Bid Documents
For

Technology Upgrade

Blue Water Community Action
302 Michigan Street
Port Huron, MI 48060

Distributed by:

Commtech Design
Contact Bret Emerson
616-863-8132
emersonb@commtechdesign.com
SECTION 28 0500 – FRONT END

PART 1 - GENERAL

1.01 INTRODUCTION

A. Blue Water Community Action invites qualified contractors to provide proposals for a Technology Upgrade. This work includes:

1. Bid Category #1
   a. The base bid is the cost for the installation of all the access control system including all equipment, labor, installation, configuration and testing.

2. Bid Category #2
   a. The base bid is the cost for the installation of all the video security cameras, servers, software, Cat-6 camera cabling and patch cables including all equipment, labor, installation, configuration and testing.

B. The Contractor shall pay all costs of the Work including, but not limited to, labor, materials, equipment, tools, transportation, freight, taxes, royalties, patent fees, support facilities, construction equipment, water, heat, utilities, supervision, overhead, and all other items necessary for the proper execution and completion of the Work.

1.02 CONTACTS

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

   Commtech Design
   Bret Emerson
   616-863-8132
   emersonb@commtechdesign.com

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

   Blue Water Community Action
   302 Michigan Street
   Port Huron, MI 4806

C. Bids are due at April 16th, 2019 at 4:00 PM at

   Blue Water Community Action
   302 Michigan Street
   Port Huron, MI 48060

D. A pre-bid meeting will be held on March 27th, 2019 at 1:00 PM. Meet at:

   Former Baker College Location
   3403 Lapeer Road
   Port Huron, MI 48060

E. All questions shall be submitted to the owner no later than April 11th, 2019 at 3:00PM. All questions shall be sent via email to Bret Emerson of Commtech Design.

   Bret Emerson bret@Commtechdesign.com 616-863-8132

1.03 BUILDING SITES

A. Work to be completed as part of this bid will be done at the sites as detailed in the drawings and specifications:

B. Access to the sites shall be from 7:30 AM to 5:00 PM Monday thru Friday.
1. Arrangements can be made for additional time on site during each day as scheduled with the owner.
2. No work activity shall disrupt the regular school day schedule or in any way intrude upon the teaching and administration of students.

1.04 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.

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

1.06 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.

<table>
<thead>
<tr>
<th>DWG.</th>
<th>Drawing Name</th>
<th>Bid Category #1 Access Control</th>
<th>Bid Category #2 Video Security</th>
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<tr>
<td>TC101</td>
<td>All Systems Schedule and Cabling Details</td>
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<tr>
<td>TC102</td>
<td>Security System and Raceway Details</td>
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<td>TC103</td>
<td>Security – Access Control Details</td>
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<td>TC104</td>
<td>Security – Video Security Details</td>
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<tr>
<td>TC901A</td>
<td>Technology Plan – First Level Zone A</td>
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<td>X</td>
</tr>
<tr>
<td>TC901B</td>
<td>Technology Plan – First Level Zone B</td>
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<td>X</td>
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<td>TC901C</td>
<td>Technology Plan – First Level Zone C</td>
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<td>TC901D</td>
<td>Technology Plan – First Level Zone D</td>
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<tr>
<td>TC902C</td>
<td>Technology Plan – Second Level Zone C</td>
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<td>X</td>
</tr>
</tbody>
</table>
B. The following specifications are part of the bid package.
   1. The following specifications are part of the bid package.
   2. Refer to the table below to determine which specification sections are included in each bid category. Some sections refer to all bid categories

<table>
<thead>
<tr>
<th>Specification</th>
<th>Bid Category #1 Access Control</th>
<th>Bid Category #2 Video Security</th>
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<td>28 0000 Coversheet</td>
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<td>28 0500 Front End</td>
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<tr>
<td>Bid Form</td>
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<td>28 1000 Communications Overview</td>
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<td>28 1600 Cat-6 Cabling</td>
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<td>28 3500 Access Control</td>
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<td>28 3600 Security Recording</td>
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<td>28 3700 Security Cameras</td>
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<td>28 7200 Technology Submittals</td>
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<td>28 7600 Technology Labeling</td>
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<td>28 7700 Technology Testing</td>
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<td>28 7750 Technology Training</td>
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<tr>
<td>28 7800 Technology Warranty</td>
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</tr>
</tbody>
</table>

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 manufacturer’s 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 building’s 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-buils 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.
3.07 PROJECT MEETINGS
   A. The contractor shall attend project meeting as designated by the owner or engineer. Attendance is mandatory.

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 June 1, 2019
   C. Upon award of the contract the contractor shall provide a complete schedule for their work. This shall reference dates in the document and be coordinated with the schedule of any other contractors.
      1. Include start date
      2. Products installed
      3. Punch list work complete
      4. Substantial Completion
      5. Final Completion after system has been working for 30 days with no outages or failures
   D. If the work is delayed through the fault of the owner (or of any separate contractor employed by the owner)
      1. The Contractor shall notify the owner, in writing, of any condition or situation that in the Contractor's opinion warrants an extension of Contract Time.
      2. The Contractor shall not be entitled to additional compensation or damages due to delays, interference’s or interruptions to the Work or the Project, but shall be entitled only to an appropriate extension of time in accord with the General Conditions of the Contract for Construction.

PART 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 owner in an amount to be determined by the owner.
      2. Have the deficiencies removed in any reasonable manner available to the Owner, and charge the Contractor at fault for the costs incurred, or reduce that Contractor's Contract Sum by a unilateral Change Order issued by the Owner for the costs incurred.
   B. The Contractor shall pay all costs of the Work including, but not limited to, labor, materials, equipment, tools, transportation, freight, taxes, royalties, patent fees, support facilities, construction equipment, water, heat, utilities, supervision, overhead, and all other items necessary for the proper execution and completion of the Work.

PART 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 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.

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

PART 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 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

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

END OF SECTION 28 0500
TO: Blue Water Community Action  
302 Michigan Street  
Port Huron, MI 48060

Company Name: ____________________________________________________________  
hereinafter called “Contractor”, does agree to provide equipment and labor as described in the specifications and drawings.

Bid Category #1  $ ___________________________ (in numbers)  
The base bid is the cost for the installation of all the access control systems  
Work shall include all equipment, labor, installation, configuration and testing.

Bid Category #2  $ ___________________________ (in numbers)  
The base bid is the cost for the installation of all the video security cameras servers, software, cat-6 camera cabling and patch cables  
Work shall include all equipment, labor, installation, configuration and testing.

Authorized Signature: ________________________________________________

Name (printed): _______________________________________________________

Date: ________________________________________________________________

Email: ________________________________________________________________

Telephone: __________________________________________________________

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

Addendum # __________ Dated: ____________ Addendum # __________ Dated: ____________

Contractor Address: ________________________________________________  
Phone: ____________________________________________________________

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

1.
Description

Add / Deduct (circle one) $ ____________________________

2.
Description

Add / Deduct (circle one) $ ____________________________

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

1 Provide, install and test one (1) CAT-6 cable and modular jack. This shall be for a cable that is 225’ long. Include one port modular plate and labels.

Unit Cost: $ ____________________________

2 Provide, install and test one security camera. Exterior camera. Provide with all licensing and configuration.

Unit Cost: $ ____________________________

3 Provide, install and test one security camera. Interior, hallway camera. Provide with all licensing and configuration.

Unit Cost: $ ____________________________
SECTION 1000 – COMMUNICATIONS OVERVIEW

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section provides a project overview and general project and Contractor requirements for technology work.

B. The “Contractor” as referred to in these specifications, shall be the bidder whose bid is eventually chosen as the winner.

C. The “Engineer” as referred to in these specifications, shall be Commtech Design and its representative on this project.

D. The “Owner” as referred to in these specifications, shall be Blue Water Community Action 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.

B. Cabling and communications infrastructure.

1. The communications portion of the project encompasses communications cabling and termination equipment. The work shall include but not be limited to:
   a. Communications Cabling and Termination Equipment:
      a. User UTP Plenum rated CAT-6 cabling
   2. All cables shall be labeled according to the drawings and the specifications.
   3. All cables shall be terminated and tested as per the specifications.
   4. Contractor shall provide personnel and equipment for full training and commissioning of the system.
   2. All cables shall be supported by J-hooks or cable tray/ladder.
   3. Label all cables
   4. Test all cables.
   5. The extent of the work shall be as shown on the drawing and detailed in these specifications

6. Audio and Video Systems
   a. The audio and video systems in the building shall consist of but not be limited to:
      A) Classroom AV Systems
      b. Test all AV systems
      c. The extent of the work shall be as shown on the drawing and detailed in these specifications

C. Bid Category #2

1. Access Control System
   a. Install an access control system in the building(s).
      A) Provide and install all equipment and servers and software required.
   b. Provide raceways as shown on the drawings.
      A) Security contractor to install raceways at doors.
   c. Install all cabling required connect each door to the security panels
      A) Security panels shall be located in each communications room. See drawings.
      B) Wire from each power supply to the panels and to the devices at the doors
d. Configure the system as per the owner’s requirements. Meet with them to determine configuration parameters

e. The extent of the work shall be as shown on the drawing and detailed in these specifications

D. Bid Category #3

1. Video Security System

a. See drawings and specs for CAT-6 cable installation and who is responsible for installing cabling.

b. Provide and install all cameras at all locations noted

c. Provide and install servers and software for monitoring and recording all access control systems.

d. Fully configure all software and hardware required for recording of camera images

e. Install viewing software on owner’s computers and devices.

f. The extent of the work shall be as shown on the drawing and detailed in these specifications

E. 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).


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 REFERENCE SPECIFICATIONS-CABLING
A. All work applicable shall conform to the following standards:
B. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises”,
C. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standard”,
F. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
G. IA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings including all Updates and Addenda.
H. TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
I. EIA-472 General Specification for Fiber Optic Cable
J. EIA-472A Sectional Specification for Fiber Optic Communication Cables for Outside Aerial
K. EIA-472B Sectional Specification for Fiber Optic Communication Cables for Underground and Buried Use
L. EIA-472C Sectional Specification for Fiber Optic Communication Cables for Indoor Use
M. EIA-472D Sectional Specification for Fiber Optic Communication Cables for Outside Telephone Plant Use
N. NEC, 2015, or latest edition available
O. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
P. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD

1.06 REERECNE STANDARDS NETWORKING
A. EE 802.3™: Ethernet
B. IEEE 802.11™: Wireless Lans
C. IEEE 802.22™: Wireless Regional Area Networks
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

1.07 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 the Authority Having Jurisdiction (AHJ).

1.08 CONTRACTOR -CABLING
A. The Contractor shall show proof of an existing contractual relationship with the approved equipment manufacturer of the horizontal cabling system, and shall pass through the manufacturer's certification and warranty to purchaser.

B. All faceplates and termination hardware shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.

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

D. All work shall be performed and supervised by Telecommunications Technicians and Project Managers who are qualified to install voice, data, and image cabling systems, and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.

E. The Telecommunications Technicians employed shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed. Evidence that the vendor is a current Certified Installer of the manufacturer must be provided in writing prior to work commencing on the structured cabling for the building.

F. The Contractor (including Subcontractor(s) if any) shall have a proven track record in cabling projects. This must be shown by the inclusion of details of at least 3 projects involving Category 6 or better cabling and optical fiber, which have been completed by the vendor in the last 2 years. Names, addresses, and phone numbers of references for the 3 projects shall be included.

