Bid Documents
For

TELEPHONE & AV SYSTEM UPGRADE

Onsted Community Schools
District Offices
10109 Slee Rd.
Onsted, MI 49265

Distributed by:

Contact Bret Emerson
616-863-8132
emersonb@commtechdesign.com

12/22/2023

SECTION 28 0500 – FRONT END

PART 1 - GENERAL

1.01 INTRODUCTION

A. Onsted Community Schools invites qualified contractors to provide proposals for a Telephone & A/v System Upgrade. This work includes:
   1. Bid Category #1.
      a. The base bid is the cost for the installation of Telephone System including 5 years of Licensing, all equipment, labor, installation, configuration and testing.
   2. Bid Category #2
      a. The base bid is the cost for the installation of all the audio and video systems including classroom AV system and cabling, cafeteria and gyms AV systems and cabling, etc. 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
bret@commtechdesign.com

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

Onsted Schools District Offices
10109 Slee Rd.
Onsted, MI 49265

1.03 BID RESPONSE DUE DATES

A. Bids are due on January 26, 2024 at 3:00PM electronically.
Email to the following:
Bret Emerson at bids@commtechdesign.com
Dustin Skeels at skeels.d@onstedschools.us

Email Title Shall say “Onsted Schools – Telephone & AV Upgrade - Bid Response”

B. A pre-bid meeting will be held on January 11, 2024 at 3:00 PM. Meet at:

Onsted Schools District Offices
10109 Slee Rd.
Onsted, MI 49265

C. All questions shall be submitted to the owner no later than January 15, 2024 at 3:00PM. All questions shall be sent via email to Bret Emerson of Commtech Design.
Bret Emerson bids@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 4:00 PM Monday thru Friday.
   1. Arrangements can be made for additional time on site during each day as scheduled with the owner.
   2. All work in the classrooms or hallway shall be completed during the summer or during non-school hours.
   3. No work activity shall disrupt the regular school day schedule or in any way intrude upon the teaching and administration of students.

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 – EMAIL PDF
A. The owner requires that all responses be a PDF document emailed to the following people:
   a. Commtech Design at bids@Commtechdesign.com
   b. Dustin Skeels at skeels.d@onstedschools.us
B. Bid response email format shall be:
   1. Email shall be titled: *Client Name -Project Name - Bidder Name* – **Response**
   2. Attach to the email a single PDF document that is all inclusive of your bid response. This document shall be considered your entire bid response.
   3. Send a second email with no attachment titled: *Client Name -Project Name - Bidder Name* – **Verification Email**
      a. **This will be used in case there were any issues with receiving the PDF file with the Response Email.**
C. Bid response PDF Format shall be:
   1. All bid responses shall be submitted on a combined PDF document. Document shall contain:
      a. First Page shall be cover page with project name and your company logo.
      b. Include fully filled out and signed Bid Form.
      c. Single-page synopsis of your bid.
      d. Familial Disclosure Form
      e. Iran Form
      f. Bid Bond (If supplying a check include a copy of the Cashier's Check. Owner may ask for physical check after the bid due date.
      g. Any other forms required in the RFP,
      h. Spreadsheet listing products being proposed.
      i. Description of the bidder's response and the services they will provide.
      j. Any information the bidder wishes to include that was not specifically required.
      k. Personnel that will be working on the project including:
         A) Project Manager. The direct client contact. Include a resume.
         B) List of proposed subcontractors and a scope of their work.

1.07 DOCUMENTS
A. The following drawings are part of the bid package.
   1. Refer to the table below to determine which drawings are included in each bid category. Some drawings refer to multiple bid categories.

DWG.	Drawing Name	Bid Category #1 Telephone	Bid Category #2 AV Systems
TC301	Telephone & AV Legend, Schedules & Details	X	X
TC302	AV Equipment Details		X
TC303	Telephone System Details	X	
TC401A	Onsted Elementary First Floor Plan Zone A	X	X
TC401B	Onsted Elementary First Floor Plan Zone B	X	X
TC401C	Onsted Elementary First Floor Plan Zone C	X	
TC401D	Onsted Elementary First Floor Plan Zone D	X	
TC401E & F	Onsted Elementary Second & Third Floor Plan Zone E & F	X	
TC411A	Onsted Middle Schools Floor Plan A	X	
TC411B	Onsted Middle Schools Floor Plan B	X	
TC411C	Onsted Middle Schools Floor Plan C	X	
TC411D	Onsted Bus Garage & Board Office Floor Plan	X	
TC421A	Onsted High Schools Floor Plan E	X	
TC421B	Onsted High Schools Floor Plan A	X	
TC421C	Onsted High Schools Floor Plan B	X	

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

1. The following specifications are part of the bid package.
   Refer to the table below to determine which specification sections are included in each bid category. Some sections refer to all bid categories:

Specification		Bid Category #1 Telephone	Bid Category #2 AV Systems
28 0000	Coversheet	X	X
28 0500	Front End	X	X
	Bid Form	X	X
	Familial Disclosure	X	X
	Iran Form	X	X
28 1000	Technology Overview	X	X
28 5402	Video Projectors		X
28 5405	Projection Screens		X
28 5450	Audio Equipment		X
28 5453	Audio Speakers		X
28 6100	Telephone System	X	
28 6120	Telephone Sets	X	
28 7200	Technology Submittals	X	X
28 7600	Technology Labeling	X	X
28 7700	Technology Testing	X	X
28 7750	Technology Training	X	X
28 7800	Technology Warranty	X	X

PART 2 - PERSONNEL

2.01 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.

2.02 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.

2.03 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 3 - WORK REQUIREMENTS

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

D. Contractor shall schedule any and all permit inspections required by the AHJ. Schedule these to support the owner occupancy date required by the owner.

3.07 PROJECT MEETINGS

A. The contractor shall attend project meeting as designated by the owner or engineer. Attendance is mandatory.

B. Meetings are a minimum of every two weeks onsite. Include these costs for attending project meetings with your bid.

C. Contractor will be required to attend additional meetings onsite or virtually when project timelines require.

PART 4 - WORK SCHEDULES

4.01 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 August 15, 2024

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 5 - DEFICIENT WORK

5.01 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 ownert 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 6 - GENERAL

6.01 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.

6.02 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.

6.03 PREVAILING WAGE

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

6.04 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.

6.05 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 if the following criteria are met:
   1. Note on the AIA invoice form that equipment invoice is for stored material.
   2. Provide a listing of all equipment that is being invoiced for and the quantity of each item.
   3. Provide pictures of the equipment/boxes that are being invoiced.

4. Provide proof of insurance on the building and equipment where the equipment is stored and that the owner is listed as additionally insured. Provide an Accord Form listing the owner as additionally insured.

C. The owner will provide payment on the invoice within 30 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 7 - REVIEW OF BIDS

7.01 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.

7.02 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.

7.03 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.

7.04 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 accident

   Or
   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

7.05 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

BID FORM

Onsted Community Schools
Telephone and AV Systems

Telephone & A/V Systems Upgrade
TO: Onsted Community schools
10109 Slee Rd
Onsted, MI 49265

Company Name: _____

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

Bid Cattegory #1 $ _____ (in numbers)
The base bid is the cost for the installation of Telephone System
including 5 years of Licensing, all equipment, labor, installation, configuration and testing
See specificaitons and drawings

Bid Category #2 $ _____ (in numbers)
The base bid is the cost to provide and install the audio / video systems including
Cafeteria AV system and Media Center AV system
Work shall include all equipment, cables, labor, installation, configuration, warranty and testing.

Authorized Signature: _____

Name (printed): _____

Date: _____

Email: _____

Telephone: _____

BID FORM

Onsted Community Schools
Telephone and AV Systems

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: _____

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 requried to fully describe intent. All alternates shall be completely inclusive and shall not require any additional work by other trades.

1. _____
Descripton

Add / Deduct (circle one) $ _____

2. _____
Descripton

Add / Deduct (circle one) $ _____

Unit Costs:
Provide pricing for the described work or the described product as a single unit cost.
The unit cost shall include any licensing, travel, equipment labor, overhead and tax required for purchase and installation of the product or service.

1 Provide, install and test one (1) telephone set Type A
Fully configure this and include all licensing and installation.

Unit Cost: $ _____

2 Provide, install and test one (1) telephone set Type C
Fully configure this and include all licensing and installation.

Unit Cost: $ _____

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

_____

_____

_____

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 Telephone & A/V System Upgrade at Onsted Community 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 – TECHNOLOGY 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 City of Marshall 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. Bid Category #1:Telephone System.

1. The contractor shall provide a new VoIP telephone system including equipment as detailed in the specifications and on the drawings.
2. Provide and configure all telephone sets and the telephone switching hardware.
3. Fully configure the systems based on the owner’s requirements. Meet with the owner numerous times to determine their requirements for installation.
4. Work with the service provider to order/change/install all incoming circuits at each building to serve the telephone system.
5. Patch all telephones to the cabling and patch at the switch.
6. Configure the existing Ethernet switching system to support the telephone system.
7. The extent of the work shall be as shown on the drawing and detailed in these specifications
8. Include 5 years of Licensing.

B. Bid Category #2: Audio and Video Systems

1. The audio and video systems in the building shall consist of but not be limited to:
   a. Large room 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

C. 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 PERMITS

A. The State of Michigan requires that the Contractor apply for and obtain permits for data telecommunication installation.
B. This is required under State of Michigan Public Act 230. The inspector at the State of Michigan states that the code never exempted data telecommunications from permits and previous rules had overstepped their bounds. Only exemptions to the permit requirements are found in Public Act 230 MCL125.1528a.
    1. There is not a license required to apply for a permit per Public Act 407 MCL339.5737(3)(o).
C. The Permit is required under Public Act 230. The permit is under 2017 Michigan Electrical Code rules Part 8.
D. People who can obtain the permit include the Owner of the building or a company representing the owner. See Public Act 230 MCL125.1510.
    1. Contractor shall be required to apply for and obtain the permit
    2. Contractor shall be required to install the data telecommunications system to fully meet all code requirements and requirements of the Inspector and Authority Having Jurisdiction (AHJ)
E. State inspector has noted that the inspection process for data telecommunications is the same as any other inspection.
    1. Do not cover or conceal any wiring without approval.
    2. Electrical Inspectors will be conducting the inspections.
    3. Contractor shall be responsible for scheduling the inspections and attending the inspections with the inspector
F. State inspector has noted that the inspectors will be inspecting for code compliance including manufacture's installation instructions for the cables and terminations.
G. An installation may not pass inspection if there is any Non-compliance with the code.

1.05 REERENCE 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. IEEE 802.3bt-2018 - IEEE Standard for Ethernet Amendment 2: Physical Layer and Management Parameters for Power over Ethernet over 4 pairs

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 –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.

1.08 CONTRACTOR –TELEPHONE SYSTEM

A. The Contractor shall show proof of an existing contractual relationship with the approved equipment manufacturer of the Telephone system and shall pass through the manufacturer's certification to purchaser.
   1. All components and hardware shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.

B. The Contractor shall accept complete responsibility for the installation, certification, and support of the system. Contractor must show proof that they have the certifying manufacturer's support on all of these issues.

C. All work shall be performed and supervised by IP Telephone Technicians and Project Managers who are qualified to install voice systems and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.

D. The 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 telephone system.

E. The vendor (including subcontractor(s) if any) shall have a proven track record in telephone system projects. This must be shown by the inclusion of details of at least three projects involving the installation of like-sized telephone systems which have been completed by the vendor in the last two 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.

E. Contractor shall provide a label at each penetration and firestop location detailing the UL rated fireproofing solution that was used in the specific application.
   1. Apply sticker to the wall near the firestopped conduit.
   2. Provide a sample of the label to the designer for review as part of the submittals.

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 Contractors 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 system they are installing. 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 system. 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 project meeting for compliance and updates.

F. Work shall immediately begin on site surveys to determine the existing infrastructure, conduit and raceway placement and determining placement of new system equipment. 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

SECTION 28 5400 – VIDEO PROJECTORS

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Parts and equipment required for video projectors and their connection to input devices.

1.02 SYSTEM DESCRIPTION
- A. Each projector shall be installed so that users can easily view the picture being presented.
- B. The video systems shall be installed to provide the easiest user interface possible.

