



Bid Documents  
For

**NORTH MIDDLE SCHOOL  
CLASSROOM AUDIO/VIDEO**  
Project #1253\_01

Portage Public Schools  
8107 Mustang Drive  
Portage, MI 49002

Distributed by:



Contact Bret Emerson  
616-863-8132  
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July 23, 2018

## SECTION 28 0500 – FRONT END

### PART 1 - GENERAL

#### 1.01 INTRODUCTION

- A. Portage Public Schools invites qualified contractors to provide proposals for a NORTH MIDDLE SCHOOL CLASSROOM AUDIO/VIDEO. This work includes:
  - 1. Bid Category #1.
    - a. The base bid is the cost for the installation of all the audio and video systems including classroom AV system and cabling, All work shall include all equipment, labor, installation and testing.
- B. The Contractor shall pay all costs of the Work including, but not limited to, labor, materials, equipment, tools, transportation, freight, taxes, royalties, patent fees, support facilities, construction equipment, water, heat, utilities, supervision, overhead, and all other items necessary for the proper execution and completion of the Work.

#### 1.02 CONTACTS

- A. The contact for all questions and any addendums during bidding shall be:

Commtech Design  
Bret Emerson  
616-863-8132  
[emersonb@commtechdesign.com](mailto:emersonb@commtechdesign.com)

- B. The owner as referred to in this bid is:

Portage Public Schools  
8107 Mustang Drive  
Portage, MI 49002

#### 1.03 DUE DATES

- A. Bids are due at August 17<sup>th</sup>, 2018 at 2:00 PM at

Portage Public Schools  
8107 Mustang Drive  
Portage, MI 49002

- B. A pre-bid meeting will be held on August 3, 2018 at 1:00PM. Meet at:

Portage Public Schools  
8107 Mustang Drive  
Portage, MI 49002

- C. All questions shall be submitted to the owner no later than August 9<sup>th</sup>, 2018 at 3:00PM. All questions shall be sent via email to Bret Emerson of Commtech Design.

Bret Emerson [Emersonb@Commtechdesign.com](mailto:Emersonb@Commtechdesign.com) 616-863-8132

#### 1.04 BUILDING SITES

- A. Work to be completed as part of this bid will be done at the sites as detailed in the drawings and specifications:
- B. Access to the sites shall be from 7:30 AM to 5:00 PM Monday thru Friday.
  - 1. Arrangements can be made for additional time on site during each day as scheduled with the owner.
  - 2. The building is under construction, so work can be coordinated with the Construction Manager

1.05 OWNERS RIGHTS

- A. The owner reserves the right to waive any formalities to bid, to reject any or all bids and to accept the bid that is most favorable to the Owner.
- B. The owner does not incur any responsibility for Bidder's costs in preparing the bid proposal.
- C. Bidder recognizes that the owner is subject to the Freedom of Information Act. Per formal request the owner will make bid documents available for public review following contract with a successful bidder.

1.06 BID RESPONSE FORMAT

- A. The owner requires that all responses include the information listed below.
- B. All bid responses shall be submitted in a three-ring binder or bound folder
  - 1. Provide three (3) copies of the bid response. One shall be marked as the ORIGINAL. The ORIGINAL shall be signed by a duly designated officer of the company.
- C. Bid responses shall be provided in the following format with section dividers.
  - 1. Bid Form –See Bid Documents
  - 2. Description of the bidder's company
  - 3. Description of the bidder's response and the services they will provide.
    - a. Include information about any manufacturer required on-going maintenance costs for software or hardware or upgrades.
  - 4. Spreadsheet detailing all equipment being submitted per building.
  - 5. Any information the bidder wishes to include that was not specifically required.

1.07 DOCUMENTS

- A. The following drawings are part of the bid package.

DWG.	Drawing Name
TC301	Audio/Video Legend, Schedules & Details
TC302	Classroom Audio/Video Connectivity Diagram
TC303	Classroom Audio/Video Connectivity Diagram
TC401B	North Middle School First Floor Audio/Video Plan – Area B
TC401C	North Middle School First Floor Audio/Video Plan – Area C
TC402B	North Middle School Second Floor Audio/Video Plan – Area B
TC402C	North Middle School Second Floor Audio/Video Plan – Area C
TC402C	North Middle School Third Floor Audio/Video Plan – Area C

- B. The following specifications are part of the bid package.

Specification	
28 0000	Coversheet
28 0500	Front End
	Bid Form
	Familial Disclosure
	Iran Form
28 1000	Communications Overview
28 5300	Classroom Video
28 5350	Classroom Audio
28 5470	AV Cabling
28 7200	Technology Submittals
28 7600	Technology Labeling
28 7700	Technology Testing
28 7800	Technology Warranty

## **PART 2 -**

### **PART 3 - PERSONNEL**

#### **3.01 BIDDER**

- A. Minimum Bidder Qualifications:
  - 1. Bidder must be fully licensed and insured.
  - 2. Bidder must be fully authorized by the manufacturer being proposed to install and configure the equipment.
  - 3. Shall have technicians that are fully certified to install and configure the equipment being provided as part of the bid.
- B. Bidder shall address each item in this package as specified. All required labor and equipment must be quoted. Any exception must be noted and explained. All bids must include the entire section bid to be considered.
- C. The Contractor can withdraw their bid at any time prior to opening the bids.
- D. Work shall be coordinated with the owner's technology coordinator, architect, construction manager and the technology designer

#### **3.02 PERSONNEL**

- A. All personnel working on the project shall be certified by the manufacturer to install, configure and connect the equipment as per the owner's requirements and the manufacturer's specifications.
- B. The contractor shall assign a Project Manager to the project who will have ultimate authority to make decisions, schedule work and fix or repair any non-conforming equipment.
  - 1. Provide a list of the projects of similar size and scope to the work they will be doing as part of this project. Include examples of three projects with similar scope that the PM has worked on in the last three years.
  - 2. The project manager will be the primary contact for this project
  - 3. The project manager shall attend all project meetings and be fully aware of all work going on as part of the project.

#### **3.03 BACKGROUND CHECKS**

- A. Contractor's staff may be required to pass a security clearance check conducted by the Owner.
- B. The Contractor shall authorize the investigation of its personnel proposed to have access to facilities and systems on a case-by-case basis.
  - 1. The scope of the background check is at the discretion of the owner and the results will be used to determine Contractor's personnel eligibility for working within the facilities and systems.
  - 2. Such investigations will include Michigan State Police Background checks (ICHAT) and may include the National Crime Information Center (NCIC) Finger Prints.
  - 3. Proposed Contractor personnel may be required to complete and submit an RI-8 Fingerprint Card for the NCIC Finger Print Check.
  - 4. Any request for background checks will be initiated by the owner or construction manager and will be reasonably related to the type of work requested.

### **PART 4 - WORK REQUIREMENTS**

#### **4.01 DOCUMENTS**

- A. The contractor shall review all bid documents including specifications and the drawings. The specifications and documents and any addenda detail the requirements of the chosen contractor.
- B. It is mandatory that items of material and equipment conform to the Contract Documents and meet the quality standards in every respect.
- C. Where any specifications or drawings are not in agreement the higher value or more stringent requirement shall apply, and shall be included in the bid pricing.

#### **4.02 PRODUCTS**

- A. All products shall be of the latest manufacture. No remanufactured or used equipment shall be provided as part of the bid.
  - B. All equipment shall be provided in the manufacturers shipping container. Provide copy of the shipping lists as part of the project documentation.
- 4.03 PRODUCT DELIVERY AND LIABILITY
- A. The contractor shall be responsible for the complete installation of new and un-damaged products.
  - B. The contractor shall be liable for all equipment until it is formally accepted by the owner in writing. This shall include the equipment when it is in the contractor's facility and when it is in the owner's facility until it is formally accepted.
- 4.04 DAMAGE
- A. The contractor shall be responsible for all damage made to the building or any of the buildings contents during their work as part of this project.
  - B. The contractor shall not disturb any hazardous material or materials that they are not authorized to work with.
- 4.05 INCIDENTAL WORK AND PERMITS
- A. The contractor shall be responsible for requesting, obtaining and paying for any and all permits required for their work by the local, county, state and federal authorities having jurisdiction (AHJ) over the work being performed.
  - B. Provide any and all work or equipment required by the Authority Having Jurisdiction (AHJ) that may or may not be specifically noted in these documents.
- 4.06 INSPECTION OF THE WORK
- A. The contractor shall keep up to date as-builts on site for the duration of the project. The engineer may request to see the as-built documents at any time.
  - B. The Contractor shall promptly facilitate inspection and testing of the Work regardless of expense as necessary or as requested by the Owner, regardless of whether or not the Work in question is his own or that of a subcontractor.
  - C. If such tests or inspections reveal deficiencies as measured by Construction documents or an independent consultant/testing agency or the owner/engineer, the Contractor shall bear all costs incurred to correct such deficiencies, and the cost to reconstruct any work to meet the contract documents.
- 4.07 PROJECT MEETINGS
- A. The contractor shall attend project meeting as designated by the owner or engineer. Attendance is mandatory.

## **PART 5 - WORK SCHEDULES**

### **5.01 PROJECT SCHEDULE**

- A. It is the intention of the owner to take possession of the Work by the established completion date or earlier, within the shortest time possible consistent with good construction practices.
- B. The Completion Date Shall be July 1, 2019
- C. Upon award of the contract the contractor shall provide a complete schedule for their work. This shall reference dates in the document and be coordinated with the schedule of any other contractors.
  - 1. Include start date
  - 2. Products installed
  - 3. Punch list work complete
  - 4. Substantial Completion
  - 5. Final Completion after system has been working for 30 days with no outages or failures
- D. If the work is delayed through the fault of the owner (or of any separate contractor employed by the owner)
  - 1. The Contractor shall notify the owner, in writing, of any condition or situation that in the Contractor's opinion warrants an extension of Contract Time.

2. The Contractor shall not be entitled to additional compensation or damages due to delays, interference's or interruptions to the Work or the Project, but shall be entitled only to an appropriate extension of time in accord with the General Conditions of the Contract for Construction.

## **PART 6 - DEFICIENT WORK**

### **6.01 PRODUCT AND INSTALLATION DEFICIENCIES**

- A. The Contractor shall expediently correct all deficiencies brought to his attention in writing or verbally by the owner. If, in the opinion of the owner and the technology design or construction manager, the Contractor fails to correct deficiencies, or fails to act expeditiously to correct deficiencies, the owner may:
  1. Accept the deficiencies in the Work, and reduce the Contract Sum of the Contractor at fault by a unilateral Change Order issued and signed by the owner in an amount to be determined by the owner.
  2. Have the deficiencies removed in any reasonable manner available to the Owner, and charge the Contractor at fault for the costs incurred, or reduce that Contractor's Contract Sum by a unilateral Change Order issued by the Owner for the costs incurred.
- B. The Contractor shall pay all costs of the Work including, but not limited to, labor, materials, equipment, tools, transportation, freight, taxes, royalties, patent fees, support facilities, construction equipment, water, heat, utilities, supervision, overhead, and all other items necessary for the proper execution and completion of the Work.

## **PART 7 - GENERAL**

### **7.01 LEGAL REQUIREMENTS**

- A. The Contractor shall comply fully with all laws, statutes, ordinances, rules, regulations, codes, and lawful orders applicable to their work, including employment regulations, unless specifically exempted from compliance by the Contract Documents. Where local codes differ from codes of broader jurisdictions, the more stringent code shall apply. The Contractor shall promptly notify the Owner in writing of items in the plans or specifications for this project that violate any applicable codes.