1.09 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.

1.10 CONTRACTOR – SECURITY

A. The Contractor shall show proof of an existing contractual relationship with the approved equipment manufacturer of the video security system and access control system and shall pass through the manufacturer's certification to purchaser.

B. All hardware shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.

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

D. All work shall be performed and supervised by security technicians and project managers who are qualified to install security systems, and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.

E. The security 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 video security system.

F. The Contractor (including Subcontractor(s) if any) shall have a proven track record in security projects. This must be shown by the inclusion of details of at least 3 projects similar in scope.
and requirements which have been completed by the vendor in the last 2 years. Names, addresses, and phone numbers of references for the 3 projects shall be included.

PART 2 - PRODUCTS

2.01 FIRESTOPPING
   A. Each contractor shall be responsible for firestopping around their cables and the raceways.
   B. Shall be completed inside and around all conduits after cable installation.
   C. Firestop for the area between the cable and the edge of the conduit shall be Nelson No. FSP, CLK or LBS+. Contractor shall install the best firestop for each individual installation.
      1. Firestop shall be installed with regard to local and national building codes.
      2. The firestop shall be a putty like substance that expands under heat and will not allow flame to pass for a designated period of time.
      3. Firestop shall conform to all NEC, NFPA, and UL requirements.
      4. Some wall pass-thru’ s are shown on the drawings. The Contractor shall utilize these where possible.
      5. Where the contractor must install cables through a wall where there is no pass-thru already provided, the Contractor shall be responsible for installing a fire-rated pass-thru and fire-stopping the conduit after cable installation.
   D. Firestopping is required at all riser conduits and all pass thru’s.
      1. Each cable tray penetration of a wall shall be firestopped after cable installation. Use pillow type firestop to allow additional cables to be installed in the future.
      2. Where riser conduits pass through floors, the area between the concrete and the conduit shall be firestopped. This shall be completed with a putty or liquid firestop product. Fill in the space with mineral wool, and then install the firestop on top. All firestop shall be of sufficient thickness to secure the rating required by code.
      3. After final cable installation, install a putty firestop around all cables where they enter and exit conduit pass thru’s and conduit risers.
      4. All firestop shall be installed to provide the fire rating as described by local fire code.
      5. It shall be the responsibility of the Contractor to verify that all conduits, walls, and raceways required to be firestopped have been firestopped.

PART 3 - EXECUTION

3.01 INSTALLATION
   A. Contractor shall be familiar with the location(s) where the work will be done. No additional compensation will be made for items the Contractor claims he was not aware of during bidding.
   B. Work Area:
      1. All work areas shall be cleaned at the end of each day. All debris shall be cleaned and removed from the site and disposed of in the approved container for the site.
      2. All equipment shall be moved out of common areas and stored in the Contractor’s lay down area, or in other approved storage locations on site.
      3. Any work that is low hanging, or may otherwise impede the general use of the space, and cannot be removed, shall be flagged and cordoned off by the Contractor.
   C. All equipment and parts shall be installed in a neat and workmanlike manner. Good installation principles shall be used throughout the project.
   D. All cables routed above the drop ceiling or in the ceiling area shall be installed square to the building. Diagonal cable runs are not permissible.
   E. All cut edges of conduits, boxes, raceway, etc., shall be trimmed and filed so that no burrs or rough edges will damage cable as it is installed.
   F. All surface raceways, including conduits in exposed areas shall be painted to match the existing colors of the surrounding area.
G. If, in the course of the work, the Contractor damages, marks, or misplaces any ceiling tiles, the Contractor shall repair, and/or replace the ceiling tile to the original condition.
   1. The Engineer shall decide if ceiling tiles have been damaged. Based on the 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 telephone switch and data/wireless network. The plan shall include scheduled dates for major milestones, and all phases required for completion prior to final cutover.
   B. The work plan shall list all items that must be completed by the Contractor or Owner to provide a smooth install of the telephone system and data network. The Contractor shall be responsible for all costs associated with the planning and cutover. The Owners only responsibility is to act as a liaison between the Contractor and the users.
   C. The work plans shall include a time line and a cutover date for the systems within each building. Contractor shall be responsible for all aspects of scheduling the work, including notification of the users, the administration, and the telephone service provider.
   D. The work shall commence within 10 days of award of the contract. The Contractor shall be responsible for attending weekly project meetings at the Owner’s site to report on progress and keep the project team informed of the work being done.
   E. The work plan will be reviewed at each weekly meeting for compliance and updates.
   F. Work shall immediately begin on site surveys to determine the existing infrastructure and determining placement of new system electronics. The Contractor shall be responsible for moving, relocating, and reconnecting any and all existing equipment required for the installation of the new systems.
   G. After work plan and system approval by the Engineer the Contractor can begin work on infrastructure work that does not impede users.
   H. The Contractor shall be responsible for working with the Owner’s Information Technology staff and administrators.

END OF SECTION 28 1000
SECTION 28 1600 – CAT-6 CABLING

PART 1 - GENERAL

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

1.02 SYSTEM DESCRIPTION
A. The horizontal cabling consists of all systems from the user faceplate, to the patch panel in the communications room, and all connections in between.
B. Products and installation detailed in this section shall comply with all applicable requirements.
   1. ANSI/TIA-568-C.0, "Generic Telecommunications Cabling for Customer Premises",
   2. ANSI/TIA-568-C.1, "Commercial Building Telecommunications Cabling Standard",
   4. ANSI/TIA-568-C.4, "Broadband Coaxial Cabling and Components Standard",
   5. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
   6. IA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings including all Updates and Addenda.
   7. TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
   8. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
   9. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD
   10. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
   11. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD
   12. IEEE 802.3bt -Amendment 2. Ratified in 2018 PoE standards powering all 4 pairs:

1.03 COORDINATION
A. All cables shall be coordinated with the installation of the telecommunications raceways.
B. Coordinate all user cables with the furniture to be installed in the building. Make any adjustments prior to cable being installed.
C. Contractor shall walk the site during construction and shall verify all raceways are being installed as required to install the user data cables. Walk the site prior to drywall being installed or floors being installed when Floor boxes are being installed.

1.04 STANDARDS
A. Cabling shall be installed in accordance with NEC code for grouping/bundling of cables in relation to Type 3 and Type 4 PoE
B. Install as per NEC 840.160 in reference to bundling cables:
C. Cables shall be installed with no more than 24 cables in a single J-hook. Install additional J-hooks as required.
D. If cables are to be bundled/grouped in larger bundles then the cable shall be LP listed per UL.
E. All cables shall be no smaller than 23 AWG.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Approved vendors for copper user cables are:
   1. Panduit
   2. Hubbell
   4. CommScope
   5. Mohawk
B. Approved vendors for CAT-6 termination equipment are:
   1. Hubbell.
   2. Panduit
   3. Belden
   4. CommScope

2.02 CAT-6 CABLEING
A. All UTP user/cabling installed shall be CAT-6 rated or above.
   1. Category 6 cabling shall consist of 4 pairs of unshielded twisted pair, 23 AWG cables.
   2. All CAT-6 cables shall be installed in cable tray or supported by J-Hooks.
   3. Individual pair shall be marked in the standard 4 pair color code of blue/blue-white, orange/orange-white, green/green-white, and brown/brown-white.
   4. Each cable shall be marked sequentially with the footage of the cable. Each cable shall also be marked with the manufacturer of the cable and the type of cable installed or the cable part number.
   5. Cable and all connectors and patch panels shall meet or exceed the following electrical and physical requirements:

<table>
<thead>
<tr>
<th>DC RESISTANCE (max)</th>
<th>23 AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms/100m @ 20°C</td>
<td>9.38ohms</td>
</tr>
</tbody>
</table>

   | DC RESISTANCE UNBALANCED (max) |
   | Individual Pair % | 5% |

<p>| CHARACTERISTIC IMPEDANCE |</p>
<table>
<thead>
<tr>
<th>Frequency (f)</th>
<th>Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-500 Mhz</td>
<td>100 ±15</td>
</tr>
</tbody>
</table>

   | DELAY SKEW (max) |
   | ns/100m | 45 |
6. All cables installed above a drop ceiling or fixed ceiling shall be Plenum Rated.

7. CAT-6, 4 pair cabling shall be plenum rated unless specifically noted.

<table>
<thead>
<tr>
<th>Cable Use</th>
<th>Manufacturer</th>
<th>Color</th>
<th>Part number</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Cabling</td>
<td>Mohawk</td>
<td>Blue</td>
<td>M58281</td>
<td>Plenum</td>
</tr>
<tr>
<td>Security Camera</td>
<td>Mohawk</td>
<td>Green</td>
<td>M58286</td>
<td>Plenum</td>
</tr>
<tr>
<td>Wireless AP</td>
<td>Mohawk</td>
<td>Yellow</td>
<td>M58283</td>
<td>Plenum</td>
</tr>
<tr>
<td>Video</td>
<td>Mohawk</td>
<td>Red</td>
<td>M58287</td>
<td>Plenum</td>
</tr>
<tr>
<td>Backbone</td>
<td>Mohawk</td>
<td>Purple</td>
<td>M58290</td>
<td>Plenum</td>
</tr>
<tr>
<td>USB</td>
<td>Mohawk</td>
<td>Orange</td>
<td>M58288</td>
<td>Plenum</td>
</tr>
<tr>
<td>Underground</td>
<td>Mohawk</td>
<td>Black</td>
<td>M58772</td>
<td>Underground</td>
</tr>
</tbody>
</table>

8. Ensure that cable passes all CAT-6 tests after installation.

2.03 UTP JACKS

A. Voice and data modular jacks shall be CAT-6 rated, 8 position, unkeyed,

1. Each jack shall be an individually constructed unit and shall snap mount in an industry standard keystone opening (.760 inches x .580 inches).

2. Jack housings shall be high impact 94 V-0 rated thermoplastic.


4. Modular jack contacts shall accept a minimum of 1000 mating cycles with 5.0 milliohm (maximum) increase over initial with the use of an FCC compliant plug.