1.03 COORDINATION
- A. Coordinate the location of all 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
- A. Approved vendors for projectors are:
  1. Samsung
  2. Panasonic
  3. Sony
  4. Epson
  5. NEC

2.02 VIDEO PROJECTORS-LARGE ROOM
- A. Video projector high powered for large room -1080 HD with 4K Enhancement
  1. The video projector shall have a minimum of 7000 ANSI lumens of light.
  2. Projector shall support native WUXGA (1920x1200) and shall resize other signals.
  3. The projector shall also support NTSC, PAL, SECAM, PAL/M, PAL/N.
  4. The unit shall have the following inputs/outputs as a minimum:
     a. HDMI x 1
     b. DVI x 1
     c. Computer: D-sub 15 pin x 1 or 5-BNC
     d. HDBase-T x 1
     e. Audio-in: Mini stereo x 3
     f. Network: RJ-45 x 1, 100 Mbps
     g. USB Type-A x 1, Type-B x 1
     h. Serial: RS-232c
     i. Monitor-Out: D-sub 15 pin x 1
  5. The projector shall be HDTV ready, and shall support 480I, 480p, 720p, and 1080i formats.
     a. Shall accept 4K image and resize to projector output.
  6. Light source shall be LASER
  7. Keystone correction shall be a minimum of 30 degrees horizontal., 45 degrees vertical.
  8. Lens shift with standard lens:
     a. Vertical: ±67 degrees
     b. Horizontal: ±30 degrees
  9. Each projector shall be supplied with a remote control.
  10. Projector shall be Epson #/L770U or equal.
  11. Open ceiling mount
      a. Provide a mount to match the projector and the actual location to be installed

b. Provide projector mount, Chief #RPMAU or equal. Equip with
c. Custom length downpipe
d. Ceiling mount to attach to the building structure. Chief Mfg. #CMA Series structural mount

PART 3 - EXECUTION

3.01 EXAMINATION

A. Location of the projector mounts 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. Coordinate with the Lighting Contractor on location of all projectors. Ensure that lighting will not impede the viewing of the image.
B. Coordination with other Trades:
    1. The Contractor shall meet with the Electrical Contractor prior to installation of the security conduits and boxes to ensure that the boxes to be installed by the Electrical Contractor meet the requirements of the security camera system.
    2. Coordinate power requirements in the communications room with other trades that will be installing equipment in the communications room.
    3. It is the responsibility of the Contractor to install additional pass-thru's if required for the installation of their work. Fire-stop each pass-thru according to code requirements.

3.03 GENERAL VIDEO INSTALLATION

A. The entire video system shall be configured to be a complete working system.
    1. Each cable shall pass the required video and audio signals.
    2. Each projector device shall be fully connected to all inputs and control cables.
    3. Each projector and signal processor and video source shall be set to maximize the video transmission and image quality so that they match the resolution.
    4. Test each input on each projector.
B. Provide all hardware and installation materials to support the video projector devices.
    1. Install custom unistrut and custom threaded rod from building structure to support all projector devices and projection screens.
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.
D. Projector mounts:
    1. Each projector that is to be ceiling or wall mounted shall have a UL listed mount.
    2. Contractor shall match the projector with the manufacturers recommended mount.
    3. Verify that the mount is rated to support the weight of the projector
    4. Install all mounts so that the projector is not located in a main traffic way where persons might injure themselves by running into the mount or projector.
    5. Ensure that the mount can support the weight of the projector, and that the wall can support the combined weight of the projector 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 provide the required length of pipe extension to meet the desired height of the projector.
    8. Contractor shall ensure the safety of all persons by securely installing the correct mounts for each projector.

3.04 INSTALLATION OF PROJECTORS

A. Standard Mount 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 wall or 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 keystoning 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.

3.05 TESTING (PRE-COMMISSIONING)

A. All systems shall be initially adjusted and set by the contractor, unless otherwise specified, in writing, by the Consultant or the architect.

B. A complete mechanical and electronic inspection to verify proper installation and operation shall be made, including mountings, interconnection, video scaling and sizing. Test procedures and documentation of results shall be provided with the system documentation.

C. procedures and documentation of results shall be provided with the system documentation.

3.06 COMMISSIONING

A. The video Contractor will provide a technician to assist the Consultant during the commissioning of the system. The technician will be ready and available to make any necessary adjustments or repairs to the system that the Consultant finds in error of the specification.

B. The Video Contractor will have on hand all installation documentation and equipment manuals. The Contractor will have the necessary tools available for any adjustment or repairs. Once the system is commissioned, the Contractor will provide final As-built documents to the Consultant for review.

END OF SECTION

SECTION 28 5405 – PROJECTION SCREENS

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Parts and equipment required for projections screens

1.02 SYSTEM DESCRIPTION
- A. Each projection screen shall be installed so that users can easily view the picture being presented.
- B. The screen shall be fully mounted into the ceiling or onto the wall or supported from the ceiling.
- C. Contractor is responsible for all miscellaneous hardware required for mounting.

1.03 COORDINATION
- A. Coordinate the location of all screen 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
- A. Approved vendors for video displays are:
  1. Da-lite
  2. Draper
  3. Other as approved

2.02 WALL MOUNT ELECTRIC SCREENS
- A. Wall mounted Electric screen
  1. Screen Operation: Electrically operated, UL and ULC listed, retractable with rigid metal roller
  2. Motor: Housed inside metal roller. Shall include automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting, and preset, adjustable limit switches to automatically stop viewing surface in the UP or DOWN positions.
     a. Type: 3-wire, permanently lubricated, reversal type designed for mounting inside roller and to suit project requirements.
     b. Voltage, Frequency: 115 V, 60 Hz.
     c. Amperage: 2.4 amps maximum.
  3. Electric Controls: Wall-mounted switch.
     a. Switch: 3 button type with cover plate for UP, DOWN and STOP functions.
  4. Screen Mounting: wall or ceiling.
     a. Include mounting hardware and roller mounting brackets that adjust to allow centering or offsetting of the screen within the case.
  5. Screen Case:
     a. Material: Extruded aluminum.
     b. Design: 2-piece with curved contour flat-backed style with heavy-duty end caps concealing roller ends.
     c. Finish: White powder coated.
  6. Acceptable Viewing Surface: Matte White
  7. Projection Screen shall be: Da-Lite #Contour Electrol Series or equal
  8. Screen Size: Aspect ratio 16:10 for any size.
     a. Contour Electrol
        1) 87” x 139”, 164” diagonal
  9. Include the following:
     a. Custom screen drop with Black fabric.
        1) Measure in field prior to ordering.

2) Minimum of 24”

b. Internal Low Voltage Control (LVC): for interface with Control system.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Location of the projection screens 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 or ceiling where a screen 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.

C. Coordination with other Trades:

1. The Contractor shall meet with the Electrical Contractor prior to installation of the conduits and boxes and power to ensure that the boxes to be installed by the Electrical Contractor meet the requirements of the projection screens
2. Coordinate power requirements at electrical projection screens with the electrician
3. Coordinate recessed screens with general trades contractor.

3.03 PROJECTION SCREEN INSTALLATION

A. Electric Projection screen

1. Coordinate provision of electric screens with locations of other wall and ceiling mounted components such as visual display boards, Acoustical Ceiling, Structural framing, light fixtures, air diffusers, ducts, and fire sprinklers to eliminate potential conflicts.
2. Coordinate installation of mounted screens with construction of suspended acoustical panel ceilings.
3. Install screens in accordance with approved shop drawings and manufacturer's installation instructions.
4. Install projection screens at locations and heights indicated on Drawings. Verify locations in field with Architect.
5. Operate each screen three times minimum. Ensure screens properly extend and retract and that screen is level and viewing surface plumb when extended. Adjust to correct deficiencies.
6. Electrical controlled screens shall be mounted in or from the ceiling. Where they are mounted flush in the ceiling the contractor shall install supports for the screen case.
   a. Connect the screen to the electrical circuit.
   b. Install the up/down switch and connect to the low voltage controller.
   c. Set stops on the screen to automatically stop at the exact location for the best image to be seen on the screen.
   d. Prior to ordering the contractor shall verify the black drop at the top of the screen with the architect.
   e. Where shown install a connection to AV control system.
   f. Install all cables for control. Mount controls where shown on the floorplans and details.
7. Where recessing a screen, measure opening and coordinate with general trades contractor about mounting and installation requirements.
8. Coordinate lights and other ceiling devices. Ensure there is no obstruction of the image from the projector to the screen. Relocate screen or projector at AV contractors

expense if there are obstructions that the AV contractor was not aware of prior to installation

9. Where mounting the screen from the ceiling or wall, coordinate the power connectivity with the electrician.
    a. Provide all unistrut, threaded rod and other cabling and supports to mount the screen at the owners desired height and location.

END OF SECTION

SECTION 28 5450 – AUDIO EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Parts and equipment required for audio enhancement and distribution.

1.02 SYSTEM DESCRIPTION
- A. The audio system shall be installed and configured to provide maximum coverage in each room.
- B. The audio systems shall be installed to provide the easiest user interface possible.

1.03 COORDINATION
- A. Coordinate the location of all racks, cabinets, and equipment with other contractors.
- B. Coordinate with other Contractors who are doing work in the ceiling space. Coordinate the installation of all cables, speakers, etc., with the locations of other services.

PART 2 - PRODUCTS

2.01 COMBO MIXER AMPLIFIER
- A. Mixer/Amplifier -400watt
  1. 6-input mixer with 400-watt amplifier
  2. 400W Into 25V/70.7V and 4Ω Loads shall include:
     a. Four Balanced Mic/Line/Tel Inputs w/ Phantom Power
     b. Two stereo summing Line Level Inputs
     c. Line Level output with rotary level control
     d. Shall include rotary input level control for each input
     e. Shall include rotary master output level control
     f. Remote Input Select (RIS)
  3. Shall be Atlas Sound #AA400PHD
     a. Equip with volume and control plate Atlas #WPD-RISRL

2.02 AUDIO DEVICES
- A. Rack Mount 1-Disc CD Player:
  1. The CD player portion of the installation shall be capable of 1-disc automatic loading. CD player shall be capable of:
     a. Integrated Ipod Dock
     b. Rack Mounting
     c. Play MP3, WAV
     d. Random and continuous play.
     e. Bluetooth Connectivity
  2. Rack Mount CD Player shall be TASCAM #CD-200BT or equal.
- B. Provide and install Line Level Audio Distribution Amplifier.
  1. RDL Labs #ST-DA3
  2. Equip with power supply, RD Labs #PS-24AS
- C. Audio extenders via UTP cable.
  1. Provide sending and receiving devices to send and receive audio signals via UTP cable.
  2. Provide and install all UTP cables.
  3. See drawings for transmitters and receivers. Provide a complete system.
  4. Where faceplates are to be provided, equip with coverplates.
  5. Install a receiver for the sending unit and connect as an input to the audio system.
  6. Install cabling from the receiver to the sending unit.

7. Connect to one of the ports on the audio mixer/dsp.
8. All cabling shall be plenum rated
9. Transmitters:
    a. Line level, 3.5mm audio input plate shall be RDL #DS-TPS7A or equal.
    b. Microphone level input plate, 3-pin XLR shall be RDL #DS-TPS1A or equal.
    c. Bluetooth sending unit shall be RDL #DS-BT1A or equal.
    d. Combination microphone 3-pin XLR and RCA audio line level input plate shall be RDL #DS-TPSL2A
10. Receiver shall accept the UTP cable and provide line level output to the mixer or DSP.
    a. Single line receiver shall be RDL #TX-TPR1A or equal.
    b. Two line receiver shall be RDL #TX-TPR2A or equal
    c. Three line receiver shall be RDL #TX-TPR3A or equal

2.03 WIRELESS MICROPHONES

A. Wireless Microphone Kits:
1. Wireless systems shall be based around the Audix R41 or R42 series receiver.
2. Equip with the following where required.
    a. AUDIX Antenna Amplifier/Distro for System #ADS48
    b. AUDIX External, Remote Directional Antenna #ANT-D360
    c. For antenna cable to remote antennas, use Belden RG6 UHF Cable #1829A for ANT-D360 Antennas
    d. Mount the Remote antennas up at the red iron to cover the entire room
3. Wireless Receiver shall have two channels or provide multiple single channel receivers.
    a. 32 MHz Wide spectrum tuning receiver
    b. 106 Pre-coordinated frequencies
    c. Up to 4 systems (8 channels) simultaneous use
    d. 21 dB Audio gain stage in 3 dB steps
    e. Internal antenna combiner for dual antenna operation
    f. 300’ (91 meters) Operating range
    g. 19” Rackmount chassis with front mount antenna kit shall be included
    h. Single Channel receiver shall be Audix R41 or equal
    i. Dual Channel Receiver shall be Audix R42 or equal
4. Bodypack shall be:
    a. 64 MHz Wide spectrum transmitter
    b. Precision metal housing
    c. Modular antenna design
    d. May be used with lavalier, head worn and instrument mics
    e. AF and RF gain control
    f. High contrast LCD display with group, channel and battery indicator
    g. Soft mute switch
    h. 10 Hour run time - AA batteries
    i. Provide (3) three sets of batteries
    j. Shall be Audix B60 or equal. Shall be compatible with receiver
5. Wired/Head worn wireless microphone shall consist of:
    a. (1) Audix #HT2 Professional head worn Microphone with Supercardiod capsule or equal
6. Lavalier wireless microphone. It shall consist of:
    a. (1) Audix #L5 Professional Lavalier Microphone with Cardioid capsule
7. Handheld wireless mic/transmitter shall be
    a. 64 MHz Wide spectrum transmitter
    b. Durable metal housing
    c. AF and RF gain control
    d. Modular and interchangeable capsule assemblies
    e. High contrast LCD display with group, channel and battery indicator
    f. Soft mute switch

g. 10 Hour run time - AA batteries
h. Shall be Audix #H60 or equal.

