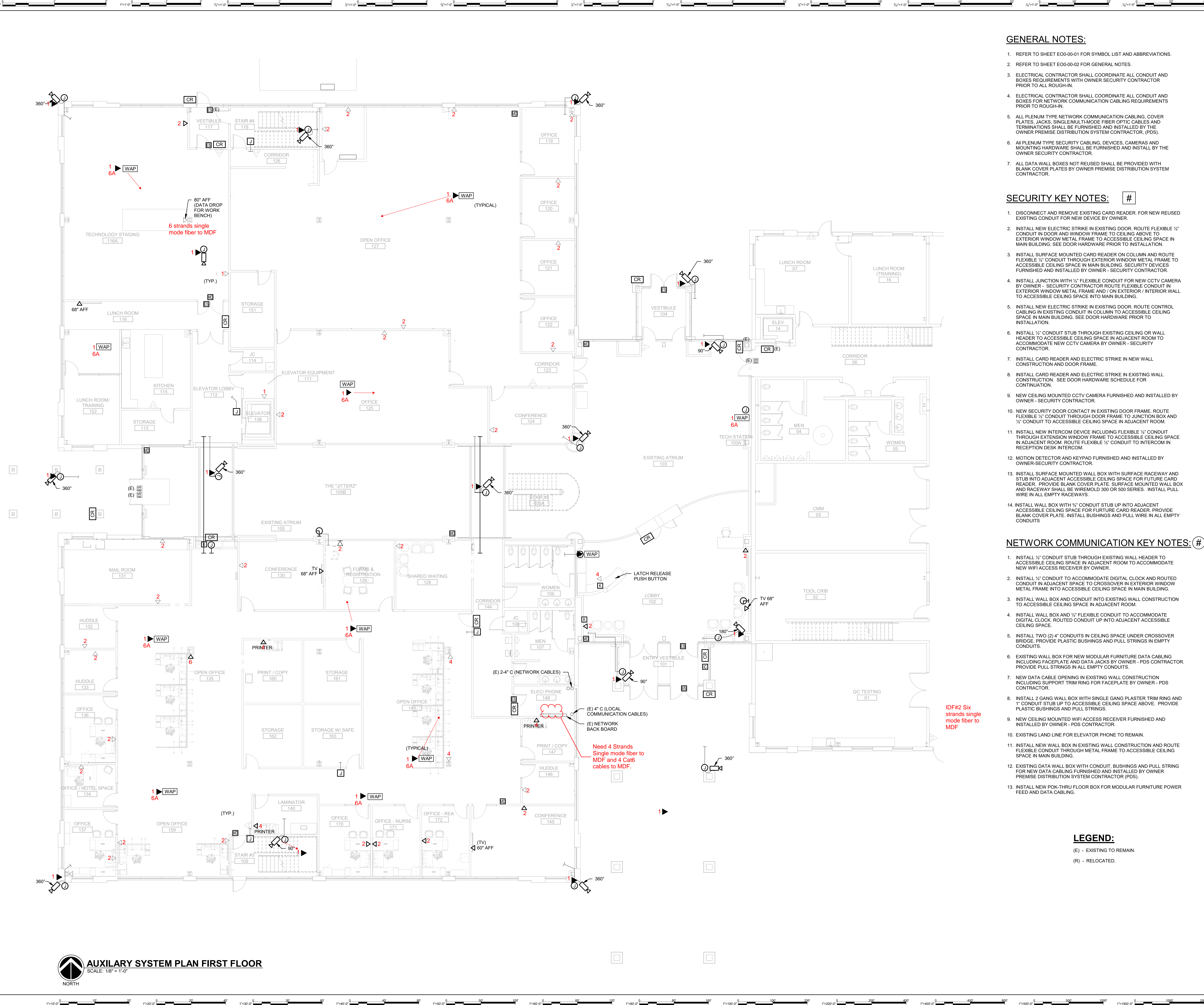
\_\_\_\_\_  
Name and Title of Authorized Representative

\_\_\_\_\_  
Signature

## Attachment A: Drawings



GHAFARI ASSOCIATES © 2020 1/17/2022 5:10:50 PM



GENERAL NOTES:

- 1. REFER TO SHEET E00-00-01 FOR SYMBOL LIST AND ABBREVIATIONS.
- 2. REFER TO SHEET E00-00-02 FOR GENERAL NOTES.
- 3. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL CONDUIT AND BOXES REQUIREMENTS WITH OWNER SECURITY CONTRACTOR PRIOR TO ALL ROUGH-IN.
- 4. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL CONDUIT AND BOXES FOR NETWORK COMMUNICATION CABLEING REQUIREMENTS PRIOR TO ROUGH-IN.
- 5. ALL PLENUM TYPE NETWORK COMMUNICATION CABLEING, COVER PLATES, JACKS, SINGLE/MULTI-MODE FIBER OPTIC CABLES AND TERMINATIONS SHALL BE FURNISHED AND INSTALLED BY THE OWNER PREMISE DISTRIBUTION SYSTEM CONTRACTOR (PDS).
- 6. ALL PLENUM TYPE SECURITY CABLEING, DEVICES, CAMERAS AND MOUNTING HARDWARE SHALL BE FURNISHED AND INSTALL BY THE OWNER SECURITY CONTRACTOR.
- 7. ALL DATA WALL BOXES NOT REUSED SHALL BE PROVIDED WITH BLANK COVER PLATES BY OWNER PREMISE DISTRIBUTION SYSTEM CONTRACTOR.

SECURITY KEY NOTES: #

- 1. DISCONNECT AND REMOVE EXISTING CARD READER. FOR NEW REUSED EXISTING CONDUIT FOR NEW DEVICE BY OWNER.
- 2. INSTALL NEW ELECTRIC STRIKE IN EXISTING DOOR. ROUTE FLEXIBLE 1/2" CONDUIT IN DOOR AND WINDOW FRAME TO CEILING ABOVE TO EXTERIOR WINDOW METAL FRAME TO ACCESSIBLE CEILING SPACE IN MAIN BUILDING. SEE DOOR HARDWARE PRIOR TO INSTALLATION.
- 3. INSTALL SURFACE MOUNTED CARD READER ON COLUMN AND ROUTE FLEXIBLE 1/2" CONDUIT THROUGH EXTERIOR WINDOW METAL FRAME TO ACCESSIBLE CEILING SPACE IN MAIN BUILDING. SECURITY DEVICES FURNISHED AND INSTALLED BY OWNER - SECURITY CONTRACTOR.
- 4. INSTALL JUNCTION WITH 1/2" FLEXIBLE CONDUIT FOR NEW CCTV CAMERA BY OWNER - SECURITY CONTRACTOR ROUTE FLEXIBLE CONDUIT IN EXTERIOR WINDOW METAL FRAME AND / ON EXTERIOR / INTERIOR WALL TO ACCESSIBLE CEILING SPACE INTO MAIN BUILDING.
- 5. INSTALL NEW ELECTRIC STRIKE IN EXISTING DOOR. ROUTE CONTROL CABLEING IN EXISTING CONDUIT IN COLUMN TO ACCESSIBLE CEILING SPACE IN MAIN BUILDING. SEE DOOR HARDWARE PRIOR TO INSTALLATION.
- 6. INSTALL 1/2" CONDUIT STUB THROUGH EXISTING CEILING OR WALL HEADER TO ACCESSIBLE CEILING SPACE IN ADJACENT ROOM TO ACCOMMODATE NEW CCTV CAMERA BY OWNER - SECURITY CONTRACTOR.
- 7. INSTALL CARD READER AND ELECTRIC STRIKE IN NEW WALL CONSTRUCTION AND DOOR FRAME.
- 8. INSTALL CARD READER AND ELECTRIC STRIKE IN EXISTING WALL CONSTRUCTION. SEE DOOR HARDWARE SCHEDULE FOR CONTINUATION.
- 9. NEW CEILING MOUNTED CCTV CAMERA FURNISHED AND INSTALLED BY OWNER - SECURITY CONTRACTOR.
- 10. NEW SECURITY DOOR CONTACT IN EXISTING DOOR FRAME. ROUTE FLEXIBLE 1/2" CONDUIT THROUGH DOOR FRAME TO JUNCTION BOX AND 1/2" CONDUIT TO ACCESSIBLE CEILING SPACE IN ADJACENT ROOM.
- 11. INSTALL NEW INTERCOM DEVICE INCLUDING FLEXIBLE 1/2" CONDUIT THROUGH EXTENSION WINDOW FRAME TO ACCESSIBLE CEILING SPACE IN ADJACENT ROOM. ROUTE FLEXIBLE 1/2" CONDUIT TO INTERCOM IN RECEPTION DESK INTERCOM.
- 12. MOTION DETECTOR AND KEYPAD FURNISHED AND INSTALLED BY OWNER-SECURITY CONTRACTOR.
- 13. INSTALL SURFACE MOUNTED WALL BOX WITH SURFACE RACEWAY AND STUB INTO ADJACENT ACCESSIBLE CEILING SPACE FOR FUTURE CARD READER. PROVIDE BLANK COVER PLATE. SURFACE MOUNTED WALL BOX AND RACEWAY SHALL BE WIREMOLD 300 OR 500 SERIES. INSTALL PULL WIRE IN ALL EMPTY RACEWAYS.
- 14. INSTALL WALL BOX WITH 1/2" CONDUIT STUB UP INTO ADJACENT ACCESSIBLE CEILING SPACE FOR FUTURE CARD READER. PROVIDE BLANK COVER PLATE. INSTALL BUSHINGS AND PULL WIRE IN ALL EMPTY CONDUITS