5. Modular jack contact wires shall be formed flat for increased surface contact with mated plugs.
6. Modular jack contacts shall be constructed of beryllium copper for maximum spring force and resilience.
7. Contact plating shall be a minimum of 50 micro inches of hard gold in the contact area over 50 micro inches of nickel.
8. Jack termination shall follow the industry standard 110 IDC.
9. Jacks shall have a designation indicating CAT-6.
10. Jacks shall utilize a paired punch down sequence. Cable pair twist shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.
11. Jacks shall terminate 22-26 AWG stranded or solid conductors.
12. Jacks shall terminate insulated conductors with outside diameters up to .050 inches.
13. Jacks shall be compatible with single conductor, 110 impact termination tools.
14. Jacks shall include translucent wire retention stuffer cap that holds terminated wires in place and allows the conductors to be visually inspected in the IDC housing.
15. Jacks shall be compatible with EIA/TIA 606A color code labeling.
16. Jacks shall accept snap on icons for identification or designation of applications.
17. Jacks shall be marked for T568A and T568B wiring schemes. TIA 568B wiring shall be used in all terminations throughout the communications system.
18. All CAT-6 modular jacks and panels shall meet or exceed the following transmission characteristics:
   a. Jacks shall be designed for 100 Ohm UTP cable termination.
   b. Jacks shall be UL verified for TIA/EIA Category 6 electrical performance.
   c. Jacks shall be UL listed 1863 and CSA certified.
   d. Jacks shall be manufactured by an ISO 9002 registered manufacturer.
19. CAT-6, 8-pin modular jacks shall be:
   a. Data Jacks shall be Hubbell # HXJ6OW or equal. Office White.
   b. Data Jacks for Security Cameras shall be Hubbell #HXJ6GN-Green
   c. Data jacks for Wireless Access Points shall be Hubbell #HXJ6Y-Yellow
   d. Data jacks for backbone connectivity shall be Hubbell #HXJ6P-Purple
   e. Data Jacks for Audio and Video connections shall be:
      A) Hubbell #HXJ6W-White
      B) Hubbell #HXJ6R-Red
      C) Hubbell #HXJ6BK-Black
   f. Data Jacks for USB connections shall be Hubbell #HXJ6OR-Orange

2.04 FACEPLATES
A. Standard flush mount faceplates shall support all the jacks and connectors required.
   1. Faceplates shall be UL listed and CSA certified.
   2. Faceplates shall be constructed of high impact thermoplastic or stainless steel. See drawings for specific requirements.
   3. Faceplates shall be 2-3/4 inches wide x 4-1/2 inches high (69.8 mm x 114.3 mm) for single gang, and 4-1/2 inches x 4-1/2 inches (114.3 x 114.3 mm) for double gang.
   4. Faceplates shall be available to mount 1, 2, 3, 4, or 6 jacks in a single gang and up to 12 jacks in a double gang configuration.
   5. Faceplates shall provide for TIA/EIA 606 compliant station labeling.
   6. Faceplates shall have plastic covers over the mounting screws that can be replaced with a clear plastic window over a printable paper insert.
   7. Each plate shall be fully configured with modular inserts. There shall be no open spaces in the faceplate.
   8. Match the color of the modular inserts to the color of the faceplate. All faceplates and inserts shall be office white unless otherwise noted.
   9. Single gang plastic faceplate shall be Hubbell # IMF1OW.
   10. Double gang plastic plate shall be Hubbell # IMF2OW.
   11. Single Gang, stainless steel, modular faceplates shall be Hubbell #IMSS1
   12. Double Gang, stainless steel, modular faceplates shall be Hubbell #IMSS2
13. Each single gang plate has 3 faceplate units (FPU’s) available to install inserts. Double
gang plates have 2 sides, each with 3 FPU’s.
14. Equip plates with the following parts as directed on the construction drawings.

<table>
<thead>
<tr>
<th>FPU</th>
<th>ITEM</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>.5</td>
<td>Blank Jack</td>
<td>SFB10</td>
</tr>
<tr>
<td>1</td>
<td>Blank</td>
<td>IMB05OW</td>
</tr>
<tr>
<td>1.5</td>
<td>Blank</td>
<td>IMB1OW</td>
</tr>
<tr>
<td>1</td>
<td>1 Port Flat</td>
<td>IM1K1OW</td>
</tr>
<tr>
<td>1</td>
<td>2 Port Flat</td>
<td>IM2K1OW</td>
</tr>
<tr>
<td>1.5</td>
<td>1 Port Angled</td>
<td>IM1KA15OW</td>
</tr>
<tr>
<td>1.5</td>
<td>2 Port Angled</td>
<td>IM2KA15OW</td>
</tr>
<tr>
<td>1.5</td>
<td>SC Angled</td>
<td>IM1SCA15OW</td>
</tr>
<tr>
<td>2</td>
<td>Two SC Angled</td>
<td>IM2SCA2OW</td>
</tr>
</tbody>
</table>

B. Some locations will require custom stainless steel plates. These shall be configured with the
correct connectors and pass thru’s to support all the data, audio and video.
1. All shall be silk-screened to detail what each connector is for.
2. Submit a product sheet for approval prior to purchase of the plates.
3. UTP Jacks shall be flush with the front of the plate

2.05 SURFACE MOUNT BOXES
A. Provide surface mount boxes for termination of cables as shown on the drawings.
1. Install a surface mount box at location for termination of the modular jacks.
2. One port surface box shall be Hubbell #ISB1OW.

2.06 AUDIO AND VIDEO CONNECTORS
A. HDMI outlet shall be utilized for connection of the video images.
1. Blank HDMI faceplate module for Modular Faceplates shall be Hubbell #IMBDS1OW
   a. HDMI tail, female to female shall be Hubbell #HDMIT1
2. Single port, GFI / Style line HDMI pass thru with Tail shall be Hubbell #NS801OW
B. HDMI cables
1. Where cables route through a drop ceiling the cables shall be plenum rated.
2. Cables shall be of sufficient size to carry the signal over the distance required.
3. Cables to connect device to device shall be HDMI male to male.
4. At the locations where the cables route into devices at the desk or shelf the contractor
   shall provide short, flexible male to female cables.
5. Standard HDMI cables shall be no longer than 35’.
C. Active HDMI cables.
1. Where the HDMI cable will be longer than 35’ the contractor shall provide Active HDMI
   cables or UTP/STP cabling and HDMI to CAT-6 transmitter/receiver.
2. Video Standards shall meet or exceed All Single Link DVI and HDMI resolutions up to
   3840x2160 @ 30 (4K UHD), Supports Deep color, xvYCC Color
3. Bandwidth 10.2 Gbps max (or channel rate of 3.4 Gbps max)
4. Aux Data Supports DDC for HDCP and EDID, CEC
5. Audio Standards Supports PCM, Dolby, True HD, DTS-HD
6. Powered from HDMI output device
7. Active HDMI cables, non-plenum shall be:
   a. 35ft Active HDMI Cable CL3 rated, Cables to Go #41366
   b. 50ft Active HDMI Cable CL3 rated, Cables to Go #41367
   c. 75ft Active HDMI Cable CL3 rated, Cables to Go #41368
   d. 100ft Active HDMI Cable CL3 rated, Cables to Go #41369
8. Active HDMI cables, Plenum shall be:
   a. 33ft Active Optical HDMI Cable Plenum Cables to Go #41370
b. 50ft Active Optical HDMI Cable Plenum Cables to Go #41371

c. 75ft Active Optical HDMI Cable Plenum Cables to Go #41372

d. 100ft Active Optical HDMI Cable Plenum Cables to Go #41373

2.07 CABLE SUPPORTS
A. All cables shall be supported in the ceiling a minimum of every 5 feet. Support can be provided by installing cable inside cable tray or conduit, or by installing J-hooks every 5 feet.
   1. J-hooks shall provide a smooth steel or plenum rated plastic, support for cables as they route through the ceiling.
   2. Steel supports shall have a galvanized finish.
   3. Steel, UL listed, ultimate static load limit 50 pounds rated to support Category 5e and higher cables, and optical fiber cables.
   4. If required, assemble to manufacturer recommended specialty fasteners, including beam clips and flange clips.
   5. Acceptable products shall be:
      a. CADDY #CAT HP series with retainer hooks.
      b. CADDY #CAT-CM SERIES
   6. Provide with interfaces and clamps required to support J-Hooks from the building structure.
   7. Provide threaded rod and associated hardware required to support all J-Hooks
   8. No more than 24 voice/data cables in each J-hook. Provide additional hooks as required.

2.08 RACK MOUNTED PATCH PANELS
A. Patch panels for termination of UTP cabling shall be provided to terminate all cables installed in the building.
B. All patch panels shall be installed into 19” racks and/or cabinets as shown on the drawings.
C. Provide panels to terminate all cables even if the panels are not specifically shown on the rack layout drawings.
   1. Provide the quantity and color of Modular jacks to match the color and quantity of all cables installed.
D. Panels shall be steel and shall allow mounting of all CAT-6 an CAT-6A jacks. Panels shall be blank panels that accept all modular jacks.
E. CAT-6 patch panels for mounting in a 19-inch rack or cabinet. Shall be;
   1. Panels shall be made of black anodized aluminum, in 24 and 48 port configurations.
   2. Panels shall accommodate 24 ports for each rack mount space or "U" (1U = 44.5 mm [1.75 inch]).
   3. Panels shall be manufactured with a rolled edge at the top and bottom for stiffness.
F. 24 port empty patch panels shall be Hubbell #HPJ24 or equal
   1. Panels shall have rear cable support bar for strain relief which shall clip to the rear of the patch panel or to the rear of the rack rail.
   2. Each 24-port patch panel shall be equipped with one (1) rear cable organizer. Organizer shall be Hubbell #ECMBR3 or equal.
   3. Ports shall be marked 1-24 on top of the openings by factory.
   4. Label all Panels for the panel, communications room and rack with a large laser-printed label.

2.09 PASS THRU’S
A. Where no pass-thru is provided by others the contractor shall install conduit or UL listed wall pass thru’s sized as required to route all cables through all walls.
B. Pass thru’s shall be EMT conduit or another UL listed rated device.
C. Install thru all drywall, block, concrete walls and through any floors required to be penetrated
D. Conduit shall be supported mechanically from the wall or floor structure. After installation, the raceway shall be firestopped to meet the requirements of the wall or floor.
PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine all pathways prior to installation of all cables.
B. Identify locations of all user conduits and backboxes prior to cable installation.
   1. Walk the site during conduit installation and ensure that all boxes are installed where required for termination of all cables.
   2. If any missing locations are not noted during electrical raceway installation the contractor shall be required to fish the wall or install surface raceway to support the cable terminations.
C. The Engineer or the Owner has the right to make adjustments to the location of any outlet to a new location within 7 wall-feet of the original location. If the change is made prior to final cable termination, and prior to any raceway being installed, then the changes shall be a no cost change to the contract.
D. Identify all locations where cable will route through furniture raceway or other nonstandard conduit or raceway installation. Make arrangements to install and terminate all cables in accordance with TIA/EIA 568 standards.

3.02 PREPARATION
A. Locate main path for all cables and install J-hooks where cable tray or raceway is not provided.
B. Coordinate with other trades to install a clear, straight path down major corridors for the routing of user cables back to the communications closet.
C. Plan installation of cables along cable ladder of rack system in communications room. All cable shall be neatly routed in groups of no more than 24 cables.

3.03 INSTALLATION
A. CAT-6 cabling shall be installed according to TIA/EIA 568 standards, including all updates and addenda.
   1. When installing CAT-X cables, care shall be taken to avoid crimping or bending the cable past the manufacturer’s recommended bend radius.
   2. During installation, the cables shall not be pulled across the ceiling tiles or the structure of the building. This may cause damage to the cable jacket.
   3. Adhere to all pulling tensions and bend radii during installation. Excessive pulling or bending can cause the cable to fail tests after installation. Any cable that does not pass the certification tests after installation shall be fixed or replaced at the Contractor’s expense.
   4. All cables shall route neatly in the ceiling. Whether they route in cable tray or J-hooks, the cables shall be neat and orderly.
   5. There shall be no more than 24 cables in each J-hook. Provide additional J-hooks as required.
   6. Support all cables at a minimum of every 5 feet.
   7. Provide a short coil of extra cable where the cable enters the vertical conduit. The coil shall consist of no less than 1-1/2 feet.
   8. Provide enough slack in the backbox to fully remove the faceplate and jack and allow work to be done on the cable.
   9. When installing cables in the communications room, all cable shall route neatly through the cable tray and cable ladder.
   10. When transitioning from the ceiling area to the cable ladder of the rack system, all cable shall route through conduits or be attached to vertical section of cable ladder. The Contractor shall provide the conduits shown and any additional conduits or cable ladder required to neatly transition cables from the ceiling to the rack.
   11. Bundle cables in groups of no more than 24 cables as it routes along the cable ladder.
12. Cables shall route down each side of a rack for termination. Split each panel into 2 sides. The first 12 positions on a panel are on the left, and positions 13 through 24 are on the right. Route the cables for panel positions 1 through 12 down the left cable ladder and route the cables for positions 13 through 24 down the right cable ladder.