### **7.02 CLEAN SITE**

- A. The contractor shall clean the site daily.
- B. The contractor shall be responsible for disposal and removal from the site any and all waste and debris generated from their work.
- C. All dust or ceiling debris generated as part of the work shall be cleaned each day.

### **7.03 PREVAILING WAGE**

- ~~A.~~ This project is not subject to the Prevailing Wage Law; Michigan Public Act 166 of 1965.

### **7.04 TAXES**

- A. The bidder is responsible to apply all tax information within their proposal. Contractor is responsible for applying such tax with each request for payment and complying with Federal, State and local laws.
- B. All tax costs shall be included in the base bid price.

### **7.05 PAYMENTS**

- A. The contractor shall submit an invoice on the AIA form G702/G703 each month. The invoice shall include only work completed at the time of submission.
- B. The contractor can be paid for equipment in storage at the owner's site as long as the owner is provided with proof of insurance for the equipment.
- C. The owner will provide payment on the invoice within 21 days of a signed invoice by the engineer and contractor.
- D. The owner will retain 10% of the total cost of the project until the system is considered finally complete as detailed in the project documents.

## **PART 8 - REVIEW OF BIDS**

### **8.01 OWNER REVIEW**

- A. The Owner reserves the right to waive any formalities to bid, to reject any or all bids, or to accept the bid that is most favorable to the Owner. The Owner does not incur any responsibility for Bidder's costs in preparing the bid proposal.

### **8.02 BID BOND**

- A. Provide with the bid response a 5% Bid Bond which is required for all proposals. The bond must be in the form of a certified check or a bond executed by a surety company authorized by the State of Michigan. The amount of the bond shall be forfeited if the Contractor, after being awarded the bid, fails to enter into an appropriate contract with the Owner within (30) days.

### **8.03 PERFORMANCE BOND**

- A. Successful bidders, for work valued at \$50,000 or more, will be required to secure Performance, Labor and Material Bonds issued for the full amount (100% value) of the contract by a company licensed to do business in the State of Michigan and having an A.M. Best rating of A- or better. The cost of these bonds is to be included in the proposal amount.

### **8.04 INSURANCE**

- A. Contractors must have the proper insurance forms submitted prior to start of their Work. The required insurance shall be written for not less than the limits shown below, or greater if required by law. Contractors will require all subcontractors to maintain similar coverage limits. The Contractor shall name the Owner as additional insured.
  - 1. Standard Workers Compensation and Employers Liability Employers Liability
    - a. \$500,000 Bodily Injury by Accident—each accident
    - b. \$500,000 Bodily Injury by Disease—each employee
    - c. \$500,000 Bodily Injury by Disease—policy limit
  - 2. General Liability Combined Single Limit Liability
    - a. \$1,000,000 each occurrence
    - b. Or Split Limit Liability
    - c. \$500,000 Bodily Injury—each occurrence
    - d. \$500,000 Property Damage—each occurrence
  - 3. Aggregates
    - a. \$1,000,000 General Aggregate
    - b. \$1,000,000 Products-completed operations
    - c. Automobile Liability Combined Single Limit Liability
    - d. \$500,000 each accidentOr
    - e. Split Income Liability
    - f. \$500,000 Bodily injury—each person
    - g. \$500,000 Bodily injury—each accident
    - h. \$500,000 Property Damage—each accident
  - 4. Umbrella Insurance
    - a. \$2,000,000 Limit over primary insurance

### **8.05 REVIEW OF BIDS**

- A. Bids will be reviewed based on the following criteria:
  - 1. Compliance with bidding documents
  - 2. Price
  - 3. Responsiveness to owner's requirements
  - 4. Experience and references with similar projects
  - 5. Manufacturers relationships and personnel that are certified in the manufacturer's equipment.
  - 6. Any on-going costs associated with the equipment or installation.
  - 7. The owner reserves the right to make any decision which they deem to be in their best interest regardless of price or experience of the bidders.

## **END OF SECTION 28 0500**

**BID FORM**  
**Portage Public Schools**  
**North MS Classroom Audio / video**

**North Middle School**  
**Classroom Audio/Video**



TO: Portage Public Schools  
8107 Mustang Drive  
Portage, MI 49002  
Project #1253\_01

**Company Name:** \_\_\_\_\_

hereinafter called "Contractor", does agree to provide equipment and labor as described in the specifications and drawings.

**A Corporation organized and existing under the laws of the State of :**

\_\_\_\_\_

**PORTAGE AFFILIATION (If it pertains):**

Do you maintain a permanent office, factory, or other facility in Allegan, Barry, Branch, Calhoun, Cass, Kalamazoo, St. Joseph, or Van Buren

Yes: \_\_\_\_\_ No: \_\_\_\_\_

Have you paid real or personal property taxes relating to said business in the

Yes: \_\_\_\_\_ No: \_\_\_\_\_

**Total Base Bid** : \$ \_\_\_\_\_ (in numbers)

The base bid is the cost for the installation of the classroom audio/video systems.  
Work shall include all equipment, cabling, labor and warranty.



**BID FORM**  
**Portage Public Schools**  
**North MS Classroom Audio / video**

***LEGAL STATUS OF BIDDER***

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS. The Vendor and/or Bidder certifies to the best of its knowledge and belief that it and its principals: Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency; Have not within a three-year period preceding this agreement been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offences enumerated above in this certification; and Have not within a three-year period preceding this agreement had one or more public transactions (Federal, State, or local) terminated for cause or default; is not now or has been, within a three-year period preceding this date, been listed on the Excluded Parties List System website (EPLS).

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

Name (printed): \_\_\_\_\_

Title \_\_\_\_\_

Date: \_\_\_\_\_

Email: \_\_\_\_\_

Telephone: \_\_\_\_\_

**Addenda**

The Contractor acknowledges receipt of the following addenda and has included their costs in the Total Base Bid price shown above.

Addendum # \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum # \_\_\_\_\_ Dated: \_\_\_\_\_

Contractor Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_  
E-mail: \_\_\_\_\_

**BID FORM**  
**Portage Public Schools**  
**North MS Classroom Audio / video**

**Voluntary Alternates:**

Voluntary alternates are allowed and may be considered at the discretion of the owner. For each voluntary alternate, provide a brief written description and attach additional information as required to fully describe intent. All alternates shall be completely inclusive and shall not require any additional work by other trades.

1. \_\_\_\_\_  
Description  
Add / Deduct (circle one)                      \$ \_\_\_\_\_

2. \_\_\_\_\_  
Description  
Add / Deduct (circle one)                      \$ \_\_\_\_\_

\_\_\_\_\_

**STATEMENT REGARDING FAMILIAL RELATIONSHIP**

AFFIDAVIT OF \_\_\_\_\_  
*(name of affiant)*

STATE OF MICHIGAN

COUNTY OF \_\_\_\_\_

\_\_\_\_\_ makes this Affidavit under oath and states as follows:

1. I am a/the
- President
  - Vice-President
  - Chief Executive Officer
  - Member
  - Partner
  - Owner
  - Other (please specify) \_\_\_\_\_

Of \_\_\_\_\_, a bidder on a construction project for  
*(insert name of contractor)*

\_\_\_\_\_ that involves, at least in part, construction  
*(insert name of school district)*

of a new school building or an addition to or repair or renovation of an existing school building.

2. I have personal knowledge and/or I have personally verified that the following are all of the familial relationships existing between the owner(s) and employees(s) of the aforementioned contractor and the school district's superintendent and/or board members

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3. I have authority to bind the aforementioned contractor with the representations contained herein, and I am fully aware that the school district will rely on my representations in evaluating bids for the construction project.
  
4. I declare the above information to be true to the best of my knowledge, information and belief. I could completely and accurately testify regarding the information contained in this affidavit if requested to do so.

\_\_\_\_\_  
*(signature of affiant)*

Dated \_\_\_\_\_

Subscribed and sworn before me in \_\_\_\_\_ County,

Michigan, on the \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_

\_\_\_\_\_  
(signature)

\_\_\_\_\_  
(printed)

Notary public, State of Michigan, County of \_\_\_\_\_

My commission expires on \_\_\_\_\_

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

**Iran Economic Sanctions Act Certification**

I am the \_\_\_\_\_ of \_\_\_\_\_, or I  
(title) (Bidder Company)  
am bidding in my individual capacity ("Bidder"), with authority to submit a binding bid for the North Middle School Video Security at Portage Public Schools. I have personal knowledge of the matters described in this Certification, and I am familiar with the Iran Economic Sanctions Act, MCL 129.311, *et seq.* ("Act"). I am fully aware that the school district will rely on my representations in evaluating bids.

I certify that Bidder is not an Iran-linked business, as that term is defined in the Act. I understand that submission of a false certification may result in contract termination, ineligibility to bid for three (3) years, and a civil penalty of \$250,000 or twice the bid amount, whichever is greater, plus related investigation and legal costs.

\_\_\_\_\_  
(signature)

\_\_\_\_\_  
(printed)

\_\_\_\_\_  
(date)

## SECTION 28 1000 – COMMUNICATIONS OVERVIEW

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. This section provides a project overview and general project and Contractor requirements for technology work.
- B. The “Contractor” as referred to in these specifications, shall be the bidder whose bid is eventually chosen as the winner.
- C. The “Engineer” as referred to in these specifications, shall be Commtech Design and its representative on this project.
- D. The “Owner” as referred to in these specifications, shall be Portage Public Schools and its representatives.
- E. In the detailed specifications and on the contract drawings, the phrases “or equivalent,” “approved equivalent,” “approved equal,” “or equal” and “engineer approved equivalent” shall be used interchangeably and shall mean the same thing.
- F. All equals, equivalents, or alternates shall be approved by the Engineer prior to ordering or installation. Without approval, deviation from the products listed in the specifications and on the drawings, shall be presumed to be nonconforming and shall be removed and replaced at the direction of the Engineer and at the Contractor’s expense.

#### 1.02 DESCRIPTION OF PROJECT

- A. Classroom Audio and Video Systems
  - 1. The audio and video systems in the building shall consist of but not be limited to:
    - a. Classroom AV Systems
  - 2. Test all AV systems
  - 3. The extent of the work shall be as shown on the drawing and detailed in these specifications
  - 4. The Teacher Lecterns are by others and will be provided at the site
  - 5. Some components are existing at the North MS and shall be removed and integrated to the new classroom system.
- B. Post installation documentation
  - 1. Each contractor shall provide post installation documentation as per the specifications. Shall include but not be limited to:
    - a. Red-lined as-built drawings
    - b. As-built detailed connectivity of AV and Network Systems
    - c. As-built cable locations and cable labels at each location.
    - d. Mark all splice locations
    - e. Update of all access control locations and equipment at each door
    - f. Camera locations and camera numbers.
    - g. Spreadsheet (hard copy and Excel file) for all network, Wireless, telephones and cameras detailing:
      - A) Mfg. Part number
      - B) IP Address
      - C) MAC Address
      - D) Device number (Camera #, Telephone # etc)

#### 1.03 STORAGE OF MATERIALS

- A. All materials shall be secured when not in use by the Contractor.
- B. It shall be the Contractor’s responsibility to secure all equipment including all material to be installed as part of the contract. No changes shall be made to the contract due to loss or theft of equipment and materials not officially accepted by the Owner.