NETWORK COMMUNICATION KEY NOTES: #

- 1. INSTALL 1/2" CONDUIT STUB THROUGH EXISTING WALL HEADER TO ACCESSIBLE CEILING SPACE IN ADJACENT ROOM TO ACCOMMODATE NEW WIFI ACCESS RECEIVER BY OWNER.
- 2. INSTALL 1/2" CONDUIT TO ACCOMMODATE DIGITAL CLOCK AND ROUTED CONDUIT IN ADJACENT SPACE TO CROSSOVER IN EXTERIOR WINDOW METAL FRAME INTO ACCESSIBLE CEILING SPACE IN MAIN BUILDING.
- 3. INSTALL WALL BOX AND CONDUIT INTO EXISTING WALL CONSTRUCTION TO ACCESSIBLE CEILING SPACE IN ADJACENT ROOM.
- 4. INSTALL WALL BOX AND 1/2" FLEXIBLE CONDUIT TO ACCOMMODATE DIGITAL CLOCK. ROUTED CONDUIT UP INTO ADJACENT ACCESSIBLE CEILING SPACE.
- 5. INSTALL TWO (2) 4" CONDUITS IN CEILING SPACE UNDER CROSSOVER BRIDGE. PROVIDE PLASTIC BUSHINGS AND PULL STRINGS IN EMPTY CONDUITS.
- 6. EXISTING WALL BOX FOR NEW MODULAR FURNITURE DATA CABLEING INCLUDING FACEPLATE AND DATA JACKS BY OWNER - PDS CONTRACTOR. PROVIDE PULL STRINGS IN ALL EMPTY CONDUITS.
- 7. NEW DATA CABLE OPENING IN EXISTING WALL CONSTRUCTION INCLUDING SUPPORT TRIM RING FOR FACEPLATE BY OWNER - PDS CONTRACTOR.
- 8. INSTALL 2 GANG WALL BOX WITH SINGLE GANG PLASTER TRIM RING AND 1" CONDUIT STUB UP TO ACCESSIBLE CEILING SPACE ABOVE. PROVIDE PLASTIC BUSHINGS AND PULL STRINGS.
- 9. NEW CEILING MOUNTED WIFI ACCESS RECEIVER FURNISHED AND INSTALLED BY OWNER - PDS CONTRACTOR.
- 10. EXISTING LAND LINE FOR ELEVATOR PHONE TO REMAIN.
- 11. INSTALL NEW WALL BOX IN EXISTING WALL CONSTRUCTION AND ROUTE FLEXIBLE CONDUIT THROUGH METAL FRAME TO ACCESSIBLE CEILING SPACE IN MAIN BUILDING.
- 12. EXISTING DATA WALL BOX WITH CONDUIT, BUSHINGS AND PULL STRING FOR NEW DATA CABLEING FURNISHED AND INSTALLED BY OWNER PREMISE DISTRIBUTION SYSTEM CONTRACTOR (PDS).
- 13. INSTALL NEW POK-THRU FLOOR BOX FOR MODULAR FURNITURE POWER FEED AND DATA CABLEING.

LEGEND:

- (E) - EXISTING TO REMAIN.
- (R) - RELOCATED.

ROCHESTER  
COMMUNITY SCHOOLS

PRIDE IN EXCELLENCE

ROCHESTER COMMUNITY SCHOOLS  
501 W UNIVERSITY DRIVE  
ROCHESTER, MI 48307  
248.726.3000  
https://www.rochester.k12.mi.us

RCS ADMIN  
RENOVATION  
52595 DEQUIDRE ROAD  
ROCHESTER, MI 48307

CONSULTANT INFORMATION

REGISTRATION SEAL

NOT FOR CONSTRUCTION

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

01/17/22 BACKGROUND PLANS FOR RCS CABLE MARKUP





(E) - EXISTING TO REMAIN.  
(R) - RELOCATED.