B. Wireless Microphone Extension Antenna.
1. Where required the contractor shall install an antenna in the room where the microphones are to be use.
2. All cabling shall be plenum rated unless noted otherwise.
3. When more than 1 wireless microphone will be used in the same room and the receivers are to be installed in a rack or cabinet, the Contractor shall provide an active antenna combining unit.
4. The antenna combiner shall be rack mountable.
5. Provide the correct antenna extension kit with the active combiner to place the antennas in the same room as the transmitter.

2.04 WALL MOUNT RACK

A. Wall Mount Cabinet:
1. The wall mount cabinets shall be black in color.
2. Cabinets shall provide adjustable 19-inch rack mounting rails.
3. Each cabinet shall have a center swingout feature that allows access to the front and back of equipment after it is installed in the cabinet.
4. Knockouts for different size conduits shall be provided on the top and bottom of the cabinet.
5. Swing side of the cabinet shall be reversible.
6. Each cabinet shall be no less than 23.5 inches deep.
7. 24” tall cabinet shall be Hoffman # EWMWG242425
8. Each cabinet shall be provided with the following hardware:
a. Plexiglas front door with lock.
b. Fan assembly mounted in the top of the cabinet. Hoffman #EWMF2
c. 6 position power strip with circuit breaker and surge suppressor.

2.05 RACK AND CABINET ACCESSORIES

A. Surge Protection and power strip.
1. This device will provide the only power on-off switch for the sound system.
2. All equipment mounted in the rack will be connected to this device.
3. No electronic device shall be powered from any non-protected power source
a. SurgeX, # SX1120RT 20A/120VAC;

B. Rack Mount drawer:
1. Drawer shall be mounted in standard 19 inch mounting rails.
2. Drawer shall be made of steel and shall be black in color.
3. 4-RU Rack-mount drawer shall be Lowell #UDEL-414.

C. Where required, provide a balancing transformer for Ipod connections. Transformer shall be RDL #TX-10B or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Location of the communications infrastructure shall be finalized in the communications room 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 communications layout to the Engineer for approval prior to installation.

3.02 RACKS AND CABINETS

A. Coordinate with all other Contractors and ensure that the locations of all cable tray and conduits are correct and will feed the rack system adequately.

B. Cabinets mounted to the wall shall be securely attached.

1. Where the cabinets are to be mounted to a wall, the Contractor shall first install a piece of plywood to be used to mount the cabinet on. Secure the plywood to the wall then secure the cabinet to the plywood and wall where possible.
2. Review the facilities above a cabinet prior to installation. When possible, cabinets should not be installed below water pipes or other facilities in the ceiling.
3. Mount the cabinet so that the top of the cabinet is not more than 7 feet AFF.
4. Check to make sure that the cabinet will be able to fully open from both hinges after installation. Change mounting location to accommodate the opening.
5. Install support wheels to the cabinet to support the weight of the cabinet when it is closed if the cabinet is 6’ tall or more.

3.03 AUDIO ELECTRONICS INSTALLATION

A. Contractor shall review design and building prior to ordering all components.

B. The Contractor shall be responsible for providing a complete system including all parts required for connectivity of all components.

C. All cables, connectors, supports, boxes, etc., shall be the responsibility of the Contractor.

D. The Contractor shall refer to the drawings for the installation notes and locations in the racks of all the equipment. If changes are required in the field, the Contractor shall submit the proposed changes in the form of updated rack/cabinet layouts. The Engineer shall have the final say on proposed changes.

E. All components required for a well-functioning system shall be provided and installed.

F. Interconnections between speakers and amplifiers shall be via terminal strips. Speakers shall not be directly connected to an amplifier. Terminal strips shall be mounted to the side of a cabinet, or to a piece of wood mounted to the back of the rack.

1. Provide self-adhesive labels for each of the speaker wires that come back to the terminal strip. Attach stickers to the area beside the terminal that the wire is connected to.
2. All wires terminated to the terminal strip shall have spade lugs attached. Size the spade lugs for the size wire and size of screw on the terminal strip.

G. When connecting speakers to the amplifiers, ensure the correct polarity throughout the system.

H. Contractor shall label all the volume, gain, etc., controls on all mixers and processors. The labels shall be self-adhesive labels. All labels shall specify the device that dial controls. All labels shall be laser-printed; handwritten labels are not allowed.

I. After connection of the system, the Contractor shall configure all components to ensure the best sound possible.

1. Contractor shall ensure that the correct speakers are connected to the correct output of the amplifier. This includes the surround sound processor (if applicable) and amplifier. contractor shall ensure that connections are made to each speaker.
2. Audio output shall be routed through the digital signal processor (if applicable) to limit the feedback noise to the speakers. Contractor shall consult with the manufacturer and ensure that the eliminator has been configured correctly.
3. Where a graphic equalizer is installed, the Contractor shall balance all the signals to provide the best sound possible. Utilize an acoustical tester.
4. All inputs such as CD players shall be integrated into the system. Utilize mixers and automatic mixers to combine microphones and other inputs.
5. Contractor shall test each and every input and output of the system. Contractor shall have the Engineer and Owner present for final testing and system checkout.

J. After installation, the Contractor shall provide as-builts and all component documentation.

3.04 MICROPHONE INSTALLATION.

A. Contractor shall install wireless microphones where shown on the drawings.
   1. Wireless receiving units shall be rack mounted.
   2. Where the receiving unit is not in the room where the transmitter is located, the Contractor shall install antenna extensions for each receiver.
   3. The antenna shall be mounted in the room where the transmitter is to be located. Install the extension cables and antenna as per the manufacturer's recommendations.
   4. Where more than 1 receiver is in the same rack/cabinet, the Contractor shall install an active antenna consolidator that has the capability to combine up to 4 receivers. This consolidator shall then have antenna extensions located in the room the users will be transmitting from.
   5. Contractor shall be responsible for all cables and connectors needed to connect antennas.
   6. Provide either a handheld wireless microphone or belt pack and lavalier/headworn mic with each wireless receiver. Refer to the drawings for the type of microphone to provide.
      a. Contractor shall match the transmitter frequency to the receiver frequency.
      b. Where multiple receivers are required, ensure that the frequencies are all different, and that there will be no interference from the local radio signals from TV stations.
      c. Label each receiver and transmitter for the frequency chosen.
   7. Contractor shall provide wind screens for all microphones provided.
   8. After installation, the Contractor shall demonstrate that each wireless microphone works at any point in the room that it serves. The Contractor shall further demonstrate that the microphones all can work at the same time without interference.
   9. All microphones shall have new batteries provided at the time of installation.

3.05 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.

3.06 TESTING (PRE-COMMISSIONING)

A. All systems shall be initially adjusted and set by the contractor, unless otherwise specified, in writing, by the Consultant or the architect.
B. A complete mechanical, electronic, and acoustical inspection to verify proper installation and operation shall be made, including mountings, interconnection, freedom from hums, buzzes, noise, and oscillation. Test procedures and documentation of results shall be provided with the system documentation.
C. All microphone and line level signal cables shall be verified for proper "Pin to pin" wiring. Example: Microphone cables; Pin 1 shall be Shield, Pin 2 shall be Positive (high or +), Pin 3

shall be Negative (low or -). Correct any irregularities and include documentation of results that shall be provided with the system documentation.

3.07 COMMISSIONING

A. The Audio Contractor will provide a technician to assist the Consultant during the commissioning of the system. The technician will be ready and available to make any necessary adjustments or repairs to the system that the Consultant finds in error of the specification.

B. The Audio Contractor will have on hand all installation documentation and equipment manuals. The Audio Contractor will have the necessary tools available for any adjustment or repairs.

C. Once the system is commissioned, the Audio Contractor will provide final As-built documents to the Consultant for review. These documents will reflect the true condition of the system after commissioning.

END OF SECTION

SECTION 28 5455 – AUDO SPEAKERS

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Parts and equipment required for audio speakers and speakers supports.

1.02 SYSTEM DESCRIPTION
- A. The speakers shall be installed and configured to provide maximum coverage in each room.
- B. Install to allow maintenance to all speakers.
- C. Each speaker in an open ceiling shall be equipped with an aircraft cable safety cable.

1.03 COORDINATION
- A. Coordinate the location of all racks, cabinets, and audio equipment
- B. Coordinate with other Contractors who are doing work in the ceiling space. Coordinate the installation of all cables, speakers, etc., with the locations of other services.

PART 2 - PRODUCTS

2.01 IN-CEILING SPEAKERS
- A. There are numerous type of speakers, and there are numerous applications for each of those speakers. The Contractor shall refer to the drawings and identify which speakers shall be installed for the most complete and well-designed sound enhancement system.
- B. Medium speaker -Drop ceiling mount.
  1. Speaker shall have a 6.5-inch low frequency transducer with a waveguide coupled 1” tweeter.
  2. Frequency response shall be 50 to 20,000 Hz at -10dB.
  3. Speaker shall have 70-volt transformer taps with 30 watts being the top end.
  4. Long term power handling shall be 80 watts with peak of 320 watts at 8 ohms
  5. Sensitivity shall be 90 dB SPL at 1 meter with 1 watt of pink noise.
  6. Speaker shall be fully enclosed with a screen-grill and shall be white in color.
  7. Each speaker shall be equipped with a mount and hardware that provides for its installation in the drop ceiling.
  8. Speaker shall be Electro-voice #C6.2 or equal.

PART 3 - EXECUTION

3.01 EXAMINATION
- A. Location of the communications infrastructure shall be finalized in the communications room prior to installation.
- B. Locate all speakers and ceiling types where speakers are to be installed, Review prior to ordering and provide correct speakers and speaker mounting hardware
- C. Where speakers are mounted from the ceiling or other structure the contractor shall provide all mounting hardware and misc. hardware.
- D. If any changes from the drawings are required, the Contractor shall submit a proposed layout of the speakers to the designer for approval prior to installation.

3.02 IN-CEILING SPEAKERS
- A. In-Ceiling speakers shall be mounted flush with the ceiling.
- B. The Contractor shall provide all equipment required to flush mount the speaker into the drop ceiling or plaster ceiling. Refer to reflected ceiling plan for ceiling type.

C. Contractor shall work with the Engineer and ceiling installer to locate all speakers where other equipment will not impede the installation.
D. Where the manufacturer provides a T-bar support for the speaker, the Contractor shall provide and install the support in drop ceiling installations.
E. Speaker wire shall not lay on the ceiling. All speaker wire shall route through conduit, tray or J-hooks.
F. The Contractor shall leave a coil of speaker wire in the ceiling to allow lowering of the speaker for maintenance and removal.
G. 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. The Engineer shall approve the installation prior to installation.
H. After installation, the entire system shall be tested, and it shall be demonstrated that each speaker is connected and in good working order.
I. It shall be further demonstrated that all audio can be easily heard throughout each room where speakers have been installed.
J. Contractor shall provide all speaker wire and connectors required to connect the system.
K. Ensure that all speakers have been connected to the correct amplifier.
L. For speakers in the commons area, the contractor shall install a safety strap that consists of an aircraft cable attached to the structure and the speaker housing.

END OF SECTION

SECTION 28 6100 – TELEPHONE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES
- A. Parts and equipment required for a complete Telephone System.

1.02 SYSTEM DESCRIPTION
- A. The owner requires a telephone system to serve their staff.
- B. The telephone system shall be a VoIP telephone system.
- C. Handsets shall be as per the specifications. Shall be IP and powered via Power over Ethernet unless specifically noted.
- D. The contractor shall consider the owner's needs, overall cost and overall usability of the system in presenting their solution as part of the bid.
- E. Entire Telephone system shall be installed so that access is provided to all components, for general maintenance and repair.
- F. All components of the Telephone system and the surrounding telephone system components and interconnects shall work together to form a cohesive and complete infrastructure.

1.03 COORDINATION
- A. Coordinate telephone system installation with the data networks and cabling systems.
  1. Install new cabling as required and as shown on the drawings.
- B. In these specifications the words "telephone system", "system" and "PBX" shall be interchangeable, and shall refer to the Telephone System and all its components.
- C. In these specifications the words "station", "telephone", "handset" and "set" shall be interchangeable, and shall refer to any telephone set.
- D. Service provider for telephone lines shall be referred to as "Local Exchange Carrier", "LEC", "Provider" etc.
- E. Coordinate with telephone signal service providers.

PART 2 - MANUFACTURERS

2.01 MANUFACTURED PRODUCT
- A. Manufacturer of the Telephone System shall be by:
  1. Mitel
  2. Cisco
  3. Sangoma
  4. Zultys
  5. Others as approved prior to bidding. Submit a requested equal and a description of how it will meet the requirements of the specifications.
     - a. An alternate system shall meet the specifications and requirements of the specifications and the owner. Contractor shall provide hardware, labor, software and configuration for a complete system that meets the specs.
     - b. Cloud-based solutions may be considered as part of the bid but the contractor shall include documentation of the recurring licensing and real costs for 5 years past substantial completion.
       - A) Any cloud based system must operate with the Existing PA system to allow announcements from a telephone, thru the Public Address (PA) system at each building.
- B. System and handsets shall be in current manufacture and shall not be scheduled for end of life for at least five years.
- C. The availability of support shall be guaranteed by the manufacturer for a period of no less than 5 years.
- D. All components of the system shall be newly manufactured products. Re-manufactured, refurbished or show-floor equipment is not permissible.