#### 1.04 REFERENCE SPECIFICATIONS-CABLING

- A. All work applicable shall conform to the following standards:
- B. ANSI/TIA-568-C.0, “*Generic Telecommunications Cabling for Customer Premises*”,

- C. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standard”,
- D. ANSI/TIA-568-C.2, “Balanced Twisted-Pair Telecommunication Cabling and Components Standard”, ANSI/TIA-568-C.3, “Optical Fiber Cabling Components Standard”,
- E. ANSI/TIA-568-C.4, “Broadband Coaxial Cabling and Components Standard”,
- F. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
- G. IA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings including all Updates and Addenda.
- H. TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
- I. EIA-472 General Specification for Fiber Optic Cable
- J. EIA-472A Sectional Specification for Fiber Optic Communication Cables for Outside Aerial
- K. EIA-472B Sectional Specification for Fiber Optic Communication Cables for Underground and Buried Use
- L. EIA-472C Sectional Specification for Fiber Optic Communication Cables for Indoor Use
- M. EIA-472D Sectional Specification for Fiber Optic Communication Cables for Outside Telephone Plant Use
- N. NEC, 2015, or latest edition available
- O. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
- P. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD
- Q. Pending (higher power) PoE standards Projected to be Ratified by IEEE in 2017 powering all 4 pairs:
  - 1. Proposed IEEE 802.3bt PoE Type 3 • 60W at PSE • with 49 watts at the PD
  - 2. Proposed IEEE 802.3bt PoE Type 4 • 100W at PSE •with 96 watts at the PD

#### 1.05 REERECNE STANDARDS NETWORKING

- A. EE 802.3™: Ethernet
- B. IEEE 802.11™: Wireless Lans
- C. IEEE 802.22™: Wireless Regional Area Networks
- D. TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
- E. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
- F. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD
- G. Pending (higher power) PoE standards Projected to be Ratified by IEEE in 2017 powering all 4 pairs:
  - 1. Proposed IEEE 802.3bt PoE Type 3 • 60W at PSE • with 49 watts at the PD
  - 2. Proposed IEEE 802.3bt PoE Type 4 • 100W at PSE •with 96 watts at the PD

#### 1.06 CONTRACTOR-ALL

- A. Each contractor shall be responsible for inspecting their own work and ensuring it meets the project requirements.
- B. Contractor shall have a project manager who will be responsible for all work, workers, equipment, cabling and project management for their work. The project manager shall have the authority to make decisions for the contractor and schedule all workers.
- C. Contractor shall attend all project meetings throughout the project.
- D. All work on the project shall meet all applicable state, federal, local and industry codes and be installed according to the requirements of he Authority Having Jurisdiction (AHJ).

#### 1.07 CONTRACTOR -CABLING

- A. The Contractor shall have a BICSI certified Registered Communications Distribution Designer (RCDD) identified that will be responsible for all aspects of the installation. (This person does not have to be a direct employee of the bidder but must inspect the work to ensure that it is done based on standards)
  - 1. The resume of the RCDD, and a list of past projects the RCDD has worked on, shall be submitted with the submittal package. The Engineer reserves the right to reject the

RCDD, and require the Contractor to assign another if the RCDD is found not to have sufficient experience in projects of relatively the same scope.

2. If during the course of the work, the Contractor changes the RCDD assigned to the project, the Contractor shall provide the resume of the new RCDD and a list of projects of similar scope the new RCDD has worked on.
- B. The Contractor shall show proof of an existing contractual relationship with the approved equipment manufacturer of the horizontal cabling system, and shall pass through the manufacturer's certification and warranty to purchaser.
- C. All faceplates and termination hardware shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.
- D. The Contractor shall accept complete responsibility for the installation, certification, and support of the cabling system. Contractor must show proof that he has the certifying manufacturer's support on all of these issues.
- E. All work shall be performed and supervised by Telecommunications Technicians and Project Managers who are qualified to install voice, data, and image cabling systems, and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.
- F. The Telecommunications Technicians employed shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed. Evidence that the vendor is a current Certified Installer of the manufacturer must be provided in writing prior to work commencing on the structured cabling for the building.
- G. The Contractor (including Subcontractor(s) if any) shall have a proven track record in cabling projects. This must be shown by the inclusion of details of at least 3 projects involving Category 6 or better cabling and optical fiber, which have been completed by the vendor in the last 2 years. Names, addresses, and phone numbers of references for the 3 projects shall be included.

#### 1.08 CONTRACTOR –AUDIO/VIDEO

- A. The Contractor shall accept complete responsibility for the installation, certification, and support of the system. Contractor shall show proof that they have the certifying manufacturer's support on all of these issues.
- B. All work shall be performed and supervised by Audio/Video Technicians and Project Managers who are qualified to install audio/video systems and cabling and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.
- C. The Audio/Video Technicians employed shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed.
- D. The vendor (including Subcontractor(s) if any) shall have a proven track record in audio/video system configuration and installation. This must be shown by the inclusion of details of at least 3 projects involving the installation of like sized audio/video systems that have been completed by the vendor in the last 2 years. Names, addresses, and phone numbers of references for the three projects shall be included.

## PART 2 - PRODUCTS

#### 2.01 FIRESTOPPING

- A. Each contractor shall be responsible for firestopping around their cables and the raceways.
- B. Shall be completed inside and around all conduits after cable installation.
- C. Firestop for the area between the cable and the edge of the conduit shall be Nelson No. FSP, CLK or LBS+. Contractor shall install the best firestop for each individual installation.
  1. Firestop shall be installed with regard to local and national building codes.
  2. The firestop shall be a putty like substance that expands under heat and will not allow flame to pass for a designated period of time.
  3. Firestop shall conform to all NEC, NFPA, and UL requirements.
  4. Some wall pass-thru' s are shown on the drawings. The Contractor shall utilize these where possible.



5. Where the contractor must install cables through a wall where there is no pass-thru already provided, the Contractor shall be responsible for installing a fire-rated pass-thru and fire-stopping the conduit after cable installation.
- D. Firestopping is required at all riser conduits and all pass thru's.
1. Each cable tray penetration of a wall shall be firestopped after cable installation. Use pillow type firestop to allow additional cables to be installed in the future.
  2. Where riser conduits pass through floors, the area between the concrete and the conduit shall be firestopped. This shall be completed with a putty or liquid firestop product. Fill in the space with mineral wool, and then install the firestop on top. All firestop shall be of sufficient thickness to secure the rating required by code.
  3. After final cable installation, install a putty firestop around all cables where they enter and exit conduit pass thru's and conduit risers.
  4. All firestop shall be installed to provide the fire rating as described by local fire code.
  5. It shall be the responsibility of the Contractor to verify that all conduits, walls, and raceways required to be firestopped have been firestopped.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Contractor shall be familiar with the location(s) where the work will be done. No additional compensation will be made for items the Contractor claims he was not aware of during bidding.
- B. Work Area:
  1. All work areas shall be cleaned at the end of each day. All debris shall be cleaned and removed from the site and disposed of in the approved container for the site.
  2. All equipment shall be moved out of common areas and stored in the Contractor's lay down area, or in other approved storage locations on site.
  3. Any work that is low hanging, or may otherwise impede the general use of the space, and cannot be removed, shall be flagged and cordoned off by the Contractor.
- C. All equipment and parts shall be installed in a neat and workmanlike manner. Good installation principles shall be used throughout the project.
- D. All cables routed above the drop ceiling or in the ceiling area shall be installed square to the building. Diagonal cable runs are not permissible.
- E. All cut edges of conduits, boxes, raceway, etc., shall be trimmed and filed so that no burrs or rough edges will damage cable as it is installed.
- F. All surface raceways, including conduits in exposed areas shall be painted to match the existing colors of the surrounding area.
- G. If, in the course of the work, the Contractor damages, marks, or misplaces any ceiling tiles, the Contractor shall repair, and/or replace the ceiling tile to the original condition.
  1. The Engineer shall decide if ceiling tiles have been damaged. Based on the Contractor's proposed fixes, the Engineer shall decide the best course of action to repair any damage done by the Contractor to the ceiling tiles.
- H. It shall be the responsibility of the Contractor to repair any damage done to the structure or finishes in the building by the Contractor. The building shall be returned to its original condition prior to final sign off of the project.
- I. Firestop shall be installed to meet national and local codes.

#### **3.02 DOCUMENTS**

- A. The Contractor shall fully read the contract documents including the detailed specifications, and the detailed drawings.
- B. No additional compensation shall be made for any portion of the project which the Contractor did not know of or understand prior to providing the bid response.
- C. In the case of any discrepancies between the detailed drawings and the detailed specifications, the Contractor shall provide the higher quality or more stringent requirement.

#### **3.03 WORK PLAN-POST BID (CHOSEN CONTRACTOR ONLY)**

- A. Along with the submittals the Contractor shall provide a work plan for the implementation of the telephone switch and data/wireless network. The plan shall include scheduled dates for major milestones, and all phases required for completion prior to final cutover.
- B. The work plan shall list all items that must be completed by the Contractor or Owner to provide a smooth install of the telephone system and data network. The Contractor shall be responsible for all costs associated with the planning and cutover. The Owners only responsibility is to act as a liaison between the Contractor and the users.
- C. The work plans shall include a time line and a cutover date for the systems within each building. Contractor shall be responsible for all aspects of scheduling the work, including notification of the users, the administration, and the telephone service provider.
- D. The work shall commence within 10 days of award of the contract. The Contractor shall be responsible for attending weekly project meetings at the Owner's site to report on progress and keep the project team informed of the work being done
- E. The work plan will be reviewed at each weekly meeting for compliance and updates.
- F. Work shall immediately begin on site surveys to determine the existing infrastructure and determining placement of new system electronics. The Contractor shall be responsible for moving, relocating, and reconnecting any and all existing equipment required for the installation of the new systems.
- G. After work plan and system approval by the Engineer the Contractor can begin work on infrastructure work that does not impede users.
- H. The Contractor shall be responsible for working with the Owner's Information Technology staff and administrators.

**END OF SECTION 28 1000**

## SECTION 28 5300 – CLASSROOM VIDEO

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Parts and equipment required for viewing video signals.

#### 1.02 SYSTEM DESCRIPTION

- A. Install an entire system for each classroom. Shall be a fully formed room and a completely connected system.
- B. Integrate with audio system as shown on the drawings.

#### 1.03 COORDINATION

- A. Coordinate the location of all LCD displays and projectors with the Owner and other trades prior to final installation.
- B. Coordinate with other Contractors who are doing work in the ceiling space. Coordinate the installation of all cables, projectors, monitors, etc., with the locations of other services.
- C. Verify all raceways in the walls with other trades prior to being onsite.
  - 1. Walk the building and ensure all raceways for the classroom AV system are being installed and sized correctly.
  - 2. If the contractor does not verify raceways then they shall install surface raceway to connect systems at no extra cost to the owner.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Approved vendors for video projectors are:
  - 1. Epson
  - 2. Others as approved prior to bid. Submit a question to the designer.