NOT FOR CONSTRUCTION

01/17/22 BACKGROUND PLANS  
FOR RCS CABLE MARKUP





## Attachment B: Project Specifications

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. All hardware, enclosures, racks, equipment and other equipment as indicated herein and on project drawings and documents, and as required for a complete installation per industry norms, standards and best practices
  - 2. Category 6 UTP horizontal cabling
  - 3. Category 6A UTP horizontal cabling
  - 4. Optical Fiber cabling
  - 5. Technology closet equipment

#### 1.3 SITE

- A. Rochester Community Schools Administration Building, 52585 Dequindre Rd Rochester, MI 48307 – currently under renovation.
  - 1. Category 6 UTP cabling for the Data Communications system as indicated per project drawings.
  - 2. Category 6 UTP horizontal cabling for cameras as indicated per project drawings.
  - 3. Category 6A UTP horizontal cabling Wireless access points as indicated per project drawings.
  - 4. Optical fiber backbone between the MDF and Technology storage / imaging room.
  - 5. Provide 48" depth cabinets for patch panels and data electronics, Quantity 6. To be installed in Data MDF. Racks to have electrical bond to bus bar/ground.
    - 42U 60mm Wide x 1200mm Deep (48" depth)
    - 2 Rows of 3 cabinets. Each end cabinet should have a side/end panel, etc.
  - 6. Other Category 6 and 6A UTP cabling as required by construction, using unit pricing.

#### 1.4 REFERENCES

- A. The contractor shall comply with the latest edition or revision of all codes, standards and regulations.
- B. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Regardless of the date shown for each reference below, the latest edition shall apply.
  - 1. ASTM INTERNATIONAL (ASTM)
    - ASTM D709 (2013) Laminated Thermosetting Materials
  - 2. ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)



- ECIA EIA/ECA 310-E (2005) Cabinets, Racks, Panels, and Associated Equipment
- 3. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
  - IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
- 4. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
  - ICEA S-83-596 (2011) Indoor Optical Fiber Cables
  - ICEA S-90-661 (2012) Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables for Use in General Purpose and LAN Communications Wiring Systems Technical Requirements
- 5. NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
  - NECA/BICSI 568 (2006) Standard for Installing Building Telecommunications Cabling
- 6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
  - ANSI/NEMA WC 66 (2013) Performance Standard for Category 6 100 Ohm Shielded and Unshielded Twisted Pairs
- 7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
  - NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
- 8. TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) - LATEST EDITION
  - TIA-1152 (2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
  - TIA-455-21 (1988a; R 2012) FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices
  - TIA-526-14 (2015c) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
  - TIA-568-D-0 (2015d) Generic Telecommunications Cabling for Customer Premises
  - TIA-568-D-1 (2015d) Commercial Building Telecommunications Cabling Standard
  - TIA-568-C.2 (2009; Errata 2010) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
  - TIA-568-C.3 (2008; Add 1 2011) Optical Fiber Cabling Components Standard
  - TIA-569 (2015d) Commercial Building Standard for Telecommunications Pathways and Spaces
  - TIA-606 (2012b) Administration Standard for the Telecommunications Infrastructure
  - TIA-607 (2011b) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  - TIA/EIA-598 (2014d) Optical Fiber Cable Color Coding
  - TIA/EIA-604-10 (2002a) FOCIS 10 Fiber Optic Connector Intermate ability Standard - Type LC
- 9. U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

- FCC Part 68 Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

#### 10. UNDERWRITERS LABORATORIES (UL)

- UL 1286 (2008; Reprint Feb 2015) Office Furnishings
- UL 1666 (2007; Reprint Jun 2012) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
- UL 1863 (2004; Reprint Nov 2012) Communication Circuit Accessories
- UL 444 (2008; Reprint Apr 2015) Communications Cables
- UL 467 (2007) Grounding and Bonding Equipment
- UL 514C (2014; Reprint Dec 2014) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
- UL 723 (2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials
- UL 969 (1995; Reprint Sep 2014) Standard for Marking and Labeling Systems

### 1.5 DEFINITIONS

- A. Unless otherwise specified or indicated herein, electrical and electronics terms used in this specification shall be as defined in TIA-568, TIA-569, TIA-606 and IEEE 100 and herein.
- B. BICSI: Building Industry Consulting Service International.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- G. RCDD: Registered Communications Distribution Designer.
- H. TDM (BICSI): Telecommunications Design Methods Manual
- I. UTP: Unshielded twisted pair.
- J. LAN: Local area network.
- K. Basket tray: A fabricated structure consisting of sides and bottom constructed of wire mesh not exceeding 2" x 4" (50mm x 100mm) spacing for routing and support of cabling main routes.
- L. Ladder tray: A fabricated steel structure 12" wide with rungs spaced no greater than 9" apart for support and routing of cabling in technology closets.

### 1.6 TELECOMMUNICATION SPACES DESCRIPTION

- A. Telecommunications spaces are the rooms and areas where telecommunications cabling systems are terminated, cross connected, and interconnected installed telecommunications equipment. Bonding and grounding (earthing), fire stopping in labeling of telecommunications infrastructure also occur in telecommunications spaces.