E. Each component of the Telephone system shall adhere to all ANSI, EIA/TIA, ISO, NFPA and NEC articles and standards that may apply.

F. The system shall be able to be mounted directly in standard 19" relay racks. The contractor shall provide all mounting hardware and racks required for a complete installation if the existing racks are not sufficient.

G. The system shall be installed with the latest revision of all hardware and software supported by the manufacturer; as of the date of the cut-over plan delivery.

2.02 INTERFACE REQUIREMENTS

A. The Contractor shall be responsible for all contact with the Owner's service provider for telephone service to serve the new system.

1. The Contractor shall work as the Owner's agent regarding the installation and provisioning of cables and circuits required for the connectivity of the telephone switch to the Public Switched Telephone Network.
2. A limited Letter of Agency will be provided by the Owner for the period of the negotiations and provisioning.
3. The Contractor shall be responsible for any and all placing of orders and requests for removal or transfer of all new/existing DID numbers, Hunt groups, SIP (Sesssion Initiated Protocol) trunks, etc.
4. Any additional trunks, circuits or lines required for the implementation of the new telephone system shall be completed by, scheduled and coordinated by the Contractor.
    a. All costs for the SIP/cloud trunks and circuits shall be paid by the owner outside of this project.
5. Contractor shall fully review the owners existing bill and determine all incoming lines for the telephone system.
    a. Determine which lines are in use and which are not in use.
    b. Provide the list of incoming lines to each building and create a spreadsheet detailing the lines and their associated numbers.
        A) Work with the owner to determine what device or devices are connected to each incoming telephone line.
    c. Work with the owner to cancel the lines that are not required or are not in use.
    d. Create a final list of the incoming telephone lines and what they are connected to after the final cutover to the new telephone system.

2.03 TRUNK REQUIREMENTS

A. The telephone system provided shall be capable of multiple incoming trunks and transmission capabilities for incoming and outgoing calls.

1. All cables, components, software and other equipment required to connect the trunks from the Local Exchange Carrier (LEC) or cloud carrier shall be provided, installed and configured by the Contractor.
2. Trunks shall be provisioned to provide caller ID on all incoming and outgoing calls.
3. Connections to the incoming trunks shall be configured to provide E911 information exchange. This shall meet the State of Michigan's E911 requirements.
    a. All 911 calls at each building shall be directed out and shall include the E911 required data.
    b. In the event of an internet or network failure, the 911 calls shall be directed out the dedicated cellular dialer.
    c. A cellular dialer shall be installed at the Elementary School and shall be connected to the telephone system to direct outgoing 911 calls if there is an internet or trunk outage.
    d. This shall send all address information about the building to the 911 operator.
    e. System shall send specific location information to the 911 operator for identification of where the call is originating. Detail down to room # level.

B. Connections between the owner's telephone system and the LEC (local Exchange Carrier) / PSTN shall be through Session Initiated Protocol (SIP) trunks that are delivered via the owners' internet connection.

1. Coordinate SIP trunks with the owners' chosen provider.
2. Configure the telephone system to support the SIP connections.

2.04 TELEPHONE SYSTEM REQUIREMENTS

A. Provide rack mounting equipment for the telephone system and all telephone system appliances. Mount in the rack in each communications room.

B. The Contractor shall provide all power supply systems for the telephone appliance.
   1. The Owner shall provide the AC power via local receptacle panel to the rack.
   2. Contractor shall provide a Uninterruptable Power Supply (UPS) for the telephone system equipment itself.
      a. See drawings for UPS quantity and location.

C. All power for IP telephones shall be provided by the Ethernet switches.
   1. Ethernet Switches are provided and installed by the owner. Configure the switches to support the telephones.
   2. All telephones shall be fully PoE 802.3af compatible and shall not require power "bricks" at the telephone handsets.

D. The telephone system shall be capable of connecting the quantity of telephone sets as shown on the drawings plus an expansion factor.
   1. Quantity of telephone sets shall be as shown on the drawings plus :
      a. One (1) type A telephone sets
      b. Five (5) type C telephone sets

E. The telephone system shall have the following general characteristics:
   1. Configuration and memory of the system shall be backed-up immediately after configuration. The memory of the system shall be stored and shall not be lost even in the event of a prolonged power outage.
   2. The System shall be Computer Supported Telephony Application compliant.
   3. Internal and external calls shall be able to be transferred within the system without assistance from the attendant.
   4. If a caller is calling outside the system, and the primary line on their phone is busy, then the call shall be routed over the secondary line (if so equipped) on their phone.
   5. Changes and updates to the system shall be made from one location, and shall be transmitted to all telephone system nodes immediately.
   6. Maintenance of the system shall be capable via the Internet when the owner opens up a connection for the vendor. The changes shall take effect immediately, and shall be stored in memory immediately.

F. Switching Capabilities
   1. The overall design of the telephone system shall be that of a distributed switching system that utilizes the data network for call transfers and routing.
   2. The telephone system shall be a modern, vendor supported, computerized telephone switching system. Support is required for hunt groups, voice Mail and three, four or five-digit dialing between all stations.
   3. Telephone system shall have an Internet Protocol (IP) interface for connectivity to extended IP functionality for control and service.
   4. Telephone system shall be capable of accepting:
      a. IP services connections for incoming and outgoing calls
      b. SIP trunks for incoming and outgoing calls
      c. See drawings for connectivity required.

G. IP Switching capabilities.
   1. The telephone system IP interface shall be configured to connect to the existing data network. The Ethernet interface shall support:
      a. Auto-negotiation and manual configuration of Ethernet connectivity.
      b. Auto-negotiation and manual configuration of duplex setting (full vs. half).
      c. VLAN tagging (802.1Q)
      d. Prioritization tagging (802.1p)
      e. DSCP (DiffServ) packet marking
      f. VLAN Support for handsets and interface to the data network.

2. The telephone system should support SIP (Session Initiation Protocol) and H.323 based call control.
3. The telephone system should support Real Time Streaming Protocol (RTSP) for the transmission of packetized voice data.
4. The telephone system shall allow for both gateway-based and direct phone-to-phone based IP calls.
5. IP phones shall be able to attach to the telephone system via an Ethernet switch and route calls through the telephone network.
    a. Changes to the system configuration shall be made directly or via an IP attached PC.
    b. Changes shall be made efficiently and easily. The Owner technicians shall be able to generate a work-order and make configuration changes without input from the vendor or Contractor, only after cutover.
    c. All cables, PC's, Terminals, Connectors, software and configuration required to make the telephone system work as described shall be provided and installed by the Contractor.
6. Telephone system shall support wireless telephone handsets that are connected to the 802.11x wireless network.
    a. See specifications/drawings for quantity of wireless handsets required.
7. Telephone system shall support "soft" phones on PC's, laptops, tablet devices and smartphones.
    a. See specifications for quantity of softphones required.
    b. Softphones shall include applications that run on a standard smartphone that allow the user to emulate their desk phone and receive desk-phone calls on their smartphone.
8. Mobility of the telephone system shall allow any user to log-in at any handset throughout the system and all calls will be routed to that handset.
    a. The connection of the user's unique extension number shall remain at that handset until:
        A) Person logs out
        B) Person logs into another telephone
        C) Telephone handset connection is reset by the administrator.
9. A user shall not be required to log into their telephone each day. Once a handset is set for a particular user that handset shall default to that extension and user name.

H. Call records shall be generated for each incoming and outgoing call. Including calls between stations.
1. The call records shall be kept in the system for no less than 6 months.
2. All call details for outgoing calls shall be kept and output from the system at the request of the administrator. The following information shall be available in a logical, structured report.
    a. Date and Time the call was initiated.
    b. The number called.
    c. Number of the station where the call was initiated
    d. End time of the call.
3. The information gathered during calls shall be able to trace a call's path through the system from its start, to its exit of the system. The following shall be contained in the records of the calls:
    a. Caller's Name
    b. Caller's Authorization code
    c. Caller's station code
    d. Number called
    e. Port on the switch
    f. Trunk port used
    g. Length of the call
4. All the information gathered via the Detail Call Recording shall be able to be searched and sorted by the administrator. The following shall all be searchable categories.

a. Station code
b. Caller's name associated with that station
c. Time call was initiated
d. Length of call in minutes
e. Outgoing trunk group
f. Area Code called
g. Local or long-distance call
h. Internal department the station is associated with

5. Separately, the system shall be able to keep specific statistics on the attendant console, such as:
   a. Total number of calls handled
   b. Average time caller is in queue
   c. Average time caller is on hold
   d. Total call hang-ups after being in queue
   e. Total call hang-ups after being on hold
   f. Configure the system to generate a custom report each month for each entity. Work with the owner to determine the information to be included in the report.

I. Data Networking Interface and configuration.
   1. All connection to the IP telephones shall be via a Power over Ethernet (PoE) switches
   2. The contractor shall be responsible for configure the switches for the owner to support the Quality of Service and VLANS for the telephone system.

J. Music on hold
   1. The telephone system shall support music on hold at the headend.
   2. Configure the system to support customized audio feed from the owner or outside actual music. Consult with the owner during configuration.

K. Incoming/Outgoing lines control
   1. The telephone system shall be capable of accommodating direct inward dialed numbers for each handset.
   2. Telephone system shall be capable of blocking any and all area codes, numbers, long-distance and other services on a station by station basis.
   3. System shall allow the owner to choose to implement dialing codes so that local and /or long distance
   4. System shall allow the owner to block specific incoming telephone numbers.

L. Telephone system shall have a directory of all the people on the telephone system and the users shall be able to call a person in the directory by just clicking or choosing their telephone number.
   1. Directory shall be available on the telephone and on the user software on the PC.

2.05 VOICE MAIL

A. The voice mail shall be an integrated system with the telephone system.
   1. Voice mail shall be retrievable through a one–touch button on each station set.
   2. When a user has a message in voice mail, the system shall show a message waiting light on that user associated telephone.
      a. Message waiting light shall be able to be muted or not initiated. This shall be a phone-by-phone basis
   3. The Contractor shall supply all hardware, cabling, software and configuration required to integrate the voice mail system into the telephone system
   4. Voice mail system shall receive calls forwarded directly from the attendant, or from the no-answer of any user that has a voice mail box.
   5. All calls shall be answered with the individual user's pre-recorded message.
   6. The system shall have an adequate number of interfaces so that users never receive a busy signal when trying to leave or retrieve messages.
   7. The system shall allow for voice mailboxes for users that do not have a physical phone set associated with them.
   8. Voice mail system shall be backed up by the same UPS system that powers the telephone system.

9. The voice mail system shall be capable of interfacing with an E-mail system to deliver voice messages to users through their E-mail account.
    a. Integrate with Google Gmail
10. Loss of power shall not cause loss of system configuration or messages stored for users.
11. Provide the quantity of voice mail boxes to meet the quantity of telephones provided plus all future growths of the system as described previously.

B. Each user of the system shall be able to have a 15-second greeting.
1. After the greeting, the user shall be able to leave a message no longer than two minutes.
2. Total storage for each mailbox shall be one hour.
3. If a user's mailbox is full, the caller shall get a message stating that the user's mailbox is full and then the call shall be forwarded to the attendant.

C. Messages shall be retrievable either internally or externally to the system.
1. Authorization codes shall be able to be required for access to voice mail when the user is not calling from their own station set.
2. Each user shall have the option of adding an authorization code to access their voicemail from their desk. The access code shall be retrievable by the attendant or administrator
3. Messages shall be saved automatically if they are not deleted after the user retrieves the message.
4. Important messages shall be able to be saved indefinitely if the user chooses to save the message.
5. UN-deleted, UN-saved messages shall be deleted from the system an owner specified period of time. Shall be able to be kept a minimum of two months.
6. Each user shall be able to forward any message to any other user

D. The Voice Mail system shall be capable of integrating with the E-mail system to deliver Voice mail messages through your E-mail account.
1. System shall be able to send a link in the email or a .wav file (or equal) in the email system.
2. Work with owner to determine how they would like their voice mails sent and configure the system as such.