#### 2.02 VIDEO PROJECTORS

- A. Video projector Short Throw.
  - 1. The video projector shall have a minimum of 3500 ANSI lumens of light.
  - 2. Native Aspect Ratio of 16:10, Image native resolution of WXGA (1280x800) and shall resize UXGA, SXGA, SVGA, and VGA signals.
  - 3. The projector shall also support NTSC, PAL
  - 4. The unit shall have the following inputs/outputs as a minimum:
    - a. Video inputs, , RCA Composite,
    - b. HDMI x3
    - c. Ethernet Network
    - d. Audio in: 3.5mm x 2
    - e. Audio Line level output, 3.5mm
    - f. USB x2 for control and interactive connectivity.
    - g. 16 watt on-board speaker.
  - 5. Third party projector control shall be via an on-board RS-232 connection or LAN Connection.
  - 6. The projector shall be HDTV ready, and shall support 480i, 480p, 720p, and 1080i formats.
  - 7. Keystone correction shall be a minimum of 3 degrees.
  - 8. Each projector shall be supplied with a wireless remote control.
  - 9. Equip with mount for mounting above markerboard
  - 10. Non-interactive projector shall be Epson #685W
  - 11. Spare Bulbs. The contractor shall provide a spare projector bulb for each of the projectors installed as part of this project.
- B. Projector Mounts

1. All supports for projectors shall be appropriately sized and chosen for the exact model display to be supported.
2. Contractor shall match the weight of the display to the recommended weight rating of the support.
3. Contractor shall review the location where the support is to be mounted. Match the surface to which the display is to be mounted with the best attachment hardware available for the support.

## 2.03 LCD DISPLAYS

### A. LCD Display

1. LCD Display are existing in the Existing Middle School
2. These LCD's shall be moved to the new building by the owner. Contractor shall installed in the new classrooms
3. Equip each display with a new mount.

### B. LCD Mounts

1. All supports for LCD panels and monitors shall be appropriately sized and chosen for the exact model display to be supported.
2. Contractor shall match the weight of the display to the recommended weight rating of the support.
3. Contractor shall review the location where the support is to be mounted. Match the surface to which the display is to be mounted with the best attachment hardware available for the support.
4. All supports shall be by Chief Corporation or equal. Contractor shall submit each support for review by the Owner and Engineer prior to installation.
5. Wall Mount
  - a. Wall Mount swing-out mount shall be Chief Mfg. #TS525TU or equal based on display size

## 2.04 SWITCHERS

### A. HDMI Switcher 2 port with Audio De-embedder

1. Digital Switching: 2 HDMI Inputs to 1 HDMI Output
2. Resolution Support: SD, HD, and VESA up to UHD/4K (4096x2160/60/30/24 or 3840x2160/60/30/24)
3. Manages TMDS re-clocking / signal re-generation, HDCP source & display authentication, Hot Plug Management and EDID Control handshake
4. Audio De-Embedder: Supports de-embedded audio from the HDMI input and send it to external digital or analog audio outputs
  - a. Analog Audio: Via 3.5mm stereo port, supports 2 ch. Analog audio
  - b. Digital Audio via Coax/RCA: Uses SPDIF format and supports 2 ch. PCM, Dolby DTS
  - c. Digital Audio via Optical: Uses SPDIF format and supports 2 ch. PCM, Dolby DTS
5. EDID Control: Internal library with 16 default EDID configurations, including native EDID data for any Output/Display
6. Licensing: Fully licensed and compatible with all HDMI and HDCP technologies
7. Control: Pushbutton, IR Sensor, Serial IR, and RS-232 control
8. Switcher shall be Key Digital #KD-Pro2x1

## 2.05 CONTROLS

### A. The control panel shall be an IR and/or RS-232 control device equipped with a faceplate, backbox and programmable push-buttons.

1. Plate shall allow for multiple configurations.
2. Provide the correct buttons and blanks for a fully populated plate.
3. System shall be able to be programmed to control equipment based on IR and/or RS-232 controls.
4. Equip with one Programming Wand per site. Wand shall facilitate enhanced programming and configuration.
5. Control panel shall include the ability to learn from other remote controls.

6. Provide with all cables and other devices required for connecting the control panel to the devices being controlled.
  7. Control panel shall be Epson Pixie Plus #ELPSP10 or equal. Equip with the Programming wand,
- B. The AV Control system is existing and shall be moved to the new classrooms.
1. Mount onto the teacher lectern.
  2. Integrate existing network cables and network connection
  3. Wire as per the drawings.
  4. Provide and install new buttons on the button panel. Coordinate with SP controls and owner on how buttons shall be installed
  5. Contractor shall provide all connectivity and programming.
    - a. Setup a demo room and all connections.
    - b. Work with the owner to determine their required layout and button arrangement.
    - c. Configure the system and test and demonstrate.
    - d. Make any requested changes from the owner.

## 2.06 OTHER EQUIPMENT

- A. Perforated Metal Board.
1. Install the perforated metal board into the teacher lectern to mount all AV equipment to the board
  2. Board shall be metal and have perforation or slots for easy mounting of equipment.
  3. Shall be .5" deep and shall have rubber feet to keep the board in place
  4. Size the board as required to fit into the lectern and to mount all equipment
  5. Attach the equipment to the board with hook and loop straps or other mechanical attachment.
  6. Engineer the board so that it can be removed as one piece from the lectern for service.
  7. Board shall be Wiremold #ECB-SHELF

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Location of the LCD displays and projectors and other equipment shall be finalized throughout the building prior to installation.
- B. Locate all equipment to be installed, and make certain that space is available for maintenance and service during the life of the system.
- C. If any changes from the drawings are required, the Contractor shall submit a proposed layout of the displays to the Engineer for approval prior to installation.

### 3.02 PREPARATION

- A. Ensure that the wall where a display will be mounted can support the weight of the mount and the display.
- B. Coordinate with the Lighting Contractor on location of all displays. Ensure that lighting will not impede the viewing of the image.
1. Install supports to ensure that lights will not impede the image.

### 3.03 INSTALLATION OF DISPLAYS

- A. Projectors:
1. Projectors shall be installed where shown on the drawings. Contractor shall field verify the location of all projectors prior to final installation.
  2. When mounting the projectors to the ceiling, the Contractor shall verify that the mount is the correct size, and will support the weight of the projector.
  3. Contractor shall review the ceiling type where the projector will be mounted, and shall provide the correct ceiling adapter for the mount.
  4. Coordinate the installation of ceiling mounted projectors with the lighting installer. Light fixtures shall not impede the image of the projector.
  5. Install overhead projectors as high as possible in the ceiling, and no lower than 7 feet AFF.

6. Install projector to ensure a rectangular image. Do not install the projector at a location where the projector cannot compensate for the keystone of the image.
  7. Review the proposed location of the projector on the contract drawings and provide the required lens based on the screen size, and the distance from the screen of the projector. Verify with the Engineer prior to ordering.
  8. The projector shall be connected to the source via patch cables. The Contractor shall provide and install all patch cables required. These patch cables shall route to a faceplate in the ceiling.
  9. Contractor shall test that the projector works with the inputs, and that the remote control (if applicable) has batteries and works with the system.
  10. Contractor shall set up the projector so that the picture is clear and set the correct color, brightness, contrast, etc.
  11. Test the projector with all inputs. Provide image generator for each type of connection that the projector uses. The projector shall be tested with all other components of the audio/video system.
  12. When mounting the projector, the Contractor shall ensure that it is installed and secured to minimize the chance of falling and causing possible injuries.
  13. Contractor shall set up a time to review the installation with the Owner and Engineer. During the review, the Contractor shall demonstrate that each projector works and is installed safely and securely.
- B. Short-throw Projector:
1. Mount the projector to the wall above the markerboard.
    - a. Coordinate location with markerboard and ceiling tiles
    - b. Install all cabling from ceiling or from wallbox inside a nylon mesh for neat routing.
  2. Connect the projector to the power.
  3. Connect projector to all video and audio cables.
  4. If transceivers are being used then install them inside the projector mount or attach to the projector mount. Provide all patch cables required for complete connectivity
    - a. Connect the Ethernet network cable with a patch cable if the projector is so equipped. Identify the cable and the port it is connected to in the Ethernet switch.
    - b. Enter this data into a spreadsheet and provide to owner or network contractor for configuration of the Ethernet ports.
    - c. Provide and install patch cables at projector and at the comm room.
- C. Display Mounts:
1. Each display that is to be ceiling or wall mounted shall have a UL listed mount.
  2. Contractor shall match the display with the manufacturers recommended mount.
  3. Verify that the mount is rated to support the weight of the display.
  4. Install all mounts so that the display is not located in a main traffic way where persons might injure themselves by running into the mount or display.
  5. Ensure that the mount can support the weight of the display, and that the wall can support the combined weight of the display and the mount. Secure to the wall using appropriate supporting screws and lugs.
  6. Where attaching to a drywall wall, attach through or into the stud and not just through the drywall.
  7. When ceiling mounting a projector or display, provide the required length of pipe extension to meet the desired height of the display.
  8. Contractor shall ensure the safety of all persons by securely installing the correct mounts for each display or projector.
- D. LCD Displays and projector installation:
1. Displays shall be installed where shown on the drawings. Contractor shall field verify the location of all displays prior to final installation.
  2. When mounting the displays to the wall, the Contractor shall verify that the mount is the correct size, and will support the weight of the display.
  3. When mounting the display from a drywall wall, the Contractor shall connect into or through the wall studs. Attachment just into the drywall is not acceptable.

4. When mounting the displays to the wall, locate them to minimize the possibility that they will be in the path of persons walking near the unit.
5. Contractor shall verify ADA compliance with the installation of all projectors and displays.
6. The display shall be connected to the source via patch cables. The Contractor shall provide and install all patch cables required.
7. Contractor shall test that the display works with the inputs, and that the remote control (if applicable) has batteries and works with the system.
8. Contractor shall set up the display so that the picture is clear and set the correct color, brightness, contrast, etc. Install all display items so that glare from natural or manmade light is minimized for all those that will view the display.
9. When mounting the display, the Contractor shall ensure that it is installed and secured to minimize the chance of falling and causing possible injuries.
10. Contractor shall set up a time to review the installation with the Owner and Engineer. During the review, the Contractor shall demonstrate that each display works and is installed safely and securely.

### 3.04 INSTALLATION OF AV EQUIPMENT

- A. Lectern or Shelf or Teacher Desk connectivity.
  1. Install the lectern or shelf as noted on the drawings. This shall support all AV equipment.
  2. Locate at the correct point in the room. Locate close to the power and AV/data faceplates.
  3. Install all patch cables between all devices and the faceplates. See drawings for all connections required. No system shall be left un-connected.
  4. Install patch cables from the teacher faceplate to the teacher desk or lectern.
  5. Install through a mesh cable protecting raceway that is tied at each end.
  6. If there are two or more of the same type of cable, then the cables shall be a different color or they shall be labeled uniquely at each end with colored tape or with a typed label detailing its connectivity.
- B. Document Camera
  1. The document camera is existing.
  2. Mount the camera on the teacher desk or lectern.
  3. Fully install and connect the document camera.
- C. Switcher shall be mounted in the teacher desk or lectern or as shown on the drawings.
  1. The Contractor shall make sure that all cables attaching to the switcher are labeled with the item from which they route. The Contractor shall provide and install a permanent label for each of the buttons on the front of the switcher to show which input is connected to which button.
  2. The switcher shall be fully connected and interfaced with each input and output device. All connections shall be made, and tested prior to turnover to the Owner.
  3. The switcher shall be fully integrated with the control system (where so equipped). All functions shall be available through the control system.
  4. All settings on the switcher shall be set to provide the highest quality video and audio output.
  5. The Contractor shall test each input and each output for proper configuration. The testing shall be done while controlling the switcher locally as well as through the wireless control system. All aspects of the systems shall be tested prior to turnover to the Owner.
- D. Perforated metal board
  1. Attach all equipment to the board
  2. Size the board to fit into the lectern/desk
  3. Mount at edge of shelf in the lectern
  4. Meet with owner and configure the board as per the outcome of that meeting

### 3.05 INSTALLATION OF CONTROLS

- A. Control Panel.