13. Each patch panel shall utilize a rear organizer for holding the cables as they route to the punchdown field.

14. Cables shall be bundled in groups of 4 as they route through the rear cable organizer.

15. When terminating cables, ensure that the smallest amount of jacket is removed from the final termination point of the cables.

16. Pair twists shall be maintained up to the IDC jack for all the cables.

17. Provide a service loop of the cables on the vertical cable ladder. The loop shall extend no less than 1 foot below the termination point on the patch panel. Route the cables 1 foot below the patch panel, and then back up to the panel. This will provide room for future moves and additions to the rack.

18. Each cable shall have a self adhesive, self laminating, laser printed label at each end. The label shall show the location identifier of that cable. Labels shall be installed no more than 4 inches from the termination point of the cable.

B. All work on the project shall meet all applicable state, federal, local and industry codes and be installed according to the requirements of the Authority Having Jurisdiction (AHJ).

Detail 01. Proper routing and support of cables on rear organizer. Where possible route 12 cables from right side and 12 cables from left side. This rack in picture did not have right side organizer.

C. CAT-6 data jacks shall be installed at the user end of each CAT-6 cable installed in the system.
   1. Jacks shall be installed to provide minimal signal impairment by preserving wire pair twists as close as possible to the point of mechanical termination.
   2. Jacks shall be installed per manufacturer’s instructions and properly mounted in plates, frames, housings, or other appropriate mounting devices.
   3. Jacks shall be installed such that cables terminated to the jacks maintain minimum bend radius of at least 4 times the cable diameter into the workstation outlet. Cables shall be terminated on jacks such that there is no tension on the conductors in the termination contacts.
   4. See drawings for the color requirements of all modular jacks.

D. Faceplates shall be mounted straight and level with the floor and walls of the building.
1. Jacks and/or connectors shall be terminated to the appropriate cable and inserted in the correct orientation into the faceplate prior to the mounting of the faceplate.
2. Jacks shall be inserted into the faceplate left to right, then top to bottom. 2 gang plates shall be labeled left to right, then top to bottom for each gang.
3. Cable slack shall be stored behind the faceplate in such a way that allows the minimum bend radius of the cables to be maintained as per the following:
4. Care shall be taken when mounting the faceplate to avoid crimping or kinking the cables.
5. Faceplates shall be securely mounted to a surface mounted housing, a recessed box, or box eliminator bracket.
6. Each faceplate shall be labeled with laser printed paper inserted behind the clear plastic label strips.
7. The label shall show the location identifier of the faceplate and the letter designation for each cable. The label shall be as large a font as possible and easily readable.
8. Each faceplate comes with a label strip at the top and the bottom.

E. Surface Mount boxes
1. Modular Jacks and/or connectors shall be terminated to the appropriate cable and inserted in the correct orientation into the surface mount box.
2. When the surface mount jack is mounted above the ceiling the cable shall be coiled and the cable and surface mount box shall be kept off of the ceiling grid.
3. Attach the coil to the building structure with a plenum rated tie-wrap.
4. Label each surface mount box for the cable number. Also, install a wrap-around label on each cable.
5. When attaching a surface mount box to a piece of furniture or to a power pole the contractor shall drill a hole in the furniture/pole that is larger than the hole on the back of the surface box.
6. Screw the surface box to the furniture or to the pole. Adhesive only solutions are not adequate.

F. Proper support of cables is of paramount importance when installing a cable infrastructure. All cables not in conduit or cable tray shall be supported via J-hooks a minimum of every 5 feet.
1. Routes of cables shall be parallel or perpendicular to the walls of the building.
2. Install the J-hooks to minimize changes in the level of the cables as they route through the J-hooks.
3. Do not install more than 50 cables in any 1 J-hook. Provide additional hooks where more than 50 cables route along a main route.
4. All communications shall route as high in the ceiling as possible while still being accessible and staying away from other utilities.
5. When installing the cable through the J-hooks, they shall all have relatively the same droop between hooks. All cables shall be installed neatly and squarely.
6. Secure the J-hooks to the building structure with beam clamps and threaded rod as required to support the cables.
7. J-hooks shall never be attached to drop ceiling support wires. Cables shall never be supported by drop ceiling wires.

G. CAT-6 patch panels shall be installed in the racks.
1. Panels shall be installed to provide minimal signal impairment by preserving wire pair twists as closely as possible to the point of mechanical termination. The amount of untwisting in a pair as a result of termination to the modular jack at the patch panel shall be no greater than a 1/2 inch (13 mm).
2. Panels shall be installed per manufacturer’s instructions and properly mounted to a rack, cabinet, bracket, or other appropriate mounting device.
3. Panels shall be installed such that cables terminated to the panel can maintain minimum bend radius of at least 4 times the cable diameter into the IDC contacts. Cables shall be terminated on the panels such that there is no tension on the conductors in the termination contacts.
4. Each patch panel shall have a rear cable organizer for routing cable from the vertical cable ladder to the patch panel. 1 organizer for each row of 24 cables.
5. The label for each outlet on the panel shall be the same as the wraparound label on each end of the cable.
6. Each label shall line up directly below or above the outlet on the panel. Misaligned labels will not be permitted.

END OF SECTION 28 1600
SECTION 28 3500 – ACCESS CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. This section includes parts and equipment required for installation and termination of a building-wide Access Control and intrusion detection system. This system shall be referred to as the "security system" throughout these specifications.

1.02 SYSTEM DESCRIPTION
A. The security system shall be supplied and installed by a Contractor able to show examples of similar projects and installations within the last 3 years.
B. The security system shall serve the building but shall be able to be expanded to serve additional buildings in the future.
C. The Security System shall provide a solution for access control. This shall be through a central server with PC attached workstations for monitoring and control. Shall include:
   1. Access Control
   2. Badging and user database/Photo imaging
D. Contractor shall provide all software required for connection of the security system to the in-house data network and associated control PC's.
E. The security system client-server architecture shall communicate with native TCP/IP over an existing Ethernet TCP/IP enterprise network.

1.03 COORDINATION
A. All cables shall be coordinated with the existing doors and new door hardware being installed as part of this project.
B. Access Control/Intrusion detection cable shall be a unique color from the Telecommunications cable, fire alarm cable and lighting control cable. Coordinate this with the Electrical Contractor prior to ordering the equipment and installation of the cables.

1.04 PROJECT PLAN
A. The contractor shall provide a project plan to the owner and contractor that describes the system and its capabilities and the possible configurations.
B. Provide a project approach which describes the installation and implementation plan and schedule and all sequencing.
C. Meet with the owner numerous times to determine how the system should work and how it should be monitored. Configure the system prior to installation to meet these requirements. Demonstrate the system use to the owner prior to installation and obtain approval to move forward with the installation.
D. Contractor shall conduct numerous site reviews to establish pathways and routes for all raceways required. Contractor shall install all raceways required for connection of the security system.
E. Generate a testing plan and have that plan approved by the owner and engineer prior to installing the system.
F. The system shall be installed and tested prior to cutting over any doors to the system. Provide and install temporary card readers, door contacts etc to the system for testing. Demonstrate that this works prior to cutover.

1.05 RELATED STANDARDS
A. The security system shall conform to the following international and national standards:
   1. FCC Rules and Regulations
   2. UL 294 Access Control Systems
   3. UL 1076 Line Supervision
4. 21 CFR part 11
5. Part 15, Radio Frequency Devices
7. Applicable Federal, State and Local laws, regulations, codes
8. Americans with Disabilities Act (ADA).

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Approved vendors for security cables are:
   1. General Cable.
   2. Belden.
   3. West Penn Wire and Cable.
   4. Equivalent manufacturers.
B. Approved vendor for access control/intrusion detection equipment is:
   1. Keyscan
   2. S2 Networks
   3. Kantech
   4. Galaxy
   5. Other manufacturers as approved PRIOR TO BID. Submit pre-bid RFI requests for other products.
      a. Systems submitted as part of the base bid that were not pre-approved in writing during bidding will not be reviewed.
C. As part of the bid the contractor shall explicitly detail the software package that is provided and shall provide a document showing all software available from the manufacturer.
   1. The document shall explicitly state which software is provided as part of the bid and shall detail other software available but not provided as part of the bid.
   2. We require this to be able to determine the level of software available and will allow us to fully review the system as a whole.

2.02 DESCRIPTION OF PROJECT
A. The access control/ system shall be an all-encompassing system that is large enough to serve up to 100 employees, collect data and monitor doors and entrances at no less than 3bdifferent buildings.
B. The system shall include all equipment, software, cabling, data collection points, raceways, card readers and hardware to monitor and control the specified buildings and provide reports to a security station as required by the owner.
C. If an Intrusion Detection system is specified, then the access control and intrusion detection system shall act as one system. They shall be integrated such that the presentation of a known access card will shunt all intrusion alarms for the door where the card was presented.
D. The system shall keep records of all access control card presentations.
E. The system shall connect to and interoperate with all the door hardware that which is existing and being added as part of this project.
F. The system shall be able to be connected to other buildings via the existing data network. Specify how the system will connect to other buildings as part of your bid response.
G. The Owner shall be able to change and monitor all settings for intrusion and access to all the buildings through the control PC.

2.03 MATERIALS
A. All security and control cables shall be plenum rated.
   1. Contractor shall provide all appropriate cable from the door security hardware to the security system. All cabling shall be plenum rated.
2. Some locations require outdoor rated cabling. The contractor shall provide the cabling to match the required area.
3. There will be requirements for many different types of cabling and the contractor shall provide for each.
4. Provide a coil of cable at each location for moves and maintenance.

B. The system shall be fully configurable and compartmentalized so that any user can be assigned and they will only see the status of doors at one building.
1. Based on a user’s login, the system shall be configurable to restrict persons from seeing or controlling doors and lock schedules at building that they do not have permission to see or control.