### 1.7 BACKBONE CABLING DESCRIPTION

- A. Backbone cabling system shall provide interconnections between telecommunications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system infrastructure. Cabling system consists of backbone cables, intermediate and main cross-connects, terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in telecommunications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.
- C. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568, when tested according to test procedures of this standard.

#### 1.8 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the telecommunications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
  - 1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
  - 2. Bridged taps and splices shall not be installed in the horizontal cabling.
  - 3. Splitters shall not be installed as part of the optical fiber cabling.
- B. The maximum allowable horizontal cable length is 328 feet (100 meters). This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

#### 1.9 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 1. Cable - Include the following installation data for each type used:
    - Nominal OD
    - Minimum bending radius
    - Maximum pulling tension
- B. Shop Drawings: For telecommunications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring diagrams to show typical wiring schematics including the following:
    - Patch panels
    - Cross – connects and patch cords
  - 3. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

4. Cross-connects and patch panels: Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- C. Field quality-control reports.
- D. Maintenance Data: For splices and connectors to include in maintenance manuals.
- E. Qualification Data: For installer, qualified layout technician, installation supervisor, and field inspector.

#### 1.10 QUALITY ASSURANCE

- A. Bidder qualifications:
- B. Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for the telecommunications system contractor, the telecommunications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.
- C. The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems within the past 3 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor.
- D. Minimum Manufacturer Qualifications
  1. Cabling, equipment and hardware manufacturers shall have a minimum of 3 years' experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568, TIA-569, TIA 606 and TIA-607.
- E. Installer Qualifications
  1. Installers: installation personnel shall be certified by the manufacturer for the installed product.
  2. Installation Supervision: Installation shall be under the direct supervision of ITS Technician or ITS 2 Installer or equivalent certification, who shall be present at all times when Work of this Section is performed at Project site.
- F. Cable Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Telecommunications Pathways and Spaces: Comply with TIA-569
- I. Telecommunications cabling and hardware: Comply with TIA-568
- J. Bonding and Grounding: Comply with TIA-607
- K. Test Plan - Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 30 days prior to the proposed test date for



approval. Include procedures for certification, validation, and testing. Test plan shall include all test requirements detailed herein at a minimum.

- L. Regulatory Requirements - In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.
- M. Standard Products - Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship unless specific manufacturer and/or part numbers is included herein. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.
- N. Material and Equipment Manufacturing Date - Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

#### 1.11 CABLE DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
  - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
  - 2. Test each pair of UTP backbone cable for open and short circuits.

#### 1.12 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cable, equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry.
- B. The Contractor shall must take part in the mandatory site walk-through and pre-bid meeting. No subsequent allowance will be made due to failure to thus observe and verify conditions, which may affect the work. The Contractor shall report to the RCS IT Project Lead any discrepancies between these specifications and existing conditions and similarly report obvious omissions.

#### 1.13 COORDINATION

- A. Coordinate layout and installation of telecommunications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
  - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.

3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
  4. Adjust arrangements and locations of equipment with distribution frames, cross- connects, and patch panels of cabling systems of other telecommunications, electronic safety and security, and related systems that share space in the equipment room.
- B. Coordinate location of power raceways and receptacles with locations of telecommunications equipment requiring electrical power to operate.
  - C. Coordinate layout and installation of telecommunications pathways and cabling with General Contractor and all associated trades.
  - D. Coordinate schedule and building access with General Contractor, all associated trades and Owner/Owner representative.

## PART 2 – PRODUCTS

### 2.1 Product Certification

- A. Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third-party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

### 2.2 PATHWAYS

- A. General Requirements: Provide telecommunications pathways in accordance with TIA-569 and as specified herein and on project drawings and associated documents. Provide system furniture pathways in accordance with UL 1286.
- B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
  1. Cable Tray.
  2. J-Hooks and Saddles
  3. Support brackets with cable tie slots for fastening cable ties to brackets.
  4. Straps and other devices.

### 2.3 COMMUNICATIONS ROOM FITTINGS AND EQUIPMENT

- A. Provide connecting hardware and termination equipment in telecommunication equipment room to facilitate installation as shown on design drawings for

terminating and cross-connecting permanent cabling. Provide telecommunications interconnecting hardware labeling and color coding in accordance with TIA-606.

B. Manufacturers: Subject to compliance with requirements.

1. Vertical and Horizontal Cable Management:

- Metal, with integral wire retaining fingers.
- Baked-polyester powder coat finish.
- Vertical cable management panels shall have front and rear channels, with covers.