1. The control system shall be installed as shown on the drawings. Provide all the appropriate push buttons in the plate.
2. Meet with the owner to determine the sequence of how the control panel should work and what it shall control.
3. Install all cabling and sensors/devices required to transmit the signal and control the devices that are to be connected.

**END OF SECTION 28 5300**



## SECTION 28 5350 – CLASSROOM AUDIO

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. This section provides specific project and Contractor requirements for audio systems in the classrooms and other general spaces
- B. Parts and labor required for installation and testing of classroom audio and video components and cabling.

#### 1.02 COORDINATION

- A. Coordinate the location of all speakers and the projector with the existing equipment in the ceiling. Take into account the lights and the other equipment when locating the speakers. Meet with the owner or their representative on placement of equipment in each room prior to installation.
- B. Speakers shall be installed in the ceiling to cover the most area. Speakers shall not be mounted to the outside edge of the room or near the edge of the room.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. The contractor shall provide equipment as required for a complete audio/video classroom teaching installation.
- B. Any and all baluns, patch cords, interface cords splitters and other equipment shall be provided and installed to provide complete connectivity.

#### 2.02 AUDIO CLASSROOM MIC AND AMPLIFIER SYSTEMS

- A. The audio amplifier is existing and shall be moved to the new lectern and classroom
  1. The amplifier is a Front Row/Calypso CA1000E
  2. It is equipped with a control panel and a breakout device.
  3. Move the existing system to the new lectern and install in the lectern
  4. Fully connect the system in the new lectern and classroom

#### 2.03 AUDIO SPEAKERS

- A. The Contractor shall conduct a field evaluation of each classroom prior to ordering the equipment and shall order and install the correct type of speakers based on the actual ceiling in each classroom Select one speaker choice from below:
- B. Drop Ceiling Speakers
  1. Ceiling Speaker (Provide four in each classroom)
    - a. Two-way speaker system
    - b. Driver Size: 6.5" driver; 1" tweeter
    - c. Frequency Response: 40 Hz – 20 kHz ± 6dB
    - d. Impedance: 8 Ω with Power Handling: 30 W
    - e. Tile Support: 20-gauge metal tile bridge
  2. Lightspeed DRQ or equal.
- C. Drop Ceiling Speakers, Type 1
  1. Speakers shall disperse the audio to cover the entire room.
  2. Provide the ceiling tile bridge for each speaker to support the speakers from the T-bar of the drop ceiling tile.
  3. Round ceiling speakers shall be capable of 70 volt or 8 ohm direct drive distribution.
  4. Drop ceiling speaker shall be provided with a removable baffle assembly with a backcan and safety tether.
  5. Speaker shall have a 4-inch low frequency transducer and a 1 inch tweeter.
  6. Power rating shall be 25 watts with multiple 70 volt taps.
  7. Pressure sensitivity of at least 88 dB SPL at 1 meter.
  8. Coaxial ceiling loudspeaker shall be Atlas Sound #FAP40T or equal.

- D. Open Ceiling, pendant Speakers: Type 2
  - 1. Description: two-way speaker system
  - 2. Driver Size: 4" with 1" tweeter
  - 3. Frequency Response: 70 Hz – 20 kHz
  - 4. Impedance: 1,2,4,8 and 16w at 70 volt and 8  $\Omega$
  - 5. Power Handling: 25 W
  - 6. Speakers shall be Atlas IED #PM4FA-WH. Check ceiling color prior to ordering

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Location of the audio components shall be finalized in each classroom prior to installation beginning.

#### **3.02 PREPARATION**

- A. The contractor shall meet with the owner to determine the installation schedule for the project. The owner will provide the contractor with dates when work can be completed in each building.
- B. Coordinate with the electrical contractor to ensure that they install the power outlet in the ceiling at the projector mount. This shall be identified in each room prior to installation.

#### **3.03 SITE REVIEW AND PLANNING**

- A. Classrooms have drop ceilings or open ceilings. Install the correct speaker type based on the ceiling of each room.
- B. All speaker cables shall route back to the teacher faceplate.
- C. The contractor shall visit each classroom where the Audio/Video systems are to be installed and shall also note any potential issues in each classroom that might impede the installation of the audio/video components.

#### **3.04 AUDIO ELECTRONICS INSTALLATION**

- A. The audio system shall be installed at the location shown on the drawings.
- B. The system includes cabling, speakers, microphone and the mixer/amplifier,
- C. Review the layout of the room and the existing lights and other items in the ceiling. Locate the speakers to provide the best coverage of the room with audio.
- D. Speaker cables shall be connected in series. One cable shall be used to connect the mixer/amplifier to the first speaker and then to the other speakers as per the drawing. Contact the manufacturer with questions about speaker and speaker cable connectivity.
- E. Connect speaker wires and all audio inputs to the mixer/amplifier. Adjust all inputs, outputs and audio controls to provide even sound between each input. Tune the system to provide clear audio without feedback. Speakers shall be placed with the idea of limiting feedback.
- F. When connecting speakers to the amplifiers, ensure the correct polarity throughout the system.
- G. Contractor shall label the volume control for each input. Labels shall be self-adhesive and shall be laser printed. Provide a sample label to the owner for approval prior to installation... All labels shall specify the device that dial controls. Handwritten labels are not allowed.
- H. After connection of the system, the Contractor shall configure all components to ensure the best sound possible.
- I. Contractor shall test each and every input and output of the system. Contractor shall have the Owner present for final testing and system checkout.
- J. Connect the control system to the main output of the amplifier.
- K. Mark the mixer for the optimal level and location each level control.

#### **3.05 SPEAKER INSTALLATION**

- A. Prior to ordering all speakers, field verify the ceiling type in each classroom. Order the correct speakers for drop ceiling rooms and hard ceiling rooms etc.

1. Review ceiling types on architectural drawings or walk the site if the building is existing.
- B. Ceiling speakers shall be mounted flush with the ceiling.
  1. Ceiling speakers shall be installed into the existing ceiling tiles. Contractor shall cut each ceiling tile and install the speaker with the tile bridge.
  2. Contractor shall work with the Owner to locate all speakers where other equipment will not impede the installation.
  3. Where the manufacturer provides a T-bar support for the speaker, the Contractor shall install the support in drop ceiling installations.
  4. Speaker wire shall not lie on the ceiling. All speaker wire shall route through J-hooks.
  5. The Contractor shall leave a coil of speaker wire in the ceiling to allow lowering of the speaker for maintenance and removal.
  6. The Contractor shall work with the manufacturer to determine the best layout of the speakers, and shall submit that layout for review prior to installation.
  7. After installation, the entire system shall be tested, and it shall be demonstrated that each speaker is connected and in good working order.
  8. It shall be further demonstrated that all audio can be easily heard throughout each room where speakers have been installed.
- C. Pendant ceiling speakers shall be mounted to the building structure and aimed to cover the room.
  1. Contractor shall work with the Owner to locate all speakers where other equipment will not impede the installation.
  2. Speaker wire shall not lie on the ceiling. All speaker wire shall route through J-hooks.
  3. The Contractor shall leave a coil of speaker wire in the ceiling to allow lowering of the speaker for maintenance and removal.
  4. The Contractor shall work with the manufacturer to determine the best layout of the speakers, and shall submit that layout for review prior to installation.
  5. After installation, the entire system shall be tested, and it shall be demonstrated that each speaker is connected and in good working order.
  6. It shall be further demonstrated that all audio can be easily heard throughout each room where speakers have been installed.
  7. Provide support cables to mount speakers at same height as lights and other devices in the room

### 3.06 MICROPHONE INSTALLATION

- A. Wireless microphones shall be installed to serve the entire room areas where they are installed.
  1. Locate the antennae for all wireless microphones so that the signal will be picked up from anywhere in the room that the microphone serves.
  2. Coordinate all outside and interior signals with any wireless microphone channels so that there is no interference.
  3. Connect the wireless microphone base receiver to the input on the amplifier/mixer.

### 3.07 AUDIO System

- A. The entire audio systems shall be configured to be a complete working system.
- B. The Contractor shall label each speaker cable at each end with a wraparound label that has been laser printed.
  1. The Contractor shall give each speaker wire a separate designator. The Engineer shall approve the proposed numbering prior to printing the labels.
- C. Each component shall be labeled for what it does and what it provides. Labels shall be laser printed, and shall be attached to the front of each unit.
  1. For example, the amplifier in a cabinet may be marked "Microphone Amplifier-First Floor Hallway."
- D. It is extremely important that each microphone cable be labeled at each end with a laser printed wrap around label. This will allow the Owner to know exactly which microphone is being connected.
  1. Where microphones are terminated, the Contractor shall provide a minimum of 3 feet of spare cable for future movements.

2. The Contractor shall provide the proposed labeling of the microphone cables prior to the actual installation of the labels.
- E. All speakers shall be set so that every area in the room where persons may stand or sit is covered with sound.

**END OF SECTION 28 5350**

## SECTION 28 5470 – AV CABLING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. This section includes parts and equipment required for installation, termination, and testing of user communications cables.

#### 1.02 SYSTEM DESCRIPTION

- A. Cabling and infrastructure shall be fully installed and connected and labeled.
- B. Products and installation detailed in this section shall comply with all applicable requirements.

#### 1.03 COORDINATION

- A. All cables shall be coordinated with the installation of the telecommunications raceways.
- B. Coordinate all cables with the furniture to be installed in the building. Make any adjustments prior to cable being installed.

### PART 2 - PRODUCTS

#### 2.01 UNSHIELDED/SHIELDED TWISTED PAIR CABLING

- A. Cabling
  - 1. Category 6 cabling shall consist of 4 pairs of unshielded or shielded twisted pair, 23 AWG cables.
  - 2. All CAT-6 cables shall be installed in cable tray or supported by J-Hooks.
  - 3. Individual pair shall be marked in the standard 4 pair color code of blue/blue-white, orange/orange-white, green/green-white, and brown/brown-white.
  - 4. Each cable shall be marked sequentially with the footage of the cable. Each cable shall also be marked with the manufacturer of the cable and the type of cable installed or the cable part number.
  - 5. CAT-6, 4 pair cabling shall be plenum rated unless specifically noted.
    - a. Cat-6 UTP Cables for Audio/Video Connectivity shall be:
      - A) Green in color, General Cable #7131806 or equal.
      - B) White in color, General Cable #7131801 or equal.
      - C) Black in color, General Cable #7131807 or equal.
  - 6. Ensure that cable passes all CAT-6 tests after installation.
  - 7. Where the transmission devices require shielded cable due to transmission speed or bandwidth, provide shielded cable per manufacturer requirements.
- B. Termination equipment
  - 1. CAT-6, 8-pin modular jacks shall be:
    - a. Data Jacks for Audio and Video connections shall be:
      - A) Panduit Minicom series. See drawings

#### 2.02 AUDIO CABLING

- A. Audio Cables
  - 1. Cable to be used for connection of the Audio between devices.
  - 2. Cables in the ceiling shall be plenum rated.
    - a. Where noted the audio shall be terminated onto the back of a connector at the faceplate.
    - b. Coordinate cable terminations with the devices to which they will connect.
    - c. Label each cable at each termination point for the device at the other end of the cable. Include port number.
- B. Speaker Wire:
  - 1. The Contractor shall size the speaker wire for the distance between the amplifier and the speaker, as well as the impedance of the speaker.
  - 2. Speaker wire resistance shall not exceed 7 percent of the speakers' impedance.