2.04 SECURITY SYSTEM SERVER

A. Management Server:
1. Contractor shall supply a new server which will be located in the MDF. The server shall hold all records and database information. The server shall be equipped with dual hard drives that are fully mirrored and shall work in hot/failover mode so that losing one would not impact the use of the security system. The PC/server shall be shipped new in the manufacturer’s box.
2. Server shall be located in the data center and shall be a control point for the security system.
   a. The server shall allow no less than 2 separate other operator workstations to login to control/configure the security system.
   b. Access shall be via client software or via a web interface. The contractor shall install software and configure no less than 2 of the owner’s PC’s to act as remote control stations.
   c. Provide software licenses for no less than 2 complete operator workstations.
3. Server shall have the following components at a minimum:
   a. Quad core processor with minimum of 3.1 Ghz or equal.
   b. Operating system compatible with security/access system.
   c. Dual, mirrored 250 Gigabit hard drives.
   d. Read/Write CD-ROM.
   e. 4 Gig RAM memory (Expandable)
   f. Dual on board 10/100/1000 Ethernet cards.
   g. Audio card with speakers.
   h. Minimum of a 19-inch LCD monitor. -Rack Mounted. Provide rack mount keyboard/monitor/mouse shelf
   i. Backup software.
   j. Dual Power Supplies
4. Servers shall be capable of handling all software to manage and configure the security system.
5. Contractor shall connect the Server to the Ethernet in the building.
6. Provide all equipment required to mount the Server in the cabinet/rack
7. Server shall connect to the Network Intelligent controllers via the Ethernet network

2.05 ACCESS CONTROL SYSTEM SOFTWARE

A. The security system shall utilize a commercially available, Open Database Connectivity-compliant (ODBC) SQL open architecture relational database.
1. The software shall allow flexibility in design allowing the integration into other data structures.
2. This database shall handle the storage and retrieval of all card holder records information, images, system maps, reports, and screen designs.
3. The database shall operate in a truly multitasking environment without degradation of system operation and be of a design that will handle the transaction loading placed on the system.
4. The relational database shall support online backup, stored procedures with control logic, and server-based referential integrity.
5. Contractor shall install a Windows or windows like control system able to control and view all aspects of the security/access system.
   a. This software shall be part of the system provided by the contractor.
6. Contractor shall provide any SQL database software required to make the system work.

B. System shall be an access control system with alarm monitoring and reporting and shall have three primary components:
   1. The Security systems primary requirement is to provide access control. The system shall be able to make access granted or denied decisions, define access privileges, and to set schedules and holiday groups.
      a. Through the use of application programming these inputs and outputs shall be capable of being linked at all field controllers for purposes of implementing system-wide control strategies.
      b. The system shall provide for features such as:
         1) Remote login via internet
         2) “Double-tap” of a card to a card reader for timed unlocking of owner specified doors. This can be accomplished via the existing card reader at a door or a second card reader and special card. The idea is that a user can use a card to unlock a door or lock a door for an extended period of time without using the software through a PC.
      c. The access control system shall control operations at all controlled and monitored doors. The system shall be available to lock, unlock, alarm, disarm totally or temporarily. Silence alarms or pulse control points or groups of points as a standard feature.
   2. Card Holder Management and Enrollment
      a. Review card holder information through a quick search and display of images in the database.
      b. The security system shall include an employee management system integrated with the access control system.
      c. This employee management functionality shall allow the enrollment of card holders into the database, capturing of images, and import/export employee data.
         1) This functionality shall also allow the user to assign or modify access privileges of a card holder.
      d. The security system shall include a state-of-the-art credential creation and production system integrated with the card holder management system.
         1) This shall allow the creation of different badge types based on database fields and the use of security colors to allow security officers to quickly identify personnel access authority by the badge design.
   C. The security system software and hardware shall provide a dynamic security environment and shall provide easy configuration and storage of cardholder records, access records, alarm records etc. All of these functions shall be viewable and controllable from the Server or attached PC’s that are provide correct Access to the system.
   1. At a minimum the system shall provide for the capability of the following:
      a. 5,000 cardholder records.
      b. 50 card readers.
      c. 1000 alarm input points.
      d. 1000 output relays.
      e. 2 client control workstations that are attached to the IP network.
      f. Interface with no less than 500 intelligent controllers.
      g. 100 time intervals.
      h. 50 different alarm priorities.
      i. Automatic seasonal time changes.
      j. Configurable automatic time controlled reports on status, security, and access.
      k. Configurable backup of information.
      l. Proximity card information generation and record keeping.
m. Automatic system wide proximity card activation and deactivation.
n. Upload and download ability from outside programs for large data input and output.
o. Ability to make a telephone call, send e-mail and/or text notifications to selected users when security is breached. Security breach shall have different levels based on configured levels of security. Shall be owner configurable.
p. Provide the dialer and software associated.
q. Provide software levels of access for management, administrators and card makers.
r. Provide for numerous .WAV files to be assigned to different alarms and alerts.
s. Provide up to 25 user defined fields for cardholder data.
t. In the event of an activation of a Panic Device, the system shall be able to dial into a central station for alarming or shall be able to generate phone calls or text messages and emails to chosen personnel.

2. Software shall collect and store real time and statistical information on security access and other transactions.
   a. Data file shall store the last 50,000 transactions.
   b. All files shall be stored on hard disk and shall be able to be copied and stored on tape or other hard drive storage device.
   c. Contractor shall configure backup to the owner’s storage device.
      1) Provide any software required to backup the data on the server.

3. The software shall be capable of generating the following reports with filters available for time, doors, buildings, and all other events.
   a. Cardholder access times and points.
   b. Cardholder denials of access.
   c. Muster or Who Is In report for those people who presented a card to enter the building.
   d. Administrator audit trail reporting upon request.
   e. Alarm History Log
   f. Door Status Report
   g. Alarm Point Status Report
   h. Controller Status Report
   i. Event History Log
   j. Disabled Personnel Report
   k. Personnel by Department Report
   l. Personnel by Area Privileges Report
   m. Lost Card Report
   n. Input/Output Status Report
   o. Schedules Report
   p. Company Listing Report
   q. Termination Report
   r. Deadbeat Report
   s. All Doors Report
   t. All Events Sorted by Door
   u. All Events Sorted by Person
   v. Printing of all reports via direct e-mails or hard copy.

4. The software shall contain a report generator, featuring word processing tools for the creation of custom reports. These custom reports shall be able to be set up to automatically run or be generated on demand.

5. System shall integrate with the following systems:
   a. Central Station connectivity at a high level including allowing central station operators to view information within the system in the event of an alarm.
   b. Internet based remote diagnostic systems that allow a central station or offsite technician to configure and review the configuration of the system.
c. The system shall be able to be monitored and fixed/repaired/changed through a remote client by the owner or by a third-party contractor who is given rights and permissions to make changes.

d. This shall support remote technical assistance center to analyze and perform any system diagnostic function using a modem and PC anywhere or direct connection via the Internet.

D. Locking and unlocking schedules. The system shall allow the owner to set locking and unlocking schedules to set the status of doors. This shall allow separate schedules for any of the buildings.
1. Each building shall be able to have multiple schedules each day for locking and unlocking all doors.
2. Override Groups Containing I/O’s:
   a. System shall incorporate override groups that provide the operator with the status and control over user-defined “sets” of I/Os with a single icon on the software or a specific prox card being shown to a specific card reader.
   b. Icon on the system shall change automatically to show the live summary status of points in that group.
   c. Override group icon/card/card reader shall provide a method to manually control or lock/unlock a group of doors. See above regarding “Double-Tap” functionality.
3. Schedule Overrides of I/Os and Override Groups:
   a. To accommodate temporary schedule changes that do not fall within the holiday parameters, the operator shall have the ability to override schedules individually for each input, output, or override group.
   b. Each schedule shall be composed of a minimum of two dates with separate times for each date.
   c. The first time and date shall be assigned the override state that the point shall advance to, when the time and date become current.
   d. The second time and date shall be assigned the state that the point shall return to, when the time and date become current.

E. The system will be monitored and controlled at a client PC 24 hours a day. The system shall allow complete control and monitoring through the client PC. This shall be a Windows like interface that provides lists, maps, groups, control and other input/output abilities to allow the security personnel to fully control and monitor the security system.
1. The system shall allow monitoring and control of all system and all input/output points connected to the system via color graphic maps. Control points are defined as any door contact or any other relay output or input point. The contractor shall generate and populate these maps for the entire system.
   a. The maps shall be populated with distinct door icons. The icons shall be able to show the door number.
   b. The map icons shall reflect the actual door status at any certain time. Each door shall show Green for closed, Red for open. This shall be based on the door contact position open/closed.
2. The System Administrator shall have the option to group these outputs to simplify common output command procedures.
   a. The system shall allow a one touch button to lock all controlled doors or unlock all doors based on a single input button.
   b. The contractor shall configure a LOCKDOWN icon on the plan that will trigger all doors to close. There shall also be a NORMAL icon that when clicked will set the entire system back onto a normal schedule.
   c. Clicking the LOCKDOWN or NORMAL button shall only affect the school that the person is viewing at that time. The system shall segment the controls based on school/site.
3. All system outputs shall be displayed upon command in a list window or graphic map. The list and commands shall be operational without interfering with alarm monitoring.
operations. If an output is ordered to a setting, and is also on time zone control, the last command shall always override.

4. All manual control commands shall record into the activity log for viewing by any user given proper privileges to do so.

5. Manual control for doors, or any relay output, shall allow the user to disable the door/output (to not accept any cards), unlock the door/output (leaving the door strike unlocked), pulse the door/output open, or reset the door/output to a pre-defined default setting.
   a. This capability shall be able to be accessed and controlled through the mapping function by clicking on the door. The click shall control the door directly or bring up a window or list where the door can be fully controlled.

6. The user shall have the ability to determine the current status (armed or disarmed, as well as the current state (alarm/normal/fault) of an input point from an input list view or map at any time.

7. The user shall have a “Status” item in the list view. Both the current status and state shall be reflected by the color of the respective columns in the list view.

8. Arm-Disarm shall be accomplished by a user through a simple click of the mouse on the individual point.

9. All input points shall be grouped for ease of operation into arm-disarm groups as requested by the owner.

10. If an alarm is noted, then the controller shall have the ability to
   a. Acknowledged
   b. Returned to normal
   c. Acknowledge and or returned to normal
   d. Acknowledged after returned to normal

11. The system shall be configurable to call-up any and all cardholder information based on cards being presented at chosen card readers.

12. The user shall have the ability to Soft Acknowledge (i.e., Silence. or Acknowledge the alarm. Each of these actions shall be logged and date/time stamped.

13. The system shall allow the owner to configure the viewing of the system based on building. In example, the people at one school shall be able to fully control their schools independently of the doors at another school.
   a. The viewing of the system shall be controlled by user login.
   b. There shall be super users who can login to the system and view and control on a global basis.

F. Cardholder enrollment and photo badging:

1. Photo badging shall be an integral part of the system. It shall provide for Access Control cards and ID cards without access control.

2. The security system shall incorporate into a single, integrated system the latest in imaging technology and identification management.

3. The system shall include the ability to have no less than 10,000 cardholder records, and monitor badge/credential use throughout the facility. These credentials shall be based on data and images that are input and captured at the time of enrollment and fabricated at any of the photo imaging/badging workstations.

4. Credential images are to be digitized using industry standard JPEG image compression, and printed using a dye-sublimation/resin thermal transfer printing process that is high quality and environmentally safe.

5. The user shall be able to create personnel records either through the use of templates or direct input into the personnel record. Each personnel record shall allow for easy navigation through the fields. The user shall have the ability from the personnel record to easily:
   a. Enable or disable the cards.
   b. Define expiration date.
   c. Define the acceptable card type.
   d. Define the card number, site code and PIN.
   e. Mark the card as lost.
f. Issue temporary or restore permanent card.
g. Display the employee photo image and/or signature.
h. Have the ability create or edit the image.
i. Create, edit, or delete the card holder’s access privileges and additional personnel attributes.

6. The selection of card type shall be chosen from a drop-down list that shall include ABA formats, Wiegand formats, and custom Wiegand format to allow use of smart cards.

7. The user shall be able to mark the card as lost by selecting that control button. This shall disable the card and create a stored record with the associated card number and card holder.