C. Cable Guides and Fasteners

1. Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on equipment racks and telecommunications backboards (to accommodate cross-connect wiring, etc.).
2. Cable guides of ring or bracket type devices mounted on rack and backboard for horizontal cable management and individually mounted for vertical cable management. Mount cable guides with screws, nuts and lock washers.
3. Hook and Loop (I.e. Velcro®) shall be used to fasten cables. Tie-wraps or similar type fasteners shall not be used.

D. Patch Panels

1. UTP Patch Panels – Provide in accordance with TIA-568 with ports for the number of cables terminated on the panel plus 25 percent spare.
  - Panels shall be third party verified and shall comply with TIA Category 6 or TIA Category 6A requirements.
  - Panel shall be constructed of 0.09 inches minimum aluminum and shall be rack mounted and compatible with an ECIA EIA/ECA 310-E 19-inch equipment mounting rails.
  - Panel shall provide non-keyed, 8-pin modular ports, wired to T568B. Patch panels shall terminate the building cabling on Type 110 IDCs and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.
2. Fiber Optic Patch Panels – Provide panel for termination and cross-connecting of optical fiber cables.
  - Panel shall be constructed of 16-gauge steel or 11-gauge aluminum minimum and shall be rack mounted and compatible with an ECIA EIA/ECA 310-E 19-inch equipment rack.
  - Each panel shall provide multimode adapters as alignment sleeves. Provide dust cover for unused adapters.
  - The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides.
  - Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

- As practical use existing fiber optic patch panels in the existing MDF, providing couplers, panels and other hardware as required.
  - 3. Optical Fiber Adapters (Couplers)
    - Provide optical fiber adapters suitable for duplex LC in accordance with TIA-604-10 with zirconia ceramic alignment sleeves, as indicated. Provide dust cover for adapters.
    - Optical fiber adapters shall comply with TIA-455-21 for 500 mating cycles.
  - 4. Optical Fiber Connectors
    - Provide in accordance with TIA-455-21.
    - Optical fiber connectors shall be duplex LC in accordance with TIA-604-10 with zirconia ceramic alignment sleeves, ferrule, epoxy-less crimp style.
    - The connectors shall provide a maximum attenuation of 0.3 dB at 850 nm with less than a 0.2 dB change after 500 mating cycles.
- 2.4 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES**
- A. Workstation Outlets
1. UTP Outlet/Connector
    - Outlet/connectors shall comply with FCC Part 68, and TIA-568. UTP outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA-568 Category 6 requirements.
    - Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided.
    - Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568B.
    - UTP outlet/connectors shall comply with TIA-568 for 200 mating cycles.
    - UTP outlet/connectors installed in outdoor or marine environments shall be jell- filled type containing an anti-corrosive, memory retaining compound.
    - 106 frames for use in faceplates and raceway to house jack assemblies
  2. Cover Plates
    - Telecommunications cover plates shall be over-sized and standard size, flush design, electrical receptacle plates, constructed of stainless steel to match electrical receptacle/switch cover plates, with 106 frames for telecommunication jack assemblies – refer to electrical detail sheet and project drawings for size and quantity
      - Manufacturer (Oversized): Hubbell ssj82 Jumbo plates or approved equal with 106 frames

- Standard and over-sized stainless-steel blank plates– refer to electrical detail sheet and project drawings for size and quantity
- Provide labeling in accordance with the paragraph LABELING in this section.

## 2.5 TELECOMMUNICATIONS CABLING

- A. Cabling shall be UL listed for the application and shall comply with TIA-568 and NFPA 70. Provide a labeling system for cabling as required by TIA-606 and UL 969. Ship cable on reels or in boxes bearing manufacture date for unshielded twisted pair (UTP) in accordance with ICEA S-90-661 and optical fiber cables in accordance with ICEA S-83-596 for all cable used on this project. Cabling manufactured more than 12 months prior to date of installation shall not be used.

## 2.6 CATEGORY 6 UTP HORIZONTAL CABLE

- A. Manufacturer: GenSPEED (General Cable/Panduit) or equivalent
- B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
  2. Comply with TIA-568 for performance specifications.
  3. Comply with TIA-568, Category 6.
  4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - Communications, Plenum Rated: Type CMP, complying with NFPA 262.

## 2.7 CATEGORY 6A UTP HORIZONTAL CABLE

- A. Manufacturer: GenSPEED 10 MTP (General Cable/Panduit) or equivalent
- B. Description: 100-ohm, 4-pair UTP, covered with a thermoplastic jacket.
1. Jacket color shall be Yellow for Wireless Access Points
  2. Jacket color shall be White for IP Cameras
  3. Comply with ICEA S-90-661 for mechanical properties.
  4. Comply with TIA-568 for performance specifications.
  5. Comply with TIA-568, Category 6A.
  6. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - Communications, Plenum Rated: Type CMP, complying with NFPA 262.