2.06 AUTO ATTENDANT

A. The voice mail system shall have an automated attendant feature that is an integral part of the system. There shall be the ability to have multiple auto attendants' appearances based on the incoming telephone line/number.
1. The auto attendant shall greet each user, then the user will be given choices on which department to be connected to, or they can directly dial any extension
2. If the user does not choose an extension or department, the user should hold and they will be directed to the operator.
3. The attendant shall have a listing capability that allows the caller to dial the first three letters of a person's last name. The system shall prompt the user with a name, and ask if this is the correct person. If it is, then the attendant will provide the name and extension number of the person being called, finally it will forward to that persons extension.
4. The attendant shall be able to direct the caller to each user, or to a general mailbox.
5. There shall be a minimum of three separate greetings available. One for workday operation, one for night operation and one for other operations as required.
6. The system shall be capable of having a user remotely change the greeting and/or the greeting shall automatically change on a time schedule.
7. In addition to the above, the Auto Attendant shall have the following characteristics:
    a. Relay paging
    b. Call queuing with up to 99 on-hold messages and 99 return to caller messages
    c. External transfer which supports up to 50-digit external phone numbers
    d. Transfer of outside callers to internal extensions

e. Transfer to operator for touch-tone and pulse-dial callers
f. Listen-only information mailboxes
g. Multi-level custom menu capability for single-digit dialing to extensions, mailboxes, or information
h. Automatic or manual day/lunch/night and holiday modes with separate greetings and menus
i. Per mailbox menu programming
j. Per trunk menu programming
k. Per line menu programming
l. System prompts and informational messages easily recorded/changed through telephone

2.07 SOFTWARE AND HARDWARE SPECIALTIES

A. User interface software
1. The system shall provide for each user to be able to control all aspects of their telephone either through the telephone itself or through PC based user software.
2. The software shall allow the user to:
a. Integrate their existing Microsoft Outlook or Google Contacts with the telephone system to allow calling by clicking on a user in their connections window.
b. PC based Telephone controls such as initiate calls, direct incoming calls to voicemail.
c. Make custom calling directories and groups.
d. Instant messaging
e. Easy setup of conference calls

B. Conference Calling
1. The system shall allow for no fewer than six (6) internal or external calls to be connected to make a conference call.
2. System shall be able to have phone number that users can call into and be added to the conference call.

C. Unified Messaging
1. The owner requires that the system provide unified messaging to all the telephone users. The tasks required shall include but may not be limited to:
a. Sending an email to individual users to alert them that they have a voice mail message. The email shall include a link to the actual voice mail file on the voice mail server or the .WAV file of the voice mail itself.
b. The owner may or may not want voice mail files to be sent and stored on the email server. This shall be a configurable solution on the telephone system.
c. Once a person listens to the email through their computer or through their telephone the message waiting light shall be extinguished.

D. Active Directory integration
1. The telephone system shall provide for active directory integration so that a single-login to the data network shall facilitate the connection of that PC to the user's telephone system control software.

E. Multiple user login to a telephone
1. System shall support multiple telephone/extension numbers to be associated with one telephone handset.

F. Attendant software
1. The system shall provide for an enhanced call control interface for secretaries and group leaders who wish to manage calls for a group of people.
2. This interface shall allow an attendant to see who in their building or in a configurable group is on a call and shall allow the attendant to queue or direct calls to other users or voice mail accounts.
3. Provide a minimum of one attendant console per building and other attendant consoles/software where noted on the drawings.

G. E911 Integration

1. The telephone system shall support E911 configuration to pass detailed information from the telephone system to the PSAP.
2. By default, the billing address and room number for each DID will be delivered to the PSAP
3. Map each telephone in the system to a physical room number and name of the room.
    a. Information provide would look something like this:
    b. 555-125-1545, 3962 N. Three Mile Road Traverse City, MI Room 212, Chemistry Lab”
    c. Provide the system so that the correct granular location is delivered even when people log into phones other than their own
4. Setup the IP Addressing so that if a person moves their telephone to another building the system will automatically provide the address of the building where they are located.
5. The system shall allow selected people in the school to be able to listen in to the 911 call while it’s in progress. Shall also send an email or text to designated persons when a 911 call is made.
6. The system shall retain the display at the PSAP even after the calling phone has hung up so that the PSAP operator can call the phone back.

H. SMART-Phone application.
1. Provide the owner with mobility application and hardware required to allow all users to use the mobility application on their smartphone.
2. Software shall allow the user to have all the features of their desk-phone appear on their smartphone.
3. Shall integrate with your calendar and show scheduled calls and conferences
4. Click the Join button for direct access to Zoom and WebEx conferences
5. Build stronger teams with peer-to-peer presence status, instant messaging and video calling
6. "Dual persona" shall separate business and personal calls on a single device
7. Leverage VoIP over Wi-Fi and 4G/5G cellular data to keep connections up and costs down
8. Encryption shall ensure secure mobile voice communications
9. Shall provide device and user-level authentication with digital certification
10. Built-in VPN so users don't need to constantly re-authenticate
11. Simplify administration with location-aware policies and enterprise directory integration.

I. Voicemail to text application
1. The owner has times when they wish to have a written documentation of a voice mail message. Listening to the message and transcribing can be time consuming.
2. The owner wishes to have five (5) licenses for voice to text software that will create text files of voice mail messages
    a. The owner shall have the software installed on the user’s computers and it shall allow the user to direct a voice mail to the voice to text engine.
    b. This shall be an integrated process in the telephone system software.
    c. All text files of the voice mail message shall be able to be delivered to a user through their email client.
    d. The system shall be able to be configured so that just the voice mail messages chosen to be transcribed are transcribed.
    e. Messages shall be directed to one or two different email accounts.
    f. The system shall be based at the owner’s data center and shall not be a hosted solution.

J. Audio recording of telephone calls.
1. Include with the telephone system a call recording system that will allow the owner to record any ongoing telephone call.
2. The system shall include:
    a. Recording of external calls continuing through call transfers and redirections.
    b. User control of Save/No Save and Pause/Resume of call recording.

c. Pause/Resume support of actual recording during phone call facilitating PCI compliance
d. Configurable Customer Start/Stop Recording key on the telephone.
e. Automatic storage in multiple file systems and/or multiple VoiceMail boxes
f. Custom folder & file names in call recording archives
g. Custom Subject: and From: fields in Voicemail box Web-based Recorder Player
h. Convenient searching, downloading, and management of recordings
i. Playback via phone or computer
j. Shall include a total of 20 hours of call recording native in the system and shall allow long term storage offload of audio.
k. Audio files shall be playable in standard audio file format (MP3 etc.)

2.08 TELEPHONE SYSTEM USE REQUIREMENTS

A. The owner has multiple listed telephone numbers and patrons can call directly into each different building and directly to any employee. This calling pattern shall remain and the contractor shall work with the service provider to keep all existing telephone numbers.
1. The contractor shall install a system that will allow different offices to have telephone calls appear at multiple locations and desks.
2. Calls that are not answered at one desk shall be able to then ring at one or more subsequent desks. Work with the owner to identify all incoming lines and their associated offices.

B. When calls come into the main numbers, they shall be routed to the appropriate attendant console. If no attendant is currently available or if the attendant function is turned off, all calls shall be routed into a queue where each caller will hear a separate announcement based on the group they were calling. Contractor and Owner shall decide what the announcements will be.
1. The caller can take no action and they will hold for the first available operator, or they shall be prompted to dial an extension number.
2. The telephone system shall have a menu driven system where the caller, once they are in the queue, can dial to find different departments. The choices shall be via prerecorded messages.
3. If the caller does not choose an extension to dial, or a general department to contact, they shall be put back into the queue waiting for an attendant to answer.
4. When a Direct Inward Dial (DID) number is not currently assigned, and a caller dials that number, they shall hear a recording that tells them the number is not in service, and that they are being forwarded to the attendant.
5. Any person calling into the system shall have the opportunity to dial-by-name.
6. Contractor shall generate a list of users and configure the system to allow the caller to enter some or all the letters of a person’s name and eventually connect with their extension.
7. Internal calling
8. If the caller makes a call within the system, then they shall be able to do that through three or four or five-digit dialing of the extension. Ask owner for their preference. Apply that preference.
9. If the caller dials a three or four-digit extension and that extension is not currently assigned, then the caller shall hear a message and then be forwarded to the attendant. The Owner and Contractor shall decide on the message.

C. The system shall provide the ability to require authorization codes for access to local and/or long distance calls on a per telephone set basis.
1. The extent of the authorization code implementation shall be finalized by the Owner and Contractor prior to installation.

D. The telephone system shall allow an intercom function between telephone sets.
1. The Caller shall be able to dial an extension, the caller and person being called shall hear a beep, and then the caller can speak through the speakerphone of the person being called.

2. The person called shall be able to respond through the speakerphone to the caller. Once the conversation is completed, the line shall be broken by the caller going on-hook.
3. Each telephone set shall be able to block incoming intercom calls.
4. The owner shall be able to implement intercom groups. These consist of numerous telephones that hear the same message via the intercom function.

E. The telephone system shall support an integrated voice mail system that will be connected and configured by the Contractor.

2.09 MANAGEMENT REQUIREMENTS

A. The management of the telephone systems shall be via an integrated system providing statistics and easy access to system changes and upgrades.
B. The management system shall be a completely Graphical User Interface. A command line only management platform is not acceptable.
C. The Management system shall employ Detailed Call Recording for all information gathered on all outgoing calls and incoming calls.
D. The management platform shall provide a single point of entry for the administrator.
   1. All updates, changes and transfers shall not only be applied to the telephone system switching database, but shall also be transmitted to all other databases associated with the telephone system.
   2. This shall include, but not be limited to, Telephone switch, Voice Mail system, Call accounting system, Work order system, and directory of extension numbers.
E. If the system fails for any reason; it shall automatically restart when power is restored.
   1. If the initial restart does not work, then one other attempt shall be made. If that restart does not work, then the telephone system shall have the ability to send an email and provide a message indicating that the phone system is inoperative.
   2. All memory and configurations shall be automatically loaded on the system. No additional programming shall be required to bring the telephone system back to its original use standards.
   3. The telephone switch shall be able to print a trouble log each day that shows dropped calls and lost messages associated with the voice mail system.
F. The management system shall allow the administrator to make all changes to the system. This shall include each aspect of the system and its uses.
   1. Moves, Adds and changes shall be able to be made from the management console.
   2. This shall be able to be done locally or remotely through the data network.
   3. Control Hunt/ACD groups and members

PART 3 - EXECUTION

3.01 EXAMINATION

A. The Contractor shall make themselves aware of the site prior to submission of the Bid Response.
B. Contractor shall be aware of the Local Exchange Carrier that currently provides service(s) to the Owner.
   1. If no existing provider has been chosen then promote providers that you have worked with previously to the owner.

3.02 PREPARATION

A. Each location where a portion of the telephone system shall be placed shall be identified and reviewed prior to installation of the components.
B. All work shall be done by trained professionals with a history of work on the equipment being installed.
C. The Contractor shall provide all hardware, software, cable, connecting blocks, electronics, configuration and labor required for a complete and operating system.
D. The Contractor shall work with the LEC during system configuration to ensure a successful cutover to the new system.

3.03 STATION INTERVIEWS

A. The Contractor shall complete in depth interviews with administrators and managers/users at each building to gather info about telephone set requirements, attendant consoles, DID numbers, etc.

B. The Contractor shall meet with the Owner's representatives to review the information that will be gathered during the interviews.
   1. The Owner and Contractor shall work together to decide upon a list of questions to ask, and a list of services that shall be made available to each individual group.
   2. The Owner and Contractor shall be in consensus of the questions and services prior to the interviews beginning.

C. In addition, the information gathered shall include, but not be limited to the following:
   1. Hunt Groups
   2. Station set requirement
   3. Extension numbers
   4. Room numbers/names
   5. Caller ID data
   6. DID numbers
   7. Rollover calls within a group
   8. Multiple line appearances at people's desks
   9. Paging system connectivity and numbering.

D. Information from the station interviews shall be collected and then the Contractor shall schedule a meeting with the owner's IT department or their representative.
   1. The meeting will be to discuss the finding of the station interviews and make decisions on implementation.
   2. The Contractor shall be prepared to list all the requirements of the users, and provide totals on each different setup requested by the users.
   3. Totals shall be provided for hunt groups, DID numbers, Attendant consoles etc.
   4. The Owner shall have the final decision making power regarding what services are available to what groups.

3.04 TELEPHONE SYSTEM PLACEMENT

A. The Contractor shall be responsible for the placement of the telephone system and all its components in the assigned Communications Room.
   1. Install the telephone system into the communications room.
   2. Connect the telephone system to the data network and the incoming SIP trunks and cellular backup dialer at each building where it is equipped with a backup dialer.
   3. Mark the incoming cables for the number that is given by the telephone service provider.

B. Final location of telephone system shall be based on agreement between the Contractor and the Owner.

C. Place each telephone at the desk or at the wall. Install a drop cord as shown on the drawings.

3.05 GROUNDING AND POWER

A. The telephone system shall be connected to the Telecommunications Ground Bar (TGB) in the Communications Room.
   1. The Contractor shall tie the telephone system directly to the TGB with a minimum of a #12 AWG ground cable.
   2. All ground lugs shall be crimped onto the ground wire.

B. Power will be available in the Communications room for the connection of the telephone switch and any associated UPS.

C. Uninterruptible Power Supply:
   1. See UPS Specifications for requirements.

3.06 SYSTEM CONFIGURATION

A. The Contractor shall configure and install the telephone system as per the detailed specifications and the meetings with the owner. Work shall include everything listed below:

B. Schedule configuration meetings with the owner.

1. No less than four (4) meetings shall be scheduled with the owner to discuss the feature sets and capabilities of the system.
2. Once the station interviews are completed, the information shall be used in the configuration meetings to decide what features will be provided to different individuals and groups.
3. The Contractor shall provide the Owner with a thorough understanding of all the feature sets associated with the telephone system and their uses. The Owner shall have the final decision on what features are made available to which users or groups of users.