8. In the event an attempted use of a cancelled or terminated card occurs, an invalid card event shall be logged and an associated alarm shall be generated to an operator workstation.

9. The owner shall be able to fully assign access levels and privileges to a card at the time of inception.
   a. The owner shall be able to define default templates for given personnel types. If a user has proper authorization, access privileges can be overwritten.
   b. When an individual’s access privileges are modified, that change shall automatically be propagated to all required controllers immediately upon completion of the change.
   c. Using personnel record configuration templates, the owner shall be capable of attaching previously defined privileges attached to the templates to new personnel requiring similar privileges.
   d. It shall be possible for the System Administrator to individually access the newly created personnel record to modify the privileges in the event the person does not exactly comply with the template.

2.06 BADGING HARDWARE

A. Contractor shall provide a card holder enrollment PC, Camera and Printer.
   1. The enrollment/photo badging station shall be a separate PC provided by the contractor that connects to a camera and badge printer which are all to be provided and configured as part of the contract.
   2. Each photo badging station shall include all equipment required to capture a high-quality portrait image, with flash lighting and a high quality digital video camera.
      a. The photo imaging workstation shall allow the camera user to view a live video image of the subject on the screen. The user shall view the subject in an upright position as they are captured.
   3. While capturing subjects, the user shall have the option of capturing a new image of any subject without affecting the subject’s record.
      a. The photo imaging workstation shall provide a digitizer color control window in order to adjust the contrast and brightness of images. For convenience, default settings shall be provided.
   4. The badging station shall include the ability, upon command, to preview, online and in full color, the badge as it will appear when printed.
   5. The badge format, including background color, layout, location of photo image, applicable graphics or company logos, text, etc., shall be completely and automatically determined by the system based on employee record information.
      a. Where choices are available to the user, choices are to be made via pre-defined list boxes to avoid user errors in spelling and badge assignment errors.
   6. The owner shall be able to choose multiple badge formats and layouts.
      a. The contractor shall create all chosen badge layouts as part of the contract.
   7. The Color Credential/Badge Printer shall be
      a. High-density dye-sublimation type printer offering, a minimum of 300 dots per inch resolution with a clear overlay option for high durability.
      b. The credential media used shall be compatible with the credential printer.
c. The credential printer shall be able to print one-sided or two-sided credentials in credit card sizes and in portrait or landscape orientations.
d. Badge shall be able to print barcodes on either side of the card.
e. The user shall be able to print the badge as soon as it is created or to send the badge to a print queue for later batch printing. Within the print queue the user may print all badges, print a selected badge, and delete a selected badge or preview without printing.
f. Printer shall be Evolis # Primacy or equal.

8. Camera for taking image shall be provided by the Contractor
   a. Provide a webcam type camera and tripod for taking pictures of users
   b. Camera shall be compatible with Windows and MAC operating systems.
   c. Shall connect to a PC through USB cable that is provided
   d. Minimum of 720p resolution. 1280x720 pixels
   e. Low light correction
   f. Mounting on a third-party tripod.
   g. Tripod shall support camera and shall mount at head height when mounted on a tabletop.

9. Enrollment Laptop shall meet the following specifications:
   a. Quad Core 3.1 MHz
   b. 64 Bit
   c. 8 Gig RAM
   d. 250 Gig Hard drive 7200 RPM SATA
   e. Windows 10
   f. HDMI output video card
   g. USB connectivity
   h. 13” screen and associated cables.

2.07 NETWORKED INTELLIGENT CONTROLLER (SECURITY PANEL)

A. The Contractor shall provide intelligent controller panels and cards for the security system that utilize a true distributed processing technology with local processing at each controller.
B. In the event system communications is lost or the file server fails, all networked intelligent controller, (controllers or security panels, terms will be used interchangeably) shall provide complete control, operation, and supervision of all monitoring and control points based on the latest database information.
C. The controller shall be configured to avoid system failure. In the event of a server or system failure, transactions are to be stored at the controller until the server and connection is back online. Once it is online then the information shall be downloaded to the server.
1. The controller shall be utilized as the “brains” of the security and access system. All door contacts, card readers, request to exit contacts, assisted openers, door controllers, electric latch devices and other devices shall connect to the controller.
   a. Controllers shall be microprocessor-based, multi-tasking, multi-user, and use real-time, digital control processors.
   b. Each control panel shall consist of modular hardware including power supply, CPU board, and various input/output modules.
   c. Memory at the controller shall be large enough to store 10,000 card holder information points.
   d. Controllers shall be able to be updated via remote connectivity or direct connectivity. Updates shall be for new firmware or software updates.
2. Controller shall be fully configurable by the Owner via a Microsoft Windows type interface through the operator workstation or through offsite connectivity through the IP network.
3. Controller shall connect to the fire alarm system. In an alarm condition, the controller shall unlock doors as required to allow people to enter and exit the building. The Contractor shall provide all cabling, software and hardware required to interface with the fire alarm system as well as the video security system.
4. Controllers shall mount in cabinets on the wall of the communications room.
   a. Extend power to the panels from existing power outlets. All power to the panels shall be hardwired. Contractor shall make all final power connections. Provide all raceway required.
   b. Contractor shall be responsible for power from the local receptacle to the panels.
5. Provide the quantity of controllers required for all security and access points in the building.
   a. Each controller shall have onboard LED's for self diagnosis.
6. Input/Output boards for all access and security points shall pop in and pop out. Replacing a board for a certain point shall not require shutting the entire controller down.
7. Each controller shall support IP communications. Additional communications shall be via RS-232 and or RS-485.
8. Controller shall provide 32-bit processing and shall meet UL 294 requirements.
9. Real-time on board clock synchronized with Server.
10. Power Supply on-board or remote shall be provided for each controller or cabinet.
11. Cabinet shall be fully enclosed and shall mount on the wall of the communications room.
   a. Shall be equipped with a lock and key.
12. Where the door hardware installer provides a door interface or door controller card that works with the electric latch/strike and request to exit button, the communications contractor shall provide the correct interface to read data and send data to the door controller.
13. The link to other systems shall take place at the controller as well as through the I/O system so that in the event of failure or an alarm, the rest of the system shall continue to function correctly.
14. Battery Backup
   a. The controller shall have battery backup UPS circuit with built-in battery charger shall provide automatic battery backup UPS power in event of AC line failure.
   b. Each controller panel shall have a battery for power failure. Battery shall be fully enclosed in a metal cabinet.
   c. The battery shall provide for full UPS operation for a minimum of 30 minutes.
D. I/O Cards/Modules shall be installed in the Controllers to allow input and output to the field devices throughout the building.
1. Modules shall be installed to connect to the all field devices, including but not limited to:
   a. Card Reader/keypad
   b. Door contacts,
   c. Request to exit devices,
   d. Push buttons/Panic buttons
   e. Security cameras,
   f. Assisted door opener devices and door opener buttons
   g. Motion sensors.
   h. Lockdown buttons with Lockdown Status Light
   i. All other security devices required and shown on the drawings.
2. Modules shall translate information from the field devices to the controller and thus the server for records and access control.
3. The Access Control Module shall provide the interface for one to four card reader/keypad controlled doors. Each access controller shall include card reader input(s), and various other inputs such as door contact, request to exit, momentary open button, door opener etc.
4. The maximum time for door opening from the proper presentation of a card shall be less than one second.
5. I/O Card shall be provided that serve access control devices such as door contacts and garage contacts. These cards shall provide alarms when the contact is "open". The time before alarm shall be fully configurable by the owner.
6. The card reader inputs shall accept both standard and "Smart Card" information.
7. Output types shall be digital for control of doors. In addition to the door output, the control module shall contain auxiliary outputs for ON/OFF control of other devices.
8. Intrusion detection and digital control modules shall provide inputs and outputs to monitor and control non-reader-based system points, such as door contacts, motion sensors, gate actuators, etc.

E. Extra Cabinet for Controller:
1. Provide extra cabinets for extra cards/modules as required for specified control points.
2. Provide growth capabilities for installation of additional cabinets and control points.

F. Power Supplies for security system:
1. Provide power supplies to power the Electric Strikes and Electric Locks and other security devices that are connected to the access control Power supplies shall be in the comm room
2. Coordinate power supplies with the door hardware supplier.
3. All power supplies shall be connected to 120VAC power with a hardwired connection. Install cable and connect to power.
4. The power supplies shall match the security device to which they are connecting
5. Size the power supplies to lock or unlock all the doors at once based on scheduled unlocking.
6. Install cabling from the power supply to the door lock based on the table below.

<table>
<thead>
<tr>
<th>Distance from lock to Power Supply</th>
<th>Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>200'</td>
<td>18 AWG</td>
</tr>
<tr>
<td>320'</td>
<td>16 AWG</td>
</tr>
<tr>
<td>500'</td>
<td>14 AWG</td>
</tr>
<tr>
<td>800'</td>
<td>12 AWG</td>
</tr>
</tbody>
</table>

2.08 FIELD DEVICES
A. Proximity Cards
1. Contractor shall provide 100 proximity cards that work with the security/access system installed in the building.
2. Proximity cards shall be industry standard size and compatible.
3. Proximity cards shall have a hole for connection to a lanyard.
4. Cards shall be standard 125Khz cards. Fobs shall meet the following standards:
   a. Card: HID IsoProx II Card or equal.
   b. Any cards or fobs provided shall be compatible with the card readers and printer.
5. When a card is being supplied, the Contractor shall work with the Owner on designing the information that will be printed onto the cards since they will also be used for identification. The card shall be able to be printed on and shall be able to contain a picture of the person it is issued to as well as their name, other information that may be required and a barcode that is compatible with standard bar-code reading systems.
6. The Contractor shall print, label, mark and otherwise make ready all the access cards that they provide as part of the system.
7. Cards shall be able to be printed by the new printers the contractor provides. Provide new ink cartridges after all badges are printed
8. Contractor shall take the picture of each employee and shall enter the data into the system for each person including their card number, picture, personal information and access level.

B. Card Readers: "CR" on drawings
1. Refer to the drawings for locations where card readers "CR" are required.
2. Card readers shall be combo readers that read standard 125 khz readers for standard prox and 13.56 MHz “smart” cards.
3. Card readers shall be completely compatible with the security/access system.
4. Card readers shall be mountable in a single gang box or in the frame of a door. Refer to drawings for locations.
5. Readers shall be sealed to allow outdoor installation.
6. Power requirements for the card shall be between 5-16 volts DC.
7. Reader must be capable of providing a read range up to 4” without modification.
8. Reader shall operate in a temperature range of minus 22 degrees (-22°) to one hundred fifty-one (151°) degrees Fahrenheit.
9. Reader shall be designed for both surface mounting and mounting on a single-gang electrical box.
10. Reader shall have a tri-color light emitting diode (LED) and audible tone for noting of accepted read or rejected card read.
11. Reader shall flash the LED green momentarily and emit a short beep to indicate that a card was read.
12. Card readers on single-gang boxes shall be HID MultiClass SE #RP40 or equal.
13. Card readers on the frame of a door shall be HID MultiClass SE #RP15 or equal.

C. Electric Latch “EL” on drawings
1. The door hardware installer will install an Electric Latch device at each door equipped with a card reader or as shown on the drawings. The security contractor shall wire from the EL device to a power supply in the communications room and then to the door controller in the communications room.
2. Provide cards in the controller panel and equipment to allow the security system to interface with the EL.
3. The EL shall be able to be held open based upon a time schedule put forth in the security system. It shall also be able to be retracted upon presentation of a valid card or fob to the card reader.
4. Wire to the Electric Latch and full integrate it into the security system.
5. Wire from the EL to the controller in the comm room to allow control of each individual door.