## 2.8 INDOOR OPTICAL FIBER CABLE

- A. Description: Single-mode (OS2), dielectric armor, tight-buffered, optical fiber cable.
- B. Manufacturer: Corning model MIC® Tight-Buffered Cable, Plenum, 12 F, single-mode (OS2) or approved equal
- C. Comply with ICEA S-83-596 for mechanical properties.
- D. Comply with TIA-568 for performance specifications.
- E. Comply with TIA/EIA-492AAAC-B for detailed specifications.
- F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- G. Maximum Attenuation: .65 dB/km at 1310nm; .50 dB/km at 1550nm.

**H. Jacket:**

1. Jacket Color: Yellow
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

**2.9 COPPER CABLING HARDWARE**

- A. General Requirements for Cable Connecting Hardware: Comply with TIA-568-C, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Patch Panel: 24-port modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  1. Rated Category 6 for Category 6 work station cabling
  2. Rated Category 6A for Wireless Access Point and Camera cabling
- C. Plugs, Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
  1. Access point cabling shall be terminated with a Panduit Direct Connect TX6A UTP Plug or equivalent at the access point
  2. Camera cabling shall be terminated with a Panduit Category 6A jack in a single port housing above the ceiling, and all shall be plenum rated
- D. Patch Cords: Factory-made, 4-pair; terminated with 8-position modular plug at each end.
  1. Category 6 shall be green in color, 12" in length in the closet and yellow in color, 15' in
  2. length at the work area outlet
  3. Wireless Access Point Category 6A patch cables shall be black in color, 12" in length in the
  4. closet
  5. Camera Category 6A patch cables shall be white in color in both the closet and at the camera. Closet patch cord length shall be 12" and device equipment cord shall be 15' in length
- E. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6/6A performance. Patch cords shall have latch guards to protect against snagging.
- F. Patch cords shall have color-coded boots for circuit identification.

**2.10 TELECOMMUNICATIONS OUTLET/CONNECTORS**

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position eight-contact (8p/8c) modular. Comply with TIA-568.
- B. Workstation Outlets: One, Two and Four port-connector assemblies mounted in single or double-gang faceplate.
  1. Plastic Faceplate: High-impact plastic. Coordinate color with electrical faceplates.

2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
  - Flush mounting jacks, positioning the cord at a 90-degree angle.
3. Legend: Machine printed, in the field, using adhesive-tape label.

#### 2.11 OPTICAL FIBER CABLE HARDWARE

- A. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
- B. Patch Cords: Provide two (2) factory terminated Duplex LC Optical Fiber patch cord per terminated optical fiber in the following lengths and quantities: 50% - 1M and 50% 2M.
- C. Cable Connecting Hardware:
  1. Comply with Optical Fiber Connector Intermate ability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA-568.
- D. Quick-connect, simplex and duplex Type LC connectors. Insertion loss not more than 0.75 dB

#### 2.12 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with requirements in TIA-607 for grounding conductors and connectors.

#### 2.13 LABELING

- A. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Identify system components, wiring, and cabling complying with TIA-606 and requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Grounding and bonding systems
    - Label connections with tags with the following minimum information "If this Connector or Cable is Loose or Must be Removed, Please Call the Building Telecommunications Manager" per TIA-607 and per TIA-569 requirements.
  2. Cable and terminations
  3. Pathway, including tray, through wall penetrations, fire stop and associated components
  4. Racks, cabinets, enclosures, blocks, patch panels etc.
- C. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA – 606.
- D. Cables use flexible vinyl or polyester that flexes as cables are bent.

### PART 3 – EXECUTION

#### 3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and

in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.2 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA-569.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks. Drawings indicate general arrangement of pathways and fittings.

### 3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  1. Comply with TIA-568.
  2. Comply with BICSI TDMM, "Cable Termination Practices."
  3. Install 110-style IDC termination hardware unless otherwise indicated.
  4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI TDMM, "Cabling Termination Practices". Install lacing bars and distribution spools.
  8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  9. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.
  10. In the telecommunications equipment room, install a 10-foot-long service loop on the end of each optical fiber cable.
  11. Provide a twelve (12) inch service loop on each category 6 horizontal cable at the workstation end.
  12. Provide a ten (10) foot service loop on each category 6a horizontal cable at the Wireless Access Point and camera ends.
  13. Pulling Cable: Comply with BICSI TDMM, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
  1. Comply with TIA-568 and manufacturer's instructions.