3. Speaker wire shall be no smaller than 18 AWG.
  4. Speaker wire shall be high conductivity, copper cable. Cable shall be of single pair, stranded construction. Cable shall be 2 parallel cables, black in color and 1 of the conductors shall be marked for identification at each end.
  5. Cable shall be a minimum of 99.95 percent copper.
  6. Provide plenum rated wire when the cable will route through a plenum area. Contractor shall be responsible for identifying plenum areas.
  7. Speaker cables for these systems shall be homeruns from the speaker to the terminal strip. There shall be no splices in the cable.
    - a. 18 AWG plenum Speaker cable shall be West Penn #25224B
- C. Line Level Audio
1. To connect audio equipment at line level the contractor shall provide cables for connection.
  2. Where bulk cable is used for phoenix style connectors the contractor shall provide single-pair stranded audio cable.
  3. Microphone cable shall be 24 AWG (7x32) tinned copper
    - a. Overall Shield with 100% coverage
    - b. Plenum rated cable shall be Belden #1801B
    - c. Non-Plenum shall be Belden 1800B
    - d. Underground Audio line-level cable shall be Belden #5500F1

## 2.03 VIDEO CABLING

- A. HDMI cables
1. Where cables route through a drop ceiling the cables shall be plenum rated.
  2. Cables shall be of sufficient size to carry the signal over the distance required.
  3. Cables to connect device to device shall be HDMI male to male.
  4. At the locations where the cables route into devices at the desk or shelf the contractor shall provide short, flexible male to female cables.
  5. Standard HDMI cables shall be no longer than 35'.
- B. Active HDMI cables
1. Where the HDMI cable will be longer than 35' the contractor shall provide Active HDMI cables or UTP/STP cabling and HDMI to CAT-6 transmitter/receiver.
  2. Video Standards shall meet or exceed All Single Link DVI and HDMI resolutions up to 3840x2160 @ 30 (4K UHD), Supports Deep color, xvYCC Color
  3. Bandwidth 10.2 Gbps max (or channel rate of 3.4 Gbps max)
  4. Aux Data Supports DDC for HDCP and EDID, CEC
  5. Audio Standards Supports PCM, Dolby, True HD, DTS-HD
  6. Powered from HDMI output device
  7. Plenum rated CMP-OF (UL) & LSZH
  8. Active HDMI cables, non-plenum shall be:
    - a. 35ft Active HDMI Cable CL3 rated, Quiktron #2101-41366-035
    - b. 50ft Active HDMI Cable CL3 rated, Quiktron #2101-41367-050
    - c. 75ft Active HDMI Cable CL3 rated, Quiktron #2101-41368-075
    - d. 100ft Active HDMI Cable CL3 rated, Quiktron #2101-41369-100
  9. Active HDMI cables, Plenum shall be:
    - a. 33ft Active Optical HDMI Cable Plenum Quiktron #2101-41370-033
    - b. 50ft Active Optical HDMI Cable Plenum Quiktron #2101-41371-050
    - c. 75ft Active Optical HDMI Cable Plenum Quiktron #2101-41372-075
    - d. 100ft Active Optical HDMI Cable Plenum Quiktron #2101-41373-100
  10. Mini-connector active HDMI cables for Small conduits.
    - a. These are combo fiber/copper cables that transmit HDMI signals
    - b. There are small connectors that can be used to pull thru conduits. Then apply the proprietary to HDMI caps after installation to connect devices.
    - c. Cables shall be ordered with correct length and shall be plenum rated
    - d. Cables shall be Hall Research #CHD-DExx where xx is the length.

## 2.04 PATCH CABLES

- A. Contractor shall provide all patch cables and gender changers required for a complete system.

- B. Provide all flexible connections for video HDMI connections where required to connect to a device and the long-distance HDMI cable is not flexible enough.
- C. All patch cables between devices that hard-wire between devices shall be labeled at each end detailing which device they connect to at the other end.
- D. Provide tabletop and device side patch cables for connection of all devices at the conference room tables etc.
- E. Patch cables shall be provided at each faceplate or tabletop device and all connections at the plate.

## 2.05 TRANSMISSION DEVICES

## 2.06 PLATES AND CONNECTORS

- A. Faceplate connectors for Audio and Video shall be provided.
  - 1. Faceplates shall be modular and shall support all AV and data connections as shown in the drawings.
    - a. Plates shall be custom made and mounted as required for complete connectivity
    - b. Label each faceplate for the device to which it is to connect.
    - c. See drawings for requirements of the faceplates
- B. Angled Table top box
  - 1. Each lectern shall have a custom mounted backbox installation for power and AV and control of the classroom AV system
  - 2. See drawings for extent of the boxes and faceplates
  - 3. Provide all parts of the angled boxes and the plates
- C. Custom AV Plate
  - 1. The contractor shall install a custom AV plate as per the drawings.
  - 2. Equip with the connectors and cables as required to pass all signals as per the drawings and design intent.
  - 3. Each plate shall be custom screen printed to show the type of connection and routing of the cable.
  - 4. Submit the faceplate design for review by the designer.
  - 5. Take note of the raceway the plate will be installed inside of and design to fit in the specified raceway.
  - 6. Shall be ProCo or equal.
- D. Cable covering Nylon Mesh
  - 1. To connect the faceplate on the wall to the desk or cabinet or other device install a flexible, semi-rigid, split braid.
  - 2. Install all AV and data cables thru through a nylon mesh cable cover.
  - 3. Mesh cover shall be flexible and shall be tie wrapped to the cables at each end.
  - 4. Nylon Mesh shall be Tech Flex #F6Nx.xx series or equal.
  - 5. Shall be White at the projector, black as it transitions from wall to desk or lectern.

## 2.07 CABLE INSTALLATION TOOLS

- A. All cables shall be supported in the ceiling a minimum of every 5 feet. Support can be provided by installing cable inside cable tray or conduit, or by installing J-hooks every 5 feet.
  - 1. J-hooks shall provide a smooth steel or plenum rated plastic, support for cables as they route through the ceiling.
  - 2. Steel supports shall have a galvanized finish.
  - 3. Steel, UL listed, ultimate static load limit 50 pounds rated to support Category 5e and higher cables, and optical fiber cables.
  - 4. If required, assemble to manufacturer recommended specialty fasteners, including beam clips and flange clips.
  - 5. Acceptable products shall be:
    - a. CADDY #CAT HP series with retainer hooks.
    - b. CADDY #CAT-CM SERIES
  - 6. Provide with interfaces and clamps required to support J-Hooks from the building structure.
  - 7. Provide threaded rod and associated hardware required to support all J-Hooks

- B. Firestopping shall be completed inside and around all conduits after cable installation. Firestop for the area between the cable and the edge of the conduit shall be Nelson No. FSP, CLK or LBS+. Contractor shall install the best firestop for each individual installation.
  - 1. Firestop shall be installed with regard to local and national building codes.
  - 2. The firestop shall be a putty like substance that expands under heat and will not allow flame to pass for a designated period of time.
  - 3. Firestop shall conform to all NEC, NFPA, and UL requirements.
  - 4. Some wall pass-thru's are shown on the drawings. The Contractor shall utilize these where possible.
  - 5. Where the contractor must install cables through a wall where there is no pass-thru already provided, the Contractor shall be responsible for installing a fire-rated pass-thru and fire-stopping the conduit after cable installation.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine all pathways prior to installation of all cables.
  - 1. Identify locations of all user conduits and backboxes prior to cable installation.
  - 2. Walk thru the building during construction and identify all boxes
  - 3. Coordinate installation of height of all boxes with the raceway installer.

#### **3.02 PREPARATION**

- A. Locate main path for all cables and install J-hooks where cable tray is not provided.
- B. Coordinate with other trades to install a clear, straight path down major corridors for the routing of user cables back to the communications closet.
- C. Meet with construction manager to understand timing of ceiling grid and drop ceiling tiles.
- D. Meet with electrical contractor to understand power installation schedule.

#### **3.03 AUDIO AND VIDEO CABLE INSTLLATION**

- A. All AV cabling shall be installed according to TIA/EIA 568 standards, including all updates and addenda.
  - 1. When installing AV cables, care shall be taken to avoid crimping or bending the cable past the manufacturer's recommended bend radius.
  - 2. During installation, the cables shall not be pulled across the ceiling tiles or the structure of the building. This may cause damage to the cable jacket.
  - 3. Adhere to all pulling tensions and bend radii during installation. Excessive pulling or bending can cause the cable to fail tests after installation. Any cable that does not pass the intended signal after installation shall be fixed or replaced at the Contractor's expense.
  - 4. All cables shall route neatly in the ceiling. Whether they route in cable tray or J-hooks, the cables shall be neat and orderly.
  - 5. Install J-hooks and other cable supports to support all cables for the AV systems.
    - a. In Gyms and cafeteria's, the contractor shall hide the speaker cable in the building steel whenever possible.
  - 6. Support all cables at a minimum of every 5 feet.
  - 7. Provide a short coil of extra cable where the cable enters the vertical conduit. The coil shall consist of no less than 1-1/2 feet.
  - 8. Provide enough slack in the backbox, to fully remove the faceplate and jack and allow work to be done on the cable.
  - 9. When installing cables in the communications room and AV cabinets, all cable shall route neatly through the cable tray and cable ladder and along the side of the cabinets.
    - a. Install cable routing panels in the cabinets and racks where required.
  - 10. When transitioning from the ceiling area to the rack or cabinet, all cable shall route through conduits or be attached to vertical section of cable ladder.
    - a. The Contractor shall provide the conduits shown and any additional conduits or cable ladder required to neatly transition cables from the ceiling to the rack.
  - 11. Cables shall route down each side of a rack for termination. Split each panel into 2 sides.



12. All speaker cables shall be terminated on a terminal strip.
  - a. Attach this terminal strip to the wall or to a panel in the rack.cabinet
  - b. Identify each speaker cables at the terminal strip and on each side of the strip
  - c. Install patch cables from terminal strip to the amplifiers. Label the speaker cable at the amplifier
13. When terminating cables, ensure that the smallest amount of jacket is removed from the final termination point of the cables.
14. Provide a service loop of the cables on the wall or to side of cabinet. The loop shall extend no less than 1 foot below the termination point on the patch panel. Route the cables 1 foot below the device, and then back up to the device. This will provide room for future moves and additions to the rack.
15. Each cable shall have a self-adhesive, self-laminating, laser printed label at each end. The label shall show the device the cable attached to.
  - a. Labels shall be installed no more than 4 inches from the termination point of the cable.