D. Latch Retraction device: “LR” on drawings
1. The door hardware installer will install a Latch Retraction device as shown on the drawings.
2. Provide and install a power supply in the communications room to power the LR device. Review the door hardware and match the power supply to the Latching Retraction devices. Provide quantity as required to power all LR devices.
3. The security contractor shall wire from the LR device to a power supply in the communications room and then to the controller panel in the communications room.
4. Provide cards in the controller panel and equipment to allow the security system to interface with the LR.
5. The LR shall be able to be held open based upon a time schedule put forth in the security system. It shall also be able to be retracted upon presentation of a valid card or fob to the card reader.
6. See door hardware specifications for transfer hinge and wiring harness provision plans.
   a. If wiring harness is provided as part of door hardware:
      1) Wire from door harness, through raceway and back to the power supply in the comm room. Wire to security panel for control of the door.
      2) Provide custom wiring and connectors to connect to the wiring harness
   b. If no wiring harness is provided as part of the door hardware.
      1) Wire from the LR, through the hinge and back to the Power Supply in the comm room. Wire to security panel for control of the door.
   c. Provide manufacturers recommended cabling type and wire gauge.

E. Electric Strike. “ES” on drawings
1. The door hardware contractor shall install the Electric Strikes.
2. The contractor shall wire from the ES to the security panel. Provide cabling to control the ES and power the ES.
3. Provide power supply in the comm room to power the ES.

2.09 DEVICES AT THE OPERATOR DESK
A. Pushbutton Release: “PB” on drawings
   1. The drawings show a “PB” where required. This shall function to facilitate the immediate or direct deactivation of an electro-magnetic lock or electric latch or electric strike or other programmed series of events when depressed.
   2. The push button shall allow the temporary deactivation of the supervisory systems of a controlled door to permit access without generating an alarm (authorized access).
   3. Push buttons shall be below the desk or as noted by the owner.
   4. Wire back to the IO panel in the networked controller
   5. PB shall be Honeywell #RPW304A1003/A or equal. Mount in a surface mount box with stainless steel faceplate. Custom cut plate and mount button in this plate.

B. Panic Device “PD” on drawings
   1. At certain locations, the PD shall direct the system to start a function. Function may be:
      a. Alert a person or dial out to authorities that there is a need for assistance.
      b. Lock a door or engage a magnetic lock.
   2. This shall function send an alarm notice to the security personnel that there is an issue.
   3. The panic device when depressed shall allow multiple outputs such as unlocking of doors, pages, telephone calls to security personnel, audible alarms etc. All this shall be configurable in the security system.
   4. The panic device shall be a button recessed in a housing to minimize wrongful depression of the buttons.
   5. Once depressed, the actions shall only be able to be reversed by pushing the button again or pulling out the button.
   6. Panic Device shall be Honeywell #270R or equal.

C. Lockdown Button; “LD” on drawings
   1. The drawings show a “LD” where required. This shall function to facilitate the immediate locking of all electronically controlled doors in the building.
   2. The button shall also be able to start the piezo and beacon strobe light for a set duration of time (if system is so equipped). This duration shall be able to be set by the owner.
   3. The button shall have a dual purpose. When pressed, the switch shall put the building into a lockdown situation. When pulled (or pushed again) out the building shall revert to its schedule locking status.
   4. The lockdown button when switched shall allow multiple outputs such as
      a. Locking/ unlocking of doors
      b. Engaging light on faceplate to note that the system is in lockdown
      c. Engage any beacon strobes or Piezo screamers if shown on floorplans.
      d. Initiate pre-recorded messages via the paging system (if shown on floorplans)
      e. Set levels for access thru card readers. Some users may not be able to use their cards to enter the building during a lockdown.
      f. All this shall be configurable in the security system.
         1) Work with the owner and determine what steps are to occur when the lockdown button is pushed. Configure the system to meet those need.
   5. The lockdown button shall be mounted in a standard single-gang backbox and shall be equipped with a cover for safety.
   6. Include a status light on the illuminated button
      a. The light shall be a red light that is on only when the system is in lockdown.
      b. When the system is taken out of lockdown the light shall turn off.
   7. Faceplate shall be custom screen printed to say “LOCKDOWN”
   8. Lockdown Button shall be Safety Technology International #SS2429LD-EN or equal.
      a. Provide all cables required to connect this button and power the light
2.10 RACEWAYS
A. Raceways to support access control devices at doors shall be by the security contractor. See details for routing and extent of the devices.
   1. Install metal backboxes where required for mounting of card readers.
   2. Install metal backboxes on doors when transitioning from raceway to the frame of the door.
   3. Raceways shall be metal and shall be wiremold V700 or equal. Size as required.
   4. All raceway shall be mechanically attached to the wall.
   5. Paint all raceways to match the frame/mullion when the raceway is mounted on the door frame or mullion.
   6. Where raceway is required from the door frame to the pushbar assembly the contractor shall provide metal, flexible conduit.
      a. All exposed metal conduit between doors and pushbar assemblies shall be Flexible metal conduit with Sealing Cord Packing. Delikon #YF-703xx-IN (interlocked) or equal.
      b. Provide manufacturer approved connectors at each end to anchor the conduit to the pushbar assembly and door frame. Provide custom transitions at the doorframe or at surface raceway where required.

2.11 WIRES AND CABLES
A. The contractor shall be responsible for supplying and installing all cabling to make the system operational.
   1. All cabling shall be Plenum rated
   2. All cabling shall be installed in raceways and in accessible ceiling spaces through cable supports.
   3. Provide manufacturer specified cabling based on use and length of signal transmission from panel to device.
   4. Generate drawings showing the cables required and get those reviewed by the designer prior to installation.
B. PVC-Jacketed, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
   1. NFPA 70, Type CM.
   2. Flame Resistance: UL 1581 Vertical Tray.
C. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; plastic jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
1. NFPA 70, Type CMP.

D. RS-485 communications require 2 twisted pairs, with a distance limitation of 4000 feet (1220 m).

E. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.

F. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
   1. NFPA 70, Type CMP.

G. Multi-conductor, Readers and Wiegand Keypads Cables: No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
   1. NFPA 70, Type CMG.
   2. Flame Resistance: UL 1581 Vertical Tray.
   3. For TIA/EIA-RS-232 applications.

H. Paired Readers and Wiegand Keypads Cables: Paired, 3 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
   1. NFPA 70, Type CM.
   2. Flame Resistance: UL 1581 Vertical Tray.

I. Paired Readers and Wiegand Keypads Cable: Paired, 3 pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
   1. NFPA 70, Type CM.
   2. Flame Resistance: UL 1581 Vertical Tray.

J. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum foil-polypropylene tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
   1. NFPA 70, Type CMP.

K. Plenum-Type, Multiconductor, Readers and Keypads Cable: 6 conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
   1. NFPA 70, Type CMP.

L. Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
   1. NFPA 70, Type CMG.
   2. Flame Resistance: UL 1581 Vertical Tray.

M. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
   1. NFPA 70, Type CMP.

N. Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
   1. NFPA 70, Type CMG.
   2. Flame Resistance: UL 1581 Vertical Tray.

O. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
1. NFPA 70, Type CMP.
P. Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum foil-polyester tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
   1. NFPA 70, Type CMR.
Q. Plenum-Type, Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum foil-polyester tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
   1. NFPA 70, Type CMP.
R. Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
   1. NFPA 70, Type CMG.
S. Plenum-Type, Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
   1. NFPA 70, Type CMP.
T. Elevator Travel Cable: Steel center core, with shielded, twisted pairs, No. 20 AWG conductor size.
   1. Steel Center Core Support: Preformed, flexible, low-torsion, zinc-coated, steel wire rope; insulated with 60 deg C flame-resistant PVC and covered with a nylon or cotton braid.
   Shielded Pairs: Insulated copper conductors; color-coded, insulated with 60 deg C flame-resistant PVC; each pair shielded with bare copper braid for 85 percent coverage.
   c. Braid: Rayon or cotton braid applied with 95 percent coverage.
   d. Jacket: 60 deg C PVC specifically compounded for flexibility and abrasion resistance. UL VW-1 and CSA FT1 flame rated.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Examine all pathways prior to installation of all cables and raceways.
   B. Install all conduits, pass-thru’s, raceways and surface mounted raceways prior to installing the security system devices and cabling.

3.02 PREPARATION
   A. Locate main path for all cables and install J-hooks where cable tray is not provided.
   B. Coordinate with other trades to install a clear, straight path down major corridors for the routing of security/access cables back to the communications closet.
   C. Plan installation of cables along wallfield in communications room. Provide finger-duct and D-rings for support of cables. See drawings

3.03 INSTALLATION-GENERAL
   A. Security/access cable shall be installed per industry standards.
      1. Care shall be taken to avoid crimping or bending the cable past the manufacturer’s recommended bend radius.
2. During installation, the cables shall not be pulled across the ceiling tiles or the structure of the building. This may cause damage to the cable jacket.
3. Adhere to all pulling tensions and bend radii during installation.
4. All cables shall route neatly in the ceiling. Whether they route in cable tray or J-hooks, the cables shall be neat and orderly.
5. Support cables at a minimum of every 5 feet.
6. When routing security/access cables parallel to electrical conduits and lighting ballasts, the cable shall maintain a clearance of at least 12 inches. When running perpendicular to electrical conduits and lighting ballasts the cable shall maintain 6 inches of clearance.
7. Provide a short coil of extra cable where the cable enters the vertical conduit. The coil shall consist of no less than 1-1/2 feet.
8. When installing cables in the communications room, all cable shall route neatly through the cable tray and cable ladder.
9. Provide a service loop of the cables on the wallfield.
10. Each cable shall have a self adhesive, self laminating, laser printed label at each end. The label shall show the location identifier of that cable. Labels shall be installed no more than 4 inches from the termination point of the cable.

B. 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.

C. Cabling at the Panel.
1. Contractor shall coil all spare cable from the door devices outside the security panel and shall neatly coil the cable on the wall.
2. Cables shall route into the panels through a grommeted hole that is sized for the cables entering.
3. All cables shall be installed in a neat and workmanlike manner.
4. Cables shall be terminated and shall allow for removal of a card without un-terminating the cables.
5. All cables shall be neatly distributed to the card in the panel.
6. All labels shall be visible inside the panel near the termination point. Label cables equidistant from their termination point.

D. Proper support of cables is of paramount importance when installing a cable infrastructure. All cables not in conduit or cable tray shall be supported via J-hooks a minimum of every 5 feet.
1. Routes of cables shall be parallel or perpendicular to the walls of the building.
2. Install the J-hooks to minimize changes in the level of the cables as they route through the J-hooks.
3. All communications shall route as high in the ceiling as possible while still being accessible and staying away from other utilities.
4. When installing the cable through the J-hooks, they shall all have relatively the same droop between hooks. All cables shall be installed neatly and squarely.
5. Secure the J-hooks to the building structure with beam clamps and threaded rod as required to support the cables.
6. J-hooks shall never be attached to drop ceiling support wires. Cables shall never be supported by drop ceiling wires.