C. If a change in station numbering is required, the Contractor shall submit a proposed numbering plan to the Owner for review.
1. The Owner shall meet with the Contractor and decide on a comprehensive station numbering plan for the organization.

D. Contractor shall configure the system as per the specifications and discussions with the owner regarding the feature sets.
1. Configure the system based on outcome of the station interviews and discussions with the owner.
2. The telephone system shall be connected and configured a minimum of 1 week prior to cutover.
3. The Contractor shall perform tests on each system prior to cutover. A station set shall be connected to each switch/telephone system and tested. A call shall be made from each survivable remote appliance to the main telephone system.
4. Each feature set shall be tested and shall work prior to cutover.
5. The Contractor shall demonstrate to the owner the working system and the ability to make calls between different stations prior to cutover.

E. All software modules that are to be used for billing, record keeping, moves, adds and changes and call statistics shall be operational prior to cutover.
1. The Contractor shall meet with the Owner and identify the features of any Call records software.
2. The Owner and Contractor shall decide what reports and statements the software shall provide on a daily, weekly and monthly basis.
3. The Contractor shall demonstrate the ability of the software to generate these reports prior to cutover.

F. Setup of user accounts
1. Each user account shall be configured in the system and each person assigned a voice mail account.
2. Setup all unified messaging and integration required for the telephone system and email system.
3. Configure each telephone so it is associated with an extension number and a specific user.
4. Integrate each user extension with their Active Directory login.

G. Setup of all attendant locations
1. Configure the system to support all identified call attendants.
2. Configure each attendant console to support the users they oversee/are connected to.
3. Where an auto attendant is installed configure the attendant console to be able to control when the auto attendant is deployed.
4. Populate the auto attendant console with the user extensions that they are to oversee.

H. Reports
1. Work with the owner to create monthly reports detailing the information identified by the owner as required.

I. Smartphone application
1. Load all instances of the application on the user’s smart phones.
2. Setup the hardware and telephone system software to support users on their smartphones
3. Configure the calls for secure connection from the user’s desk or their smartphones
4. Fully setup the application to meet the owner’s requirements.

3.07 VOICE MAIL AND AUTO ATTENDANT CONFIGURATION

A. The Auto Attendant tree and choices shall be designed and configured with the input and choices of the Owner
   1. The Owner shall either be able to use the Auto Attendant as the first response with the operator as a backup, or the operator will be the first response. This shall be able to be configured based on the DID number. Certain different offices may want to answer with the auto attendant and others may want to answer by a person. The system shall allow both choices.
   2. If the Attendant is the first response, then callers should be greeted and informed that they can dial an extension directly or wait to hear a list of options.
   3. The list of options shall include being forwarded to a certain department, dial by name, leaving a general message in the general mailbox or pushing zero and waiting for an operator.
   4. Each individual department shall be able to decide what prompts they want once callers are forwarded into their group. Configure as requested
   5. The Contractor shall be responsible for the design and setup of the auto-attendant system per the owner requirements and station interviews.
   6. As a discussion point, the Contractor shall provide a decision tree diagram of the auto attendant system. The decision tree shall be used to show the Owner the choices made available to each caller.
   7. The decision tree diagram shall be approved by the Owner prior to the programming of the system.

B. Once the system is setup; the Contractor shall schedule a meeting to review the prompts in the system
   1. All the users pertinent to the section being demonstrated will be involved. The Contractor shall make a call and test the call system. The users can review the system and decide what, if anything needs changed.
   2. The Contractor shall make changes based on the recommendations of each group.
   3. When the changes have been made, the Contractor shall schedule another review by the users.
   4. Any changes made with this review will be applied. At this point the system should be working as per the Owner requirements.

C. The voice mail (VM) system shall be connected to the telephone system.
   1. The Contractor shall configure each voice mailbox to correspond with the station set that it is associated with.
   2. All mailboxes that are not associated with a station shall be configured.
   3. Contractor shall work with the Owner on setting the exact time limits for storage of messages and the length of each individual message.
   4. Owner and Contractor shall work through the entire system to decide which options will be incorporated into the voice mail system

D. The Contractor shall be responsible for the complete programming and configuration of the entire auto attendant and voice mail system
   1. This includes recording of all auto attendant messages and prompts.

E. The Contractor shall ensure that the Owner is satisfied with the workings of the auto attendant and the voice mail system, and that the system has been installed as per the detailed specifications.

F. The contractor shall provide a “cheat-sheet” to each user that provides them simple instructions on using the voice mail and unified messaging client. This cheat sheet shall include all known shortcuts and efficiencies.

3.08 INTERFACE WITH INCOMING LINES VIA SIP TRUNKS

A. The Contractor shall act as the Owner’s Agent in dealing with the service providers that provide telephone service to the Owner.
   1. A letter of Limited Agency will be provided to the Contractor so that he can order the installation and removal of telephone lines for the client.

2. The Contractor shall work with the Owner to decide what services will be required for the new telephone system.
3. With this knowledge, the Contractor shall interface with the service providers to schedule the installation of all incoming lines and connection of private links to the other building.

B. The Contractor shall have discussions with the provider to identify the circuits that will be connected, the circuits to be re-used and the new ones to be connected.

C. The costs and benefits of the new, re-used, and disconnected lines shall be discussed with the owner, and then the Owner shall direct the Contractor on any changes that need to be made.

D. The Contractor shall be ready to discuss the Pros and Cons of all the different configurations possible.

E. The Contractor shall provide the Owner with a thorough understanding of the recurring charges for the services from the provider.

F. Coordinate the location of all the lines from the telecom providers with the location of the telephone switch and network electronics.

G. The point of demarcation for the service providers shall be on the wallfield and shall be labeled for the incoming lines attached.

H. After the system has been cutover the Contractor shall provide the information on all the incoming lines to the Owner.
1. The report shall include the line designation, the provider of the service, a contact name and number for service on the line, the line's bandwidth, make-up and the service that it provides.
2. Each line shall have a separate piece of paper listing the above information. All the papers shall be submitted prior to final project completion.

3.09 DATA NETWORK CONFIGURATION

A. The owner has an existing data network that shall be configured to support the telephone system.

B. Network configuration:
1. The engineer shall meet with the owner and review the current system configuration and then generate a report that details:
a. Existing configuration of the network
b. Suggested VLANS and quality of service settings for each switch to support the VoIP telephone system
2. Engineer shall reconfigure the data network at each building and comm room so that it will support the telephone system
3. Assign a port on an Ethernet switch at each building to support the connection to the telephone system appliance.
4. Generate a final report detailing the ports on each switch that the telephone system and telephone sets are connected to and the specific network settings that are configured.

C. Provide a certified engineer to configure the network. Person shall be certified in the networking gear the owner is utilizing.

D. Owner will configure the Ethernet network based on suggested parameters by the telephone system contractor

3.10 FAX SERVER CONFIGURATION

A. The Fax Server shall be installed into the data center and attached to the data network.

B. The server shall be configured to replace the existing FAX machines at the buildings.
1. Contractor shall work with the owner to inventory all FAX machines and their incoming telephone numbers
2. Configure the software to support all the FAX machines
3. Associate FAX numbers with the owner directed email accounts.
4. Configure the FAX server to associate with copiers so that faxes can be sent directly from copiers.

5. Enter all user data into the FAX server software to setup all accounts.
6. Connect all copiers and printers to the system to direct general FAX documents to a device.
7. Configure the systems to attach the incoming faxes to the email system.

3.11 REMOVAL OF OLD TELEPHONE SYSTEM

A. The contractor shall remove the existing telephone systems from each building.
B. Remove all existing handsets from each building.
   1. All existing telephone devices shall be moved to the transportation building.
   2. Sort all existing equipment and inventory all equipment. Provide a spreadsheet with equipment totals to the owner.

3.12 WORK AREA

A. The Contractor shall maintain a clean and orderly area to work in during system installation.
   1. The work areas shall be cleaned daily. All packing trash and other assorted junk items shall be removed at the end of each workday.
   2. Dust shall be kept to a minimum during the installation. All dust shall be removed prior to the cutover, and then again just prior to project closeout.
   3. The Owner and Engineer shall have access to the work area at any time during normal working hours.
   4. The Owner and Engineer have the right to stop work and seek answers to questions and concerns that may come up during the installation of the new telephone system.

END OF SECTION

SECTION 28 6120 – TELEPHONE SETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section Includes specifications and installation instructions for the user telephone (station) sets.

B. Instructions are included on how to install and test the connectivity of user phones during and after cutover to a new telephone system.

1.02 SYSTEM DESCRIPTION

A. The systems described herein are connectivity products for communication through the telephone system.

B. In these specifications, the words “station”, “telephone” “handset” and “set” shall be interchangeable, and shall refer to any telephone.

1.03 COORDINATION

A. The installation of new products for the user shall be coordinated through the Owner’s IT department and the department where the new products are to be placed.

B. The installation of new station sets shall be coordinated with the installation of the telephone system.

PART 2 - MANUFACTURERS

2.01 TELEPHONE SETS

A. There shall be five (5) types of telephones installed as part of this contract
   1. Type A, Office telephone for administrators. Equip with sidecar
   2. Type C. Classroom room Telephone
   3. Type D. Power Failure Transfer Analog telephone sets

B. The Contractor shall install the number of telephone sets at the buildings as shown on the drawings. The contractor shall in addition provide the following spare phones:

Phone type	Quantity of Spares
Type A	1
Type C	5

C. All station sets shall be placed as per the user interviews and discussions with the Owner.

D. All station sets shall be new sets. Each wired set shall be equipped with a handset connected to the base unit with a coiled cord. The cord shall be detachable from the handset and base unit.

E. Each set except the analog PFT sets, shall have an integrated duplex speakerphone, unless otherwise noted.

F. In the event of a loss of power to the telephone system, the phones shall not require reprogramming after the system power has been restored.

2.02 TELEPHONE SET DETAILS

A. Telephone Type A, Administrator multi-line telephone with a display. Shall minimally be equipped with:
   1. Multi-line telephone
   2. Multi-line backlit color LCD Display
   3. Full duplex speakerphone
   4. Equipped with analog handset jack.
   5. Message waiting light
   6. Ethernet switching port for connection of a PC through the telephone. 10/100/1000 Mbit
   7. PoE powered based on 802.3AF and 802.3AT
   8. Shall be wall mountable.

9. Feature/soft keys to minimally include:
    a. Multi line keys
    b. Soft keys
    c. Hold
    d. Transfer and conference keys
    e. Standard keypad
    f. Volume control
    g. Speakerphone and Mute keys
10. Telephone shall be Cisco 8851 or equal. Equip with a sidecar Cisco 8800

B. Telephone Type C, Standard one-line or more IP telephone with a display. Shall minimally be equipped with:
1. Multi-line telephone
2. Multi-line backlit LCD Display
3. Full duplex speakerphone
4. Equipped with analog handset jack.
5. Message waiting light
6. Ethernet switching port for connection of a PC through the telephone. 10/100/1000 Mbit
7. PoE powered based on 802.3AF and 802.3AT
8. Shall be wall mountable.
9. Feature/soft keys to minimally include:
    a. Multi line keys
    b. Soft keys
    c. Hold
    d. Transfer and conference keys
    e. Standard keypad
    f. Volume control
    g. Speakerphone and Mute keys
10. Telephone shall be Cisco 8811 or equal.

C. IP sets shall comply with the following requirements:
1. Integrated Ethernet switching with compatible 802.3af PoE
2. DHCP compatibility with integrated switch port for connection of a PC to the telephone set.
3. SIP compatibility
4. IP-based telephone sets shall have the following protocols support and features,
    a. Integrated, multi-port Ethernet switch. Shall allow connection of pc or other Ethernet device. Minimum 10/100. See requirements of specific telephones.
    b. 802.1p (frame prioritization tagging)
    c. 801.1Q (frame VLAN tagging)
    d. 802.1X (Network authentication)
    e. IP address allocation via Dynamic Host Allocation Protocol (DHCP)
    f. DSCP IP packet prioritization (DiffServ)
    g. Downloadable configuration
    h. G.711 (a and μ –law)
    i. G729A
    j. MGCP signaling protocol
5. IP phones shall be capable of receiving power from the network via 802.3af compliant switches.
    a. The monochrome IP phones shall operate as a 802.3af class 2 device or lower for power consumption.
    b. The color IP phones may operate as a 802.3af class 3 device or lower for power consumption.