### 3.04 FACEPLATE/CUSTOM PLATE INSTALLATION

- A. Faceplates/custom plates shall be mounted straight and level with the floor and walls of the building.
  1. Jacks and/or connectors shall be terminated to the appropriate cable and inserted in the correct orientation into the faceplate prior to the mounting of the faceplate.
  2. Each connector shall have a laser-printed or engraved/painted label detailing what it connects to.
  3. Cable slack shall be stored behind the faceplate in such a way that allows the minimum bend radius of the cables to be maintained as per the following:
  4. Care shall be taken when mounting the faceplate to avoid crimping or kinking the cables.
  5. Equip with all connectors and pass thru's shown on the drawings.
  6. Provide a cutsheet on the custom plates as part of the submittal process. Get designer approval prior to ordering and labeling.

### 3.05 PATCH CABLE INSTALLATION.

- A. The contractor shall provide and install all patch cables and gender changes and baluns as required for complete system connectivity.
- B. Install patch cables from the table or floorbox to the tabletop for connection of the systems.
- C. Provide and install any DVI or Display port to HDMI devices for transmission of the AV signals
  1. Connect each device to the plate or other device with patch cables and interconnection cables.
  2. Keep all patch cables short where possible unless otherwise noted on the drawings. Large coils of extra patch cables are not required.
  3. Where there are two of the same type of cables routing to one device, provide different color cables or provide different color tape at each end of each cable.

### 3.06 LECTERN CABLING

- A. Teacher Lectern
  1. Each lectern shall be installed in the classroom and shall be equipped with all the equipment as shown on the drawings.
  2. Lectern shall be connected to the wall in the classrooms via the patch cables that are installed inside thy nylon mesh.
  3. At each school the faceplate shall be at the wall and patch cables shall route to the lectern for connection.
  4. Contractor shall connect all items including the PC to the audio and video equipment.
  5. Set all levels of audio equipment to optimum level. Mark all optimum levels.
  6. Ensure that the cables between the wall and the lectern in the school are as long as shown on the drawings and details.

### 3.07 CABLE MESH

- A. Nylon Mesh.
  1. At each lectern location, the contractor shall install the patch cables between the wall faceplate and the lectern inside a mesh cable sleeve.

2. At the projector install the cables from the backbox or drop ceiling through the mesh. Match color of wall when possible.
  - a. The contractor shall route all cables through the nylon mesh. This includes all data and AV cables.
  - b. Install the power cable inside the mesh.
  - c. Tie wrap the nylon mesh at each end.

**END OF SECTION 28 5470**

## SECTION 28 7200 – TECHNOLOGY SUBMITTALS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. This section provides the Contractor with requirements regarding Product Data Sheets, Shop Drawings and Product Samples collectively referred to as “Submittals”.
- B. This section provides the Contractor requirements regarding As-Built Documentation after installation and prior to Final Completion and Final Payment
- C. The requirements of this section deal only with those submittals that are required to be provided by the chosen contractor after bid award. No submittals in this section are required to be provided with the Bid Response.
- D. The requirements contained herein should be considered bound and apply to all technology and security specification sections per this contract.

#### 1.02 PRE-INSTALLATION SUBMITTALS

- A. The contractor shall provide material submittals to the Construction Manager or directly to the designer, whichever is managing the project.
- B. Prior to beginning work, the chosen Contractor shall provide PDF files of all material submittals.
  1. Highlight the part number of each item specifically. Submittals that are not highlighted will be rejected and sent back immediately.
  2. Include an Excel spreadsheet in .xls format to the designer for use in reviewing the submittals. Shall include all part numbers and manufacturers. Match camera submittals with the camera type on the drawings
  3. Provide an Excel Spreadsheet listing the following:

Description	Manufacturer	Part Number	Mark
Enet Switch	Rainbos	XR-243T	Cam type “CA”

4. Provide the PDF with the following file names
  - a. Site - Spec Section - Description
  - b. In Example: **Kent City 28 1600: Data Cabling submittal**

#### 1.03 AS-BUILT DOCUMENTATION

- A. The contractor shall provide As-Built documentation to the Construction Manager or directly to the designer, whichever is managing the project.
- B. Provide the As-Built in hard and soft copy
  1. Hard Copy shall include one or more three-ring binders that include all documents listed below. Include a cover page on the front of the binder(s) detailing the client, the project, date of submission and project name/number
  2. Soft copy on USB Drives (PDF or Microsoft Word or Excel) shall include all documents provided in the hard copy plus any configuration or data files. Include XLS files for all spreadsheets.

### PART 2 - PRE-INSTALLATION SUBMITTALS

#### 2.01 PRODUCT DATA SHEETS

- A. Product data sheets shall consist of the manufacturers detailed specification sheets or “cut-sheets” for each product that is to be installed by the contractor or any subcontractors.
- B. Product data sheets shall minimally include, but shall not be limited to:
  1. Part Number
  2. Manufacturer
  3. Description of the product
  4. Physical dimensions and characteristics of the product
  5. Picture or manufacturers drawing of the item, where applicable

6. Electrical characteristics of the product including heat-load for active electronics.
  7. Optical characteristics of the product for Fiber-Optic equipment and cable.
- C. Provide product data sheets for all equipment and cabling that is to be installed by the contractor

#### 2.02 SHOP DRAWINGS

- A. Shop Drawings shall consist of detailed drawings showing actual connectivity and cable types for the systems noted below:
1. AV Classroom Systems one-line connectivity
- B. Shop drawings shall also be provided for systems that the contractor intends to connect differently than what is shown on the contract drawings or where no connectivity is shown.

#### 2.03 PRODUCT SAMPLES

- A. Product Samples shall consist of a sample of the actual product that is to be installed.
- B. Samples shall be tagged with the part number and specification section to which it pertains.
- C. Product Samples shall be provided for the following:
1. None at this time.

#### 2.04 SUBMITTAL DOCUMENTS

- A. The Contractor shall provide all Submittals to the Construction Manager or the designer
- B. The Contractor shall provide PDF and Excel Files for all Product Data Sheets.
1. All Product Data sheets shall be PDF files grouped via specification section or drawings number
  2. The data sheets in the file shall be segmented to match the specification section and page number they pertain.
  3. The Contractor shall highlight the actual part number on the sheet of the component that they are submitting.
  4. If no part number is highlighted or marked with an arrow, then the entire submittal package will be rejected and sent back for re-submission.
  5. Contractor shall submit an electronic copy of the Excel spreadsheet with their data sheets that details the manufacturer, part number and common name of the products that they are submitting.
- C. The Contractor shall provide 1 set of PDF and one hard copy set of Shop Drawings.
1. Shop drawings shall be marked for the specification section of the bid documents to which they pertain.
  2. All shop drawings that are required to be drawn on the building background shall be provided on full-size drawings the same scale as those in the bid documents.
  3. All lines on the shop drawings shall be highlighted or completed in ink that is not the same color as that provided in the bid documents.
  4. The contractor shall provide a drawing legend detailing all symbols used in creation of the shop drawings.
- D. The Contractor shall provide one of each product sample required to be submitted.
1. Provide a cutsheet with each product sample detailing the specifics of the product and what it is proposed to be used for.

#### 2.05 SUBMITTAL REQUIREMENTS

- A. Submittals shall be provided for approval prior to installation of the work.
- B. Any equipment installed that does not have an approved submittal associated with it can and will be removed from the project and replaced with other equipment as defined by the Designer. All replacement costs shall be the responsibility of the Contractor.
- C. It shall be the responsibility of the Contractor to provide the submittals for review in sufficient time to not delay the installation. Work with the Construction manager on the schedule.
- D. It shall be the responsibility of the contractor to ensure they have provided and have on hand "Reviewed" or "Furnish as Corrected" submittals for all equipment they install.

## **PART 3 - AS-BUILT DOCUMENTATION**

### **3.01 MATERIALS**

- A. The Contractor shall provide the following to the Designer prior to the issuance of the final payment.
  - 1. Approved submittals and equipment user manuals.
  - 2. As-Built Documentation as detailed below.
  - 3. All spare parts and cover plates for all components of the systems
  - 4. Manufacturer warranty cards for all components.
  - 5. (2) spare of each kind of audio and video patch cable installed as part of the project.

### **3.02 AS-BUILT PROCESS**

- A. The Contractor shall provide all project as-builts to the designer at substantial completion.
  - 1. Provide them to the designer for review
  - 2. Make any required changes the designer requests
  - 3. Re-submit at the time of Final Completion / final payment. Final Payment is not possible without a complete post installation deliverable package

### **3.03 PREPARATION**

- A. All binders for As-Builts and test results shall be neat and clearly labeled with listing of the project and documents included in each binder.
- B. Quantity:
  - 1. Submit one (1) set of three-ring binder(s) with hard paper copies of project closeout submittals.
    - a. Provide a clear label or cover sheet with the following information:
      - A) Client name.
      - B) Project name.
      - C) Manual title (e.g., "Project Close-out Manual for security system upgrade").
      - D) Date; date format: <month> <day>, <year> (e.g., "January 1, 20xx").
      - E) Installer and General Contractor names and contact information
  - 2. Submit (2) USB Drives with all As-Built documentation.

### **3.04 PROJECT DELIVERABLES**

- A. Provide a copy of all submittals and manuals and pamphlets. Shall be separated by equipment type with dividers in the binders.
- B. All spare parts shall be provided in a box. The Contractor shall detail which component each spare part is for.
- C. The contractor shall provide one set of full sized as-built prints. Provide a PDF of the as-built prints on the USB drives.
  - 1. Provide a clean set of the latest drawings with red lines marked for all field changes or bulletins.
  - 2. Provide an AutoCAD file of the latest drawings that have been updated with ass as-built information. These drawings shall be generated from an AutoCAD file that is provided by the designer.
- D. The As-Built drawings shall include:
  - 1. Changes to be reflected on the drawings for Audio and Video Systems shall include:
    - a. Microphone/speaker faceplate locations and labels.
    - b. Changes to the schematic connectivity of any system shown on the drawings.
    - c. Ceiling/wall mounted projector locations
    - d. Label designation of all cables, including system interconnection cables.
    - e. Spreadsheet detailing serial numbers of all devices. Detailed with the room number where they were installed
- E. Documentation for the specific systems shall include. Provide the following for each system:
  - 1. Contractor warranty dates based on Substantial completion date and contact information for warranty work.
  - 2. Audio / Video Systems
    - a. Warranty certificate for projectors

F. Training sign-in sheets detailing what was trained, who was trained and their time in training.

**END OF SECTION 28 7200**

## **SECTION 28 7600 – TECHNOLOGY LABELING**

### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDED**

- A. This section provides direction on labeling of cables and devices.