2. Main cable bundles shall be routed through corridors and across common areas and then to work area outlets in rooms. Main bundles shall not be routed through/across classrooms, offices etc. without authorization from the Owner.
  3. Main cable bundles shall be routed using existing cable tray or other appropriate pathways or supports where available.
  4. Do not remove more than the minimum of cable jacket required for termination. To maintain cable geometry do not untwist UTP cables more than 1/2 inch from the point of termination.
- D. Optical Fiber Cable Installation:
1. Comply with TIA-568 and manufacturer's instructions.
  2. Cable shall be terminated on connecting hardware that is rack mounted.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend UTP cable not in a wire way or pathway a minimum of 8 inches above ceilings by approved cable supports not more than 60 inches apart.
    - Approved supports include Category 6 rated J – hooks, saddles etc.
    - All cable shall be independently suspended from building structure using rated support components. The use of tie wraps and bridle rings is prohibited
  3. Cable shall not be supported directly by structural members or in contact with pipes, ducts, or other potentially damaging items.
- F. Separation from EMI Sources:
1. Comply with BICSI TDM and TIA-569 for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open telecommunications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  3. Separation between telecommunications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

- Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  - 4. Separation between telecommunications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    - Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
  - 5. Separation between Telecommunications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
  - 6. Separation between Telecommunications Cables and Fluorescent Fixtures: A minimum of 5 inches.
  - G. Empty Technology Boxes and Openings
    - 1. Contractor shall be responsible for providing and installing blank cover plates over empty technology boxes and providing blank inserts in unused openings in technology faceplates and 106 frames.
- 3.4 FIRESTOPPING**
- A. Comply with TIA-569, "Firestopping."
  - B. Comply with BICSI TDMM, "Firestopping Systems" Article.
- 3.5 GROUNDING**
- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
  - B. Comply with TIA-607.
  - C. Bond metallic equipment and cable shield to the grounding bus bar, using not smaller than No. 6 AWG stranded copper equipment grounding conductor.
  - D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG stranded copper equipment grounding conductor.
    - 1. Bond the shield of shielded cable to the grounding bus bar in telecommunications rooms and spaces.
- 3.6 IDENTIFICATION**
- A. Identify system components, wiring, and cabling, complying with TIA-606.
  - B. Paint and label colors for equipment identification shall comply with TIA-606 for Class 2 level of administration or as modified by owner.
  - C. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - D. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - 1. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular devices as shown.
    - 2. Label each unit and field within distribution racks and frames.
  - E. Label all components of the grounding system per TIA – 606 and TIA-607.

- F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- G. Cable and Wire Identification:
  - 1. Label each cable within 4 inches (100 mm) of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.
  - 3. Reference project drawings for cable labeling format
- H. Label format: Use the following format when labeling cables. Confirm with Owner any deviations from this format for location types that aren't included below
  - 1. Closet #, space identifier, cable within the space – examples:
    - Conference room 1 fed from IDF 2: 2-C1-1, 2-C1-2, etc.
    - Classroom 7 (Note classroom labels only have the room number) fed from IDF 2: 2- 7-1, 2-7-2, etc.
    - Ancillary room 1 fed from IDF 3: 3-A1-1, 3-A1-1, etc.
    - Coordinate with Owner labeling for Wireless Access points and cameras.
    - Provide the same label at both ends of the cable
- I. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- J. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA-606.
  - 1. Cables use flexible vinyl or polyester that flex as cables are bent.
- K. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, pathways and cables, termination hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA-606. Furnish electronic record of all structured cable drawings, in software and format selected by Owner.

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections
  - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in telecommunications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test instruments shall meet or exceed applicable requirements in TIA-568 for Category 6 Permanent Link. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for permanent link test configuration.
4. All horizontal Category 6 UTP shall be tested using the Permanent Link Method.
5. All horizontal Category 6A UTP shall be tested using the Modular Plug Terminated Link (MPTL) method and shall conform to all permanent link parameters for Category 6A.
6. Optical Fiber Cable Tests:
  - Optical Fiber testing shall use an Optical Loss Test Set. Test instruments shall meet or exceed applicable requirements in TIA-568. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - Link End-to-End Attenuation Tests:
    - Optical link measurements: Test at 1310 and 1550 nm bi-directionally according to TIA-526-7-A, Method B, One Reference Jumper.
    - Attenuation test results for backbone links shall be less than calculated according to equation in TIA-568 "Passive Cable System Attenuation Loss".
- B. Data for each measurement shall be electronically documented. Data for submittals shall be printed in a summary report that is formatted similar to the example in the BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Data shall be submitted to client in soft copy in PDF format.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare and submit test and inspection reports for approval within 10 business days of substantial completion.

END OF ATTACHMENT B