D. All station sets shall be from the same manufacturer.

E. All IP sets shall have the following available features:

FEATURE	DESCRIPTION

Primary Line	When handset is picked up, the phone connects to the stations primary line.
Call Forwarding	Forward any call internally or externally
Call Hold	All hold calls shall be available at all stations where the line appears
Call Park	Place a call on hold on your phone and retrieve from another.
Call Pick-up	Allows you to answer another person's telephone without leaving your desk
Call Transfer	Transfer calls to any other station within the system
Call Waiting	
Called Name and Number Display	The display shows the name and extension number of the person you called if the call is internal to the system
Call Waiting Cancel	All callers during a call are directed to voice mail
Date and Time	Data and Time shall be displayed whenever a call is not in progress
Do Not Disturb	All calls are forwarded to voice mail
Headset compatible	Type A phones only
Incoming Call Pickup	When the phone is picked up to answer a call, the phone automatically picks up the ringing line.
Redial	Last complete number dialed
Manual Exclusion	Other stations where the line appears are restricted from listening to the conversation.
Message Light	
Ring Change	User shall be able to change the ring of the telephone
Speed dialing	Type B and C phones only
Mute Ringer	User can Mute the ringer
3 or 4 or 5-digit dialing	For intra-system calls.
Three-way calls	
Touch tone	Tones shall be generated at any time during a call
Volume	Control handset volume.

F. The attendant console shall have the following features:.

Feature	Description
Answer Button	Allows attendant to answer calls by touching a button
Answer prompting by CO line	
Conference Set-up	Attendant can set up a conference call with users inside and outside the system
Auto Day/Night mode	Changes answer mode based on configurable time of day
Busy Lamp field	Shall show lamps for all lines
Caller ID/ANI display	
Calling/called number and name display	Shows the number called and the name associated with that number if it is within the system
Color Flat panel display	
Dial by name or number	
Directory Display	Attendant can scroll through directory by name or number
DTMF keypad	
Emergency Call	One button connection to 911
Emergency Page	One button for alarm to paging system
Employee Database	Database of the extension and the person associated with that extension. General information
On Line Help	On-line database for Help functions
Flexible Program Buttons	Configurable buttons based on users preferences

Headset operation	Outlet for connection of a headset
Headset Volume control	
Hold Button	Button to put people on hold
Hold timer per call	Shows time each call has been on hold
Incoming Caller ID	Shows number and name of incoming caller
Join button	Allows attendant to insert any call into an existing conference call
Message Waiting lamp	
Overflow Message	When calls exceed set threshold, they are forwarded to another station
Release Button	One touch hang up of any active line
Recall Information	Calls returned to the attendant shall show why call was returned. I.e. busy, no answer etc.
Speed Dial	Allows one touch dial of any pre-set string of numbers
Transfer direct to Voice Mail	Allows attendant to send calls directly to a users voice mail.
Windows PC operation	Attendant console shall be windows PC compliant

G. All station sets shall be fully compatible with the phone switch and voice mail system.

H. Each phone shall come with a replaceable or configurable label that shows the uses of each configurable button.
   1. The label shall be replaceable by the user any time that station is moved, or other lines or services are offered through that station
   2. The Contractor shall provide one laser-printed label for each station installed. Each label shall be custom to that station.
   3. The Contractor shall provide one extra, blank label for each station provided.
   4. The Contractor shall provide the software required to set-up and print the associated labels for the stations. The software shall be Windows compatible.
   5. Provide a part number for ordering extra sets of labels from the manufacturer.

I. Each station (except the attendant console) shall have the ability to be mounted on the wall with the attachment of a wallplate.
   1. Where Wallphone is marked on the drawings provide a wall mount.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall be responsible for the installation and connection of all telephone sets and telephone devices.

B. Based on the station interviews completed prior to cutover, the Contractor shall place phone sets where required to provide complete connectivity of each user to the telephone system.

C. All buttons for each phone shall be programmed by the Contractor to provide the required functionality of each station set.

D. All phones shall have the pre-printed labels or configurable buttons installed/labeled prior to placing the phone in service.

E. Telephones shall be set with the cords required to connect them to the user cable and associated jack.

F. Regular telephone sets shall be set on their desk, or installed on the wall for use.
   1. Prior to setting the telephones, the Contractor shall prepare a list of all the people who will be receiving phone sets, their location, and their extension number.
   2. Each set shall be pre-programmed for that extension and that person.
   3. Once the phone is set and connected the Contractor shall test the line.
   4. Review to see that the data and time appears if the set is a display set.
   5. Make a call to a centrally located operator and confirm that you are calling from the correct extension.

6. Have the operator call you back at the extension number on the list and make sure that the phone rings.
7. Check that the voice mail system is accessible from this station, and it is associated with a voice mailbox.
8. Connect the associated PC to the Ethernet switch in the telephone and test that the PC has network connectivity. Reboot the PC and confirm connectivity.

G. All phones once they are installed shall be tested for the correct extension, and for the correct connectivity.

H. All sets mounted to a wall shall be securely mounted and there should be little chance of the set coming off the wall.

I. Contractor shall provide updated as-built drawings showing the location of each extension.

END OF SECTION

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. Provide the PDF with the following file names
   a. Site - Spec Section - Description
   b. In Example: K**ent 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-Builts in hard and soft copy

1. Hard Copy shall include all Red-lined Drawings showing what was actually installed and where it was installed.
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

D. Provide a PDF of all the Equipment being submitted. Each actual part number shall be highlighted on the PDF in yellow.

1. Group Product Data Sheets by:

a. Telephpone system
b. Audio and Video Systems

2.02 SHOP DRAWINGS

A. Shop Drawings shall consist of detailed drawings showing actual connectivity, equipment to be installed and cable types for the systems noted below:
   1. Specialty AV system one-line connectivity
   2. Telephone System
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 Files for all Product Data Sheets.
   1. All Product Data sheets shall be PDF files grouped as shown in 2.01/D
   2. The Contractor shall highlight the actual part number on the sheet of the component that they are submitting.
   3. 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.
C. The Contractor shall provide 1 set of PDF of Shop Drawings.
   1. Shop drawings shall be marked for the specification section of the bid documents to which they pertain. Mark the Detail (TCXXX/Y) to which the Shop Drawing refers.
   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.
E. When reviewing submittals marked “Furnish as Corrected” take into account the comments and incorporate the comments into the products and installation of the systems.

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.

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 documents 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 Red Lined, As-Built floorplans for the Systems detailed in 3.04/D.
      a. Provide one set of physical documents, full size,
      b. Provide PDF Scans of the As Built Floorplans.
   2. Submit Electronic files for As-Built Documentation
      a. Provide PDF Files. Provide a Coversheet that details:
         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
         F) Warranty contacts for all systems.
      b. Submit Electronic files to Owner, Designer and Construction Manager via email or dropbox or directly through USB Drives.
   3. Submit (2) USB Drives with all As-Built documentation and software configurations.
      a. Software configurations shall be provided for:
         A) Telephone system

3.04 PROJECT DELIVERABLES

A. Provide a copy of all submittals and manuals and pamphlets.
B. Provide a copy of all Warranty documents and contact numbers for Warranty requests.
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 or via Email or Dropbox.
   1. Provide a clean set of the latest drawings with red lines marked for all field changes or bulletins. See above for systems to be included on the As-Built prints
   2. Changes to be reflected on the drawings for Audio and Video Systems shall include:
      a. Microphone/speaker faceplate locations and labels.
      b. Rack/cabinet locations.
      c. Speaker and microphone locations.
      d. Rack layout of all components in each rack.
      e. Changes to the schematic connectivity of any system shown on the drawings.
      f. Ceiling/wall mounted projector locations
      g. Label designation of all cables, including system interconnection cables.
   3. Changes to be reflected on the drawings for Telephone System shall include:
      a. Telephone system locations in comm rooms.
      b. Extension number at each telephone location
D. 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. Telephone System
    a. Vendor created network diagram showing all switches and connectivity to the network and to the PSTN and incoming lines
    b. Create a floorplan based diagram showing all extension numbers and telephone locations.
    c. Spreadsheet detailing:
        A) Telephone IP address
        B) Extension number
        C) Building name, room number
        D) Name for E911 addressing
        E) MAC Address
        F) User currently assigned to that extension.
    d. Manufacturer Warranty
3. Audio / Video Systems
    a. Warranty certificate for LCD Monitors
    b. Warranty certificate for projectors

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

END OF SECTION

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. Audio and Video Components in a cabinet or rack or teacher desk/.lectern.
   1. Each of the audio and video components shall be labeled.
   2. The labels shall have a white background with black, laser printed letters.
   3. Each label shall be large enough for 2 lines of text and wide enough to detail what each dial and component is for.
   4. Each input and output control point on the amplifiers and other equipment shall be labeled for the device to which it connects.
   5. 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.

B. Faceplate Labels
   1. Laser-printed, paper labels shall be used to label user faceplates.
   2. 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.
   3. 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.

C. Custom Faceplates
   1. Engraved labels shall be installed at locations including but not limited to:
      a. Audio and Video special input plates. Detail each input and output
   2. Size the phenolic labels for their individual uses. Provide a sample to the Engineer for approval prior to ordering or installation.

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.

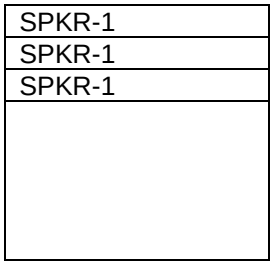
B. All labels shall be installed to more easily identify the cables and ports on all panels. If there are any questions regarding labeling, contact the Engineer prior to installation.

C. Engraved lamacoid labels shall be provided and installed whenever there is no location for paper inserts on faceplates, power poles, poke thru's, floor boxes, modular furniture and surface raceway.
   1. Engraved lamacoid labels shall provide the same labeling as the paper inserts, but they shall be self-adhesive.
   2. These labels shall be adhered to the location closest to the modular jack.
   3. Individual letters shall be provided for each cable. An overall location identifier can be provided for all the cables at that faceplate or floor box.
   4. Engraved labels for rack shall be at least 1-1/2 inch high with letters 1 inch high.
   5. These labels shall be affixed to the top and front of each rack or cabinet. Verify that the label will fit the rack or cabinet prior to purchasing.

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:



      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

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 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 AUDIO AND VIDEO SYSTEMS COMMISSIONING

A. Audio/Video System Testing
   1. Notice of at least 1 week shall be given by the Contractor to the Engineer and Owner prior to the demonstration of all the audio and video components.
   2. The Contractor shall provide a check off sheet of all the audio/video systems that will be demonstrated.
   3. The video check off sheet shall include:

a. Listing of all headend equipment.
b. Listing of all the display equipment throughout the building.
c. Listing of all the controls systems for the video.
d. Include a short synopsis of the video system and the requirements for channels, viewing, switching, and control.
e. There shall be space for the Engineer and Owner to check off that each feature has been demonstrated and has been shown to work. Additional space shall be provided at the bottom to note items that do not work or need to be fine-tuned.

4. The audio check off sheet shall include:
   a. Listing of all specialty audio system in different rooms throughout the building.
   b. There shall be space for the Engineer and Owner to check off that each feature has been demonstrated and has been shown to work. Additional space shall be provided at the bottom to note items that do not work or need to be fine-tuned.
5. For each system demonstrated, the Contractor shall show that each input is seen/heard through the output as required.
   a. Show that volume controls for each system actually do control the volume.
   b. Identify each piece of equipment and show the Owner its use.
   c. Test each video input and display throughout the entire system. Demonstrate connectivity to the CATV distribution system and show that the digital signage system is connected and working.
   d. Show that all channels are available as well as any internal input such as DVD players and video camera signals.
   e. Show that these systems can be controlled by a central control panel if the system is so equipped.
   f. Demonstrate connection of the desktop PC and audio to overhead projectors. And LCD displays.
   g. Demonstrate that each wired connection to the overhead projector works and demonstrate how to switch between inputs with the remote control.
   h. If a video switcher is installed, show its operation, and all its switching capabilities.
6. The check off sheets shall be provided to the Engineer prior to the day of the meeting for review. Any changes required by the Engineer shall be made before the sheet is handed out at the check off meeting.
7. Prior to the check off meeting, all the as-built drawings shall be updated with the latest field data. The as-built drawings shall be used to verify connectivity of all components. The Contractor shall also verify that all cable locations and audio/video components are connected as per the drawings.
   a. As-built drawings shall be available at the check off meeting for review by the Owner and Engineer.
8. As part of the as-built drawings, the Contractor shall provide a printed spreadsheet listing all the video and audio cables that route from a video or audio cabinet to a user location or display unit.
   a. The spreadsheet shall list the cable, the room it terminates in, and its identifying number. Refer to the testing specifications for further details.

B. Audio/Video System Substantial Completion.
1. The Audio/Video system shall be considered substantially complete as soon as:
   a. All systems have been shown to be connected and work as required
   b. All labeling is installed and systems are balanced.
   c. As-built drawings have been updated to reflect any changes in the connectivity.
   d. All manufacturer literature has been turned over to the Owner.
   e. Training has been completed.
2. The contractor shall schedule a substantial completion meeting where all AV systems shall be demonstrated and shown to be in working order and configured as per the specs and the owner's requirements.

PART 4 - EXECUTION TELEPHONE SYSTEM

4.01 TELEPHONE SYSTEM PREPARATION

A. There shall be two stages to the testing of the telephone system. The first consists of testing during the configuration and before cutover. The second is the full system testing completed after cutover.

B. All patch cables used for interconnection of the telephone system and data network in the communications room to the telephones and PC's shall be installed by the contractor.