### **PART 2 - PRODUCTS**

#### **2.01 CABLE LABELING PRODUCTS INTERIOR**

- A. Laser printed, self-adhesive wrap around labels for CAT- 6 and audio / video cabling user cables shall be Brady LAT-18-361 or equivalent.
  - 1. Label shall be 1.00 inch width x 1.33 inch high.
  - 2. Labels shall come on a sheet with 7 labels per row with a white and transparent matte finish.
  - 3. Sheet size shall be 8-1/2 inch x 11 inch.
  - 4. Printable area shall be a minimum of 1.00 inch width x 0.50 inch high.
  - 5. All labels shall be printed through a laser printer using labeling software.
  - 6. The Contractor shall submit a proposal for the labeling scheme for all audio and video wiring. The Engineer shall approve of the scheme prior to all labeling.
- B. Each of the audio and video components in the cabinet or rack shall be labeled.
  - 1. The labels shall have a white background with black, laser printed letters.
  - 2. Each label shall be large enough for 2 lines of text and wide enough to detail what each dial and component is for.
  - 3. Each input and output control point on the amplifiers and other equipment shall be labeled for the device to which it connects.
  - 4. Mark each volume or level control for the optimum setting.
    - a. Put a mark at the nominal input and output level for each control. This shall be useful for a new person to reset the system to work as designed if someone else has changed the settings.
- C. Laser printed, paper labels shall be used to label user faceplates.
  - 1. Individual paper labels shall be installed behind the clear plastic strips of all user faceplates and surface mount housings.
    - a. The labels shall show the location identifier number and letter of each individual cable.
  - 2. Where a faceplate or surface mount box does not have a clear plastic strip the contractor shall install an adhesive label on the plate or surface mount box showing the cable number of each cable in the plate.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Terminate all cables in proper color code sequence.
- B. Clean any surfaces where an adhesive label is to be installed.
- C. Prior to beginning the work, the contractor shall submit to the engineer a plan for labeling all the cables. This shall take into account to what components each cable is connected.

#### **3.02 GENERAL LABELING**

- A. Everything shall be labeled as per the specs and drawings.
- B. All labels shall be installed to more easily identify the cables and ports on all panels. If there are any questions regarding labeling, contact the Engineer prior to installation.

### 3.03 AUDIO/VIDEO LABELING

- A. The Contractor shall make up a spreadsheet listing each audio and video cable that extends from the cabinet/rack to a location within the building.
  - 1. The spreadsheet shall detail the number of the cable, the room it is located in, and the cabinet to which it routes.
  - 2. One line on the sheet shall show the results of the test. After being tested for continuity, and being tested that the cable delivers the required signal, the Contractor shall enter "PASS" into the result column.
  - 3. There shall be spaces for the name of the person doing the test, the date, and the company name.
  - 4. All information on the sheet shall be printed by a printer except the name of the person performing the tests, the date, and the "PASS" column.
  - 5. This spreadsheet shall be submitted to the Engineer and Owner prior to project completion.
- B. Each control, audio, video, speaker, and microphone cable shall be labeled with a self-laminating, laser printed label at each end. This includes all interconnection cables.
  - 1. The cables shall be labeled for the equipment that the cable connects. Consult with the Engineer prior to labeling.
  - 2. All speaker cables shall be marked according to their location in each room. Consult with the Engineer prior to labeling.
  - 3. Each video cable shall be labeled according to the equipment it connects to.
  - 4. The cable label shall be similar to the label below:

SPKR-1
SPKR-1
SPKR-1

- a. The above label details that this cable is the first speaker cable for the audio system. The same rationale will be used for speakers, video cables, etc. The Contractor shall mark all as-built drawings to show the microphone location or speaker that the label refers to. There shall be continuity between all labels and as-built prints.
    - b. Provide a sample label to the Engineer for approval prior to installation of all labels.
- C. Once the system is set up and running, many different people will be using the system. The Contractor shall label each audio and video component for what it does.
  - 1. In example, the mixers shall detail what microphones they mix. Do this by labeling each gain control dial on the mixer. The mixer would be labeled as "Microphone-Mixer in Incident room" or other similar label.
  - 2. For the description of all the components, consult with the Engineer. All labels shall be laser printed.
  - 3. The Contractor shall identify each item on the as-built connectivity drawings. Use the same identification as you do on the labels.

**END OF SECTION 28 7600**



## SECTION 28 7700 – TECHNOLOGY TESTING

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. This section provides direction on
  1. Testing of copper and fiber cable,
  2. Testing and commissioning of the technology systems

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Approved vendors for cable testers are:
  1. Fluke or equal

#### 2.02 TESTING PRODUCTS

- A. Category 6 cable shall be tested.
  1. Cable tester shall support Cat 6 channel and permanent link certification.
  2. Tester shall provide accuracy beyond TIA level III requirements traceable to laboratory reference standards.
  3. Through add on fiber optic probes, the tester shall be able to test multimode and single mode fiber cable.
  4. Test results shall be able to be stored on internal or removable compact flash memory cards.
  5. Tester shall have optional talk set for discussions over the cable being tested.
  6. Tester shall support a frequency range of 1-350 MHz with accuracy to the current proposed TIA Level III.
  7. Tester shall support the following tests:
    - a. Near end crosstalk (NEXT).
    - b. Attenuation.
    - c. Equal level far end crosstalk (ELFEXT).
    - d. Return loss.
    - e. Ambient noise.
    - f. Wire map shall identify miswires, shorts, opens, reversals, and split pairs.
    - g. Shall measure cable length and distance to faults (if any).
    - h. Propagation delay.
    - i. Loop resistance.
  8. Tester shall support the following test standards:
    - a. TIA Cat 6 and ISO Class E.
    - b. TIA Cat 5.
    - c. TIA TSB-95.
    - d. TIA Cat 3, 4 and 5 per TIA TSB-67.
    - e. UTP, STP, SCTP coaxial and twinax cabling.
    - f. IEEE: all Ethernet 802.3UTP and fiber PMD interfaces including 1000BASE-T; other 802.x PMD interfaces including token ring and demand priority.
    - g. ATM: All UTP and fiber PMD interfaces.
  9. Tester shall have all required probes and accessories required to perform CAT-6 tests and "Network Tests."
  10. Tester shall have been recently calibrated (within 4 months) and shall be utilizing the latest software.

#### 2.03 PUNCHLIST PROCESS

- A. The contractor shall be required to go through a punchlist process prior to substantial completion and final completion/payment of each project

- B. Contractor shall be responsible for reviewing their own work and checking to ensure it has met the project requirements.
- C. The contractor shall:
  - 1. Review your work in each room
  - 2. Review the specifications and drawing and review their work to ensure it meets requirements
  - 3. Create a punchlist document showing what work is not yet done and what as-builts are yet to be completed. Send document to designer.
    - a. Provide a date when contractor punchlist work will be completed.
  - 4. Schedule a punchlist and substantial completion meeting with designer.
  - 5. Present updated punchlist document to the owner
  - 6. Walk the site with the contractor and demonstrate all systems and review the work completed. Demonstrate how all work is completed
- D. Designer will create an "Owner Punchlist" document
  - 1. This will be provided to the contractor
  - 2. Contractor shall review the list, fix/upgrade/replace all equipment and cabling and finish work on the punchlist
  - 3. Return punchlist to the designer showing when the work was fixed/completed and a signature on the sheet showing that the contractor has reviewed each item.
- E. Meet onsite with the designer to review the finished work.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Testing shall be completed after fiber is installed inside the fiber patch panel and the fiber panel has been put together.
- B. All cables and panels where cables terminate shall be labeled with the cable label or name of each individual cable. Identify how each cable and panel will be labeled.

#### **3.02 CLASSROOM AV SYSTEMS**

- A. Classroom AV system testing:
  - 1. The Contractor shall make up a spreadsheet that will be used for testing the equipment and connectivity in each room. There shall be a separate piece of paper for each room.
  - 2. The spreadsheet shall include a list of the equipment in each room and the cables in each room. The contractor shall note the serial number of each of the active components on the spreadsheet.
  - 3. The spreadsheet shall also list each connectivity point and shall contain a space to note that each audio and video connection was tested and that it passed the test.
  - 4. Spreadsheet shall include space for noting who tested the connections and the date of the test. All information on the sheet shall be printed by a printer except the name of the person performing the tests, the date, and the "PASS" column.
  - 5. This spreadsheet shall be submitted to the Engineer and Owner prior to project completion. Shall be submitted showing that each piece was tested.
  - 6. After installation of all cables and components, the contractor shall test each cable and device to ensure that it works as intended.
    - a. Test that the remote works for the projector.
    - b. Test that the control system actually controls all items to which it connects
    - c. Test that the video input images are able to be seen on the LCD/projector and on the projection screen.
    - d. Test that the audio from each device is played through the speakers.
    - e. If so equipped, connect and demonstrate the document camera.
    - f. Pull down the projection screen and note that the image from the projector fully fills the screen.

- g. If the system is deemed to be in working order then the engineer shall sign a letter stating that the systems are Substantially Complete. The system is not Substantially Complete until a letter is provided to the contractor and owner.
- B. After substantial completion the systems shall be in good working order for a period of 30 days.
  1. In the event that the system or systems should fail or not work as required during the 30-day period, the Contractor shall be on site the same day to fix and configure the system to make it work as designed.
  2. A new 30-day period will begin as soon as the system has been demonstrated to be in good working order and the engineer acknowledges in writing that the system has been fixed and is again considered substantially complete.
  3. Once the system has been considered Substantially Complete and has been working for 30 consecutive days with no interruption in service, the system shall be thought of as "Finally Complete."
  4. Warranty shall begin immediately after the system is deemed Finally Complete.

**END OF SECTION 28 7700**

## **SECTION 28 7800 – TECHNOLOGY WARRANTY**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. This section includes directions for the Contractor regarding system and equipment warranties.

#### **1.02 SYSTEM DESCRIPTION**

- A. The project is not complete until all paperwork has been provided.
- B. The Contractor shall warranty his work and all the products installed for a minimum of 1 year from day of Substantial Completion.

#### **1.03 COORDINATION**

- A. Coordinate as-built drawings and records with the Engineer and Owner.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide manufacturer's warranty for all equipment installed
- B. Provide contractor warranty for workmanship and equipment
- C. Provide software upgrade protection (SUP) warranty as detailed in the specifications.

#### **2.02 MATERIALS**

- A. The Contractor shall provide the following to the designer at Substantial Completion and any updates prior to the issuance of the final payment
  1. Manuals and pamphlets on all electronic equipment.
  2. All spare parts and cover plates for all components of the network.
  3. Red lined set of as-built drawings for the entire project.
- B. Updated hard copy and soft copy of the As-Built Documentation. See associated spec section.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Contractor shall fully examine all components of the system to make sure that all manuals and paperwork are included in the final submittal.

#### **3.02 GENERAL WARRANTY**

- A. The Contractor shall warranty the installation and all the parts contained therein for a period of not less than 1 year after receipt of a completely signed copy of the Notice of Substantial Completion.
- B. This shall include each and every part, cable or software system provided as part of this project. This includes cabling, Networking, Wireless, Audio/Video systems and Access Control and Video Security systems.
  1. If any part is broken due to a manufacturing defect or installation defect, the Contractor shall fix and/or replace the broken item at their own expense.
  2. If any equipment loses connectivity or fails for any reason the contractor shall be onsite to diagnose and fix or replace equipment and upgrades software.

3. The Contractor shall also supply all configuration and programming necessary to keep all electronic equipment to the latest revision of software during the year.
  4. If the "system" goes down, and needs configuration to be brought back up, the Contractor shall be liable for any programming or reconfiguration.
  5. During the year, the Contractor shall make the Owner aware of any software upgrades that are available.
  6. Contractor shall install all software upgrades for that year or as detailed below for specific systems.
  7. If the system does not run well during the year the contractor shall be onsite to diagnose and fix the system.
  8. Warranty on existing equipment is not required
- C. The contractor shall be onsite within 24 hours after a call from the owner or designer regarding system or equipment issues.

**END OF SECTION 28 7800**