C. The Contractor shall work with the owner prior to the system configuration to determine how the telephone system will work.

1. The Contractor shall present all the options on configuration of the system to the Owner. The Owner will be able to decide how the telephone system, Auto Attendant and Voice mail system shall work
2. These decisions and configuration notes shall be finally presented in a document presented by the Contractor.
3. The letter shall finally list all the features and systems and how they are to be configured. The Contractor shall work off of this list when doing the configuration.

4.02 TESTING DURING CONFIGURATION –TELEPHONE SYSTEM

A. During the configuration, the Contractor shall be testing components as they are configured.

1. Once incoming trunks are connected to the switch, the Contractor shall demonstrate that calls within and outside of the system can be placed.
2. If a separate long distance carrier is being used, then the Contractor shall demonstrate that long distance calls can be made via the switch.
3. As each portion of the tree of the auto attendant is configured the Contractor shall demonstrate that calls can be made and completed.
4. When the Auto Attendant is configured, the Contractor shall place test calls and during the test calls he shall test each option.
5. Each option shall be shown to work prior to cutover.

B. The Owner and Engineer shall be present to witness that the entire voice system works prior to cutover.

1. The Contractor shall schedule a check out meeting with the Owner and Engineer a minimum of one week prior to the scheduled use of the new system
2. This meeting is the opportunity for the Contractor to demonstrate that the telephone system, Auto Attendant, Voice mail systems work as per the specs and the configuration options as decided at the earlier configuration meetings.
3. The Contractor shall present a check-off sheet that lists all the features and functionality required by the Owner.
4. During the check out meeting the Contractor shall demonstrate that each system works as configured and as required by the Owner. This includes the telephone switching, Auto Attendant and Voice mail system.
5. Only after the Owner and Engineer have decided that the system is working as per the specifications and the Owners requirements will the cutover be allowed to occur.

4.03 CUTOVER TESTING –TELEPHONE SYSTEM

A. During the cutover the Contractor shall test the system to make sure it is working as designed.

1. Test all incoming and outgoing trunks.
2. As each station is set, the Contractor shall test that it is associated with the correct extension.
3. A centrally located operator shall call back each extension to ensure that the newly installed station rings and is able to complete the call.

4.04 POST-CUTOVER TESTING –TELEPHONE SYSTEM

A. The Contractor shall schedule a "Substantial Completion" meeting after cutover where all the features of the entire voice communications system shall be demonstrated. The meeting shall not be able to be scheduled until the system is fully populated and all telephone sets are connected.

1. This meeting shall be scheduled for a time when the system has been cutover and is working correctly.
2. Prior to the meeting, the Contractor shall provide a checklist of all the features and components of the voice system. This checklist will contain all the items required to be working for sign off to occur.
3. Provide the list to the Engineer for review prior to scheduling the meeting. The Engineer will review the checklist and make sure all components of the system are being reviewed.
4. Once the list is reviewed and approved by the Engineer, the “Substantial Completion” meeting can be scheduled.
5. During the Substantial Completion meeting, each item on the checklist shall be demonstrated to work as it was intended.
6. If at the end of the meeting, the Engineer and Owner can sign the checklist, the installation of the telephone system will be “Substantially Complete”. At that time the 30-day Acceptance period begins.

B. From the day the telephone system is Substantially Complete, there is a thirty- (30) day Acceptance Period. The Acceptance period shall be used to show that the system functions under a full load and provides reliable communications services.
1. After the Completion of the Acceptance Period, the installation will be deemed complete, and the warranty period can begin.
2. During the Acceptance period, the Voice Communications system, and all its components shall work, without interruption, as it was designed.
3. If there is an outage or interruption in service due to a malfunction or misconfiguration of the system, the thirty (30) day Acceptance period shall begin after the malfunction or configuration has been shown to be completely repaired.

C. During the 30 day Acceptance period, the Contractor shall provide the As-built documentation regarding the voice communications system and all its interconnections. The As-built documentation shall include:
1. Spreadsheet listing all components, part numbers, serial numbers and location of the equipment installed.
2. As-Built drawings of the connectivity of different system elements. Detail which cables are used to interconnect the different items.
3. Spreadsheet listing all the extensions, the name of the person, any DID numbers, the building name and the room number
4. Final plan views of the location of the telephone system in each room. As-Built drawings of the rack layouts.
5. Configuration details of the system.
6. All manuals and guides concerning the system.
7. A system warranty from the Manufacturer as detailed in section 17390.

D. After the Acceptance period has passed with no outages or interruptions, and the As-Built documentation is provided, the system shall be deemed finally complete.
1. As Final Completion is signed, the Warranty period begins.
2. The Owner and Engineer shall sign the notice of “Final Completion”

END OF SECTION

SECTION 28 7750 – TECHNOLOGY TRAINING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section includes directions for the Contractor regarding training for technology and security systems.

1.02 SYSTEM DESCRIPTION

A. The Contractor shall provide training on all the installed systems.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 GENERAL TRAINING REQUIREMENTS

A. The Contractor shall provide training on all systems installed or upgraded as part of the contract.
   1. The Contractor shall involve the personnel from the Owner's office in the implementation and configuration of the systems.
   2. Prior to the cutover of the system, the Contractor shall work with the Owner on the training that will be provided. The Owner and the Contractor shall schedule the training at a time beneficial to both.
   3. Each system is to have training provided as part of the installation.
   4. Each training session shall include.
      a. This training will give an overview of the capabilities of each system, and the methods to be employed in utilizing the system.
      b. The Contractor shall provide a syllabus detailing what will be discussed at the training, and notes for the Owner to refer to during the life of the system. The notes shall list directions for general use of the system and possible fixes to general issues that could occur.
      c. Training shall include as-built diagrams of the connectivity, a walk-thru of the system, a demonstration of actual user interface with the system, and directions on its general use.
      d. This training is only meant to give an overview of each system. In depth training shall be provided for an in-depth analysis of certain systems as described below.
   5. For all training, the Contractor shall pay all expenses.

B. Create cheat sheets for all systems that the users can keep after the training.
   1. Cheat sheet shall include details on how to use the system.
   2. A copy of the cheat sheet shall be laminated and installed at the system location.
   3. For individual training the contractor shall provide a cheat sheet for each person being trained.
   4. Cheat sheet shall be laminated.
   5. Provide a cheat sheet in each classroom or conference room.
   6. Submit these for approval to the designer and owner prior to training. Have the cheat sheets at the training.

3.02 AUDIO/VIDEO SYSTEM TRAINING

A. Training on the audio/video systems shall be as follows:
   1. Provide training on each type of System installed.
   2. Contractor shall provide a 2-hour in depth training class on the connectivity and use of each type of audio and or audio/video system.
   3. Training class shall be on-site utilizing the actual equipment installed as part of the system.
   4. The class shall be open to 6 of the Owner's Representatives.
   5. The Contractor shall provide handouts at the meeting detailing all aspects of the use of the system. It shall include directions on how to best utilize all components, as well as a checklist of items to go through if something is not working properly.
   6. The Owner and Contractor shall meet and decide on the syllabus prior to training.
   7. Generate a laminated sheet detailing the sequence and how to use each system in each room. Leave that behind in the room. Provide extra paper copies to the owner.

3.03 TELEPHONE SYSTEM TRAINING

A. The Contractor shall provide training on the telephone systems installed or upgraded as part of the contract.
B. Prior to the cutover of the system, the Contractor shall work with the owner on the training that will be provided. The Owner and the Contractor shall schedule the training at a time beneficial to both.
C. Each system is to have training provided as part of the installation. This includes the telephone system, voice mail system, data network system and wireless network.
D. Telephone System Administrators Training on the Management of the telephone systems.
   1. The Contractor shall provide class space for 4 trainees.
   2. The Training shall be in-depth, covering the administration of the entire system.
   3. Training can be on-site, utilizing the owners installed system.
   4. Class shall be no shorter than 12 hours. This shall be broken up to two separate days. The classes shall be separated by no less than three weeks.
   5. The goal of this class is to provide the Administrator the knowledge necessary to make all upgrades and changes required for the normal use of the system.
   6. The second day of training will be scheduled after the owner has had time to use the system and can generate questions prior to the second day of training.
E. Operator console training.
   1. The Contractor shall provide class space for 10 trainees.
   2. The Training shall be in-depth, covering the Operator Console
   3. Training shall be on-site.
   4. Class shall be no shorter than 6 hours. This shall be broken up to two separate days. The classes shall be separated by no less than three weeks.
   5. The goal of this class is to provide the Operators all pertinent information regarding the Operator console, and the day to day requirements of the Operator.
   6. The training shall include the simulation of all the requests for transfers, forwarding and other tasks the operator may be asked to do each day.
   7. Contractor shall provide a "cheat sheet" that details common day to day activities that an operator may be required to complete. This shall include forwarding calls, parking calls and paging users etc.
F. End-User Training.
   1. The Contractor shall train all end users on the general use of the telephone system, specifically on the operation of the user stations and use of the voice mail.
   2. The training shall familiarize the end user with the station set they will use at their desk.
   3. Training shall be on-site.
   4. Class shall be no shorter than 30 minutes, and as long as required to inform the average end user.
   5. The training shall include the simulation of calls the user might get during each day utilizing one telephone set for every two employees.

6. Provide class space for the same number of telephones that are installed or connected.
7. Provide and hand out a “Cheat sheet” to each use that describes typical actions that the user will be required to complete for use of the telephone system and voice mail.
8. Include an additional day on site for training of users no less than three weeks after initial training. This day shall be used to answer any additional questions that they

END OF SECTION

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.

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 owner/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.
- B. Examine all equipment and cabling to ensure that it is labeled as per the drawings and specifications.

3.02 GENERAL WARRANTY
- A. Warranty Period shall be 1 year after a signed copy of Substantial Completion. This shall be the Warranty Period.
- B. See further specifications for additional warranty requirements that may be longer for certain systems.
  1. Contractor shall be responsible for generating and submitting the Substantial Completion document to the designer for review and signature.
- C. Warranty 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. During the Warranty Period:
     - a. 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.
     - b. 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.
     - c. The Contractor shall also supply all configuration and programming necessary to keep all electronic equipment to the latest revision of software during the warranty period.
     - d. If the "system" goes down, and needs configuration to be brought back up, the Contractor shall be liable for any programming or reconfiguration.

e. During the warranty period, the Contractor shall make the Owner aware of any software upgrades that are available.
f. Contractor shall install all software upgrades for that warranty period or as detailed below for specific systems.
g. If the system does not run well during the warranty period the contractor shall be onsite to diagnose and fix the system.

D. The contractor shall be onsite within 24 hours after a call from the owner or designer regarding system or equipment issues.

3.03 TELEPHONE SYSTEM WARRANTY

A. Hardware Warranty for telephone System.
1. The Contractor shall warranty the installation and all the parts of the telephone system for a period of not less than one (1) year after Substantial Completion.

B. Software Warranty for Telephone System.
1. As part of the project the contractor shall provide a five-year (5) telephone system software warranty that provides for all software updates during the warranty period after Substantial Completion.
2. Contractor shall be required to install all software and firmware updates during the three years.

C. If any portion of the equipment becomes inoperable or provides less than the designed service levels during the warranty period, the Contractor shall be on site to fix and or replace the broken or inoperable part at the Contractor's expense.

D. For the telephone hardware warranty period the Contractor shall provide next day, onsite service for diagnosis and configuration issues related to outages or poor performance. This shall include onsite diagnostic tests, including any diagnostic software, tools, and other parts required to keep the system operating at peak levels.

E. If the "System" goes down during the warranty period and needs configuration to be brought back up, the Contractor shall be liable for any programming or configuration.

F. During installation and during the warranty period, the Contractor shall provide technicians that are certified by the manufacturer.

G. After being notified of a loss of service, the Contractor shall:
1. Begin a trouble ticket and assign technicians as required to come to a quick resolution of all issues.
2. If remote service is not possible, the Contractor shall dispatch a technician to the site to review the cause of the loss of service.
3. The Contractor shall work as quickly as possible to come to a resolution to any issues. During the warranty period, the contractor shall guarantee a technician be on site within 24 hours of the notice of an issue or an outage.

H. During the software warranty period the Contractor shall maintain a backup of the configuration of each telephone system component. The backups shall be maintained in a revision control system so a configuration can be restored from one of multiple previous backups.

I. Manufacturer's warranty shall be provided for all components of the system.
1. All paperwork and submittals required by the manufacturer for compliance with the warranty program shall be provided and submitted for approval by the Contractor.
2. Contractor shall submit all paperwork, apply for warranty certification, and provide a Certificate of Warranty from the manufacturer prior to project closeout.

J. Software Upgrades
1. The contractor shall provide updates and upgrades to the telephone system, software and firmware for the length of the Software Warranty period
2. The Contractor shall supply and install all upgrades, configuration, and programming necessary to keep all equipment to the latest revision of software and firmware.
3. The contractor shall be on-site two times a year for the Software Warranty period after substantial completion to check all software and apply all patches and upgrades.

END OF SECTION