E. Raceways.
1. Shall be mechanically attached to the wall or door.
2. Paint to match door frame/mullion.
3.04 SERVER AND SOFTWARE INSTALLATION

A. Management Server:
1. Install and configure the server. Attach to the network.
2. Install the server in the MDF on the data rack. Provide shelves as required for keyboard, PC, mouse, and monitor.
3. Connect Server into the Ethernet network to allow remote monitoring and remote control of the system from other locations also attached to the Ethernet network or IP network.
4. Contractor shall provide and install software that allows remote monitoring and control of the entire security/access system through the Ethernet.
   a. Configure backup of the system to the owner’s storage device.

B. Control Software:
1. Contractor shall provide all software required for a fully functional security/access system.
2. Software shall be installed and fully configured by the Contractor.
3. Contractor shall schedule meetings with the Owner prior to installation to determine the working of the security/access system.
4. Install control software on the management PC in the communications room.
5. Install software on up to 2 other PC’s attached to the IP network to allow remote monitoring and control of the entire security/access system. Work with Owner on determining location of PC’s.
6. Configuration of the security software shall include but not be limited to the following:
   a. Installation of all user information into the security software. This shall include all staff. This shall include no less than 80 staff members.
      1) Configure the personnel information field prior to beginning the staff information input. Meet with the owner to determine the information that they wish to be in the system.
      2) Take all personnel pictures as they are enrolled into the system.
      3) Enter the person’s information into the fields required by the owner.
      4) Meet with the owner prior to installing data to determine custom data fields and to layout the card requirements.
      5) Print all cards with a card printer. Provide the ink for each card.
   b. Number each door input and associate it with a standard door name for easy review.
   c. Meet with the owner to determine how they will use the system. Take information from them that will allow all custom settings of the software system. This shall include but not be limited to:
      1) User groups based on building and administrative group
      2) Access levels based on groups and times.
      3) Building locking and unlocking schedules for each building
      4) Administrative levels and super administrators
      5) Lockdown and Normal locking schedules. Configure the system to lock all doors upon going into lockdown mode through the button or through the software system.
      6) Setup all user logins to allow specific viewing of portions of the system based on login ID.
   d. Generate customized maps for each building.
      1) Create maps from the owner that have multiple levels such as entire building and then subdivided into different areas.
      2) The maps shall show icons for each door. The icons shall be green or red based on open or closed door.
      3) Setup all icons to allow the owner to click on a door and then have direct access to lock or unlock or pulse the lock on a door.
   e. Setup all user accounts and install the user software on the owner’s pc’s.
      1) Setup the user accounts based on the doors or buildings they will be allowed to control.
2) Work with the owner to determine which panels, doors, maps or buildings the user will be able to see and control.

3.05 CONTROL PANEL INSTALLATION
A. Networked Controller:
   1. Controller(s), shall be mounted to the wallfield in the communications room.
   2. Controller shall be sized for all security, access, control, and monitoring points existing on the drawings and shall be expandable.
   3. Controller shall be able to be linked to additional controllers in other communications rooms via the Ethernet network.
   4. Each port in the controller that is connected to a security point shall be labeled inside the controller box.
   5. Install power to the battery backup power supply that supports the controller. Power shall be hardwired from the local power circuit.
   6. Label the outside of the panel with the door numbers that are connected in that panel. Shall be laser printed adhesive labels.
   7. Label the inside of the panel door with the layout of the panel and which cards attach to which devices. Include door numbers on the diagram.
   8. Hardwire power to the panel or panel supply. Extend the 120 volt circuit to the panel. Do not plug into the circuit. Provide an electrician for connection of the power supplies.
   9. Depending on the type of panel the contractor shall provide cable routing hardware and equipment to neatly install cabling.
      a. Route cable to allow easy change and replacement of the individual control cards in the panel.
      b. Mount the controller on the wall
      c. Cabling shall be neatly bundled. See example below of adequate cabling being routed into a panel.
3.06 FIELD DEVICE INSTALLATION

A. Card Readers: “CR” on drawings
1. Card readers shall be installed at locations shown on the drawings.
2. Review site and drawings and coordinate the wall mounted readers and frame mounted readers. Order the correct reader for each location.
3. Coordinate installation of all card readers with the doors and walls.
4. Where the reader is mounted on the door, coordinate the installation with the installation of the door to allow all cable for security/access.
5. Locate all card readers at ADA compliant heights and locations.
6. At the garage doors, the card readers shall be installed in a weatherproof method and shall be weatherproof.

B. Electric Latch and Electric Strike “EL and “ES” on drawings
1. The Electric Latch and Electric Strike devices shall be installed by the door hardware contractor.
2. Power supplies shall be located in the comm room. Provide and install power supplies.
3. Install all cables required to be connect this device to the security system
4. Review door hardware specifications to determine if a wiring harness is being provide by the door hardware supplier.
   a. Install cables from the controller panel and power supply in the comm room to the wiring harness. Connect to harness
   b. For EL devices, install harness from door hardware EL to the hinge, through the hinge and to the connection point for cables from the controller.
   c. For ES devices, install cabling rom security panel do the Electric strike in the latch side of the frame.
   d. Wire from device, through frame and back to controller/power supply in the comm room.

C. Latch Retraction device. “LR” on drawings
1. The Latch Retraction devices shall be provided by the door hardware supplier and installed by the security contractor.
2. Power supplies for Latch Retraction devices
   a. Power supplies for LR devices are provided by the door hardware supplier.
   b. Power supplies will be located in the comm room.
3. Install all cables required to be connect this power supply to the security system and to the actual Latch Retraction lock at the door.
4. Review door hardware specifications to determine if a wiring harness is being provide by the door hardware supplier.
   a. Install cables from the controller panel and power supply to the wiring harness. Connect to harness
   b. Install harness from door hardware LR to the hinge, through the hinge and to the connection point above the door.
   c. Wire from connection point above door to the power supply and then to the security panel.
   d. If no harness is provided, then wire from EL device, thru the hinge, to the power supply controller and finally to the security panel.

3.07 DESKTOP DEVICE INSTALLATION

A. Toggle Switch: “TS”, Push Button “PB, Panic Device “PD” and Desktop Console “CO”
1. Wire each device back to the access control system panel.
2. Wire each button and each light if so equipped
3. Provide the correct cable to support full use of the button or switch or control of the LED light
4. Install the toggle switch on the desk or under the desk. Provide a cover on the switch.
   a. Mount to a backbox with blanks stainless steel plate
5. Mount each device to the furniture at location identified by owner.
6. Wire back to system. Configure system to have two or more states. One for each switch position. Talk to owner to identify the states required.
7. Meet with owner to discuss how buttons shall be configured.

END OF SECTION 28 3500
SECTION 28 3600 – SECURITY RECORDING

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. This section includes parts and equipment required for installation and configuration of a video security system. This system shall be referred to as the “security system” throughout these specifications.

1.02 SYSTEM DESCRIPTION
A. The security system shall be supplied and installed by a Contractor able to show examples of similar projects and installations within the last 3 years.
B. The video security system shall serve the building(s) shown and be able to be expanded to support other buildings attached to the data network.
C. New cameras shall be IP cameras with direct connection to Ethernet Switches.
D. Software and hardware shall allow for monitoring from any PC attached to the data network.
E. Software and hardware shall allow for monitoring from any Smartphone or Wireless tablet device. Provide hardware and software to accomplish this.

1.03 COORDINATION
A. Coordinate with the network contractor. Provide IP addresses and ports the cameras are connected to in an excel spreadsheet to the network contractor for VLAN configuration.
B. Coordinate with data cabling contractor. Walk the site and identify all camera locations and make the cabling contractor aware of all camera locations.

1.04 PROJECT PLAN
A. The contractor shall provide a project plan to the owner and contractor that describes the system and its capabilities and the possible configurations.
B. Provide a project approach which describes the installation and implementation plan and schedule and all sequencing.
C. Meet with the owner numerous times to determine how the system should work and how it should be monitored. Configure the system prior to installation to meet these requirements. Demonstrate the system use to the owner prior to installation and obtain approval to move forward with the installation.
D. Provide shop drawings showing all configuration and connectivity of the system.
E. Generate a testing plan and have that plan approved by the owner and engineer prior to installing the system.

1.05 RELATED STANDARDS
A. The security system shall conform to the following international and national standards:
1. FCC Rules and Regulations
2. UL 294 Access Control Systems
3. UL 1076 Line Supervision
4. 21 CFR part 11
5. Part 15, Radio Frequency Devices
6. National Electrical Manufacturers Association (NEMA)
7. Applicable Federal, State and Local laws, regulations, codes
8. Americans with Disabilities Act (ADA)
9. National Electrical Code (NEC)

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Approved vendor for video security camera recording software is:
   1. Exacq
   2. Milestone
   3. Avigilon
   4. Genetec
B. Other manufacturers as approved PRIOR TO BID. Submit pre-bid RFI requests for other products.
   1. Systems submitted as part of the base bid that were not pre-approved in writing during bidding will not be reviewed.

2.02 VIDEO SECURITY HARDWARE
A. Network Video Recorder (NVR):
   1. The Contractor shall provide an NVR or multiple NVR’s that connect to all the video cameras. Size the system to accept additional cameras to be installed in the future. See drawings and/or specs for quantity
      a. The NVR shall be a central control and storage system that allows the Owner to view and review images from any or all cameras.
   2. NVR and associated storage shall be of the latest manufacture and software release available.
   3. Shall supply multiple simultaneous playback streams.
      a. The system shall allow all PC’s attached to the wired Ethernet network to view cameras at full resolution on their PC.
      b. Size the processor of the NVR and Monitoring PC to allow viewing of up to 32 cameras at the monitoring PC without any slowness or loss of signal.
      c. The network video recorder shall have outputs viewable on up to 2 individual workstations, shall record video, audio, and data streams for every channel, and shall have storage locking.
   4. The NVR shall be capable of continuous, schedule, alarm/event, and motion recording, shall have pre- and post-alarm recording and shall be fully programmable on a per-channel basis.
      a. Any motion sensing shall be assumed to be done at the server. Use this for servers sizing.
      b. See specifications below for recording parameters.
   5. The NVR shall have expandable storage capacity to allow additional storage of video. The expandable storage shall be easily added and integrated into the system.
   6. The network video recorder shall offer plug-and-play configuration for cameras.
   7. The network video recorder shall provide performance enhancement and fault tolerance by employing RAID-5 style redundancy across multiple disk drives and shall feature a hot drive swap that automatically configures the drives when installed.
      a. Where the Video Management Software (VMS) requires, the Immediate recording shall be to High-Speed drives.
      b. Images can then be moved to slower, long-term storage devices.
      c. Provide these drives based on the VMS being installed.
   8. The network video recorder shall meet or exceed the following design and performance specifications:
      a. Processor:
         A) No less than Two, Quad-core processors, Intel® Xeon 5600 series® 4, 2.8 GHz or equal.
         B) 64 Bit
         C) Provide calculations from the software manufacturer and camera manufacturer to prove processing and storage submitted will meet system requirements
D) Provide the actual throughput and quantity of storage being provided and note how it meets calculations from the software manufacturer and the camera manufacturer.

b. Internal Memory:
   A) 16 GB minimum.

c. Operating System:
   A) Linux or Microsoft. (provide any operating system software)

d. User Interface:
   A) Remote operation from standard Windows 10 PC's.
   B) Shall be equipped with web interface to allow viewing of live and recorded video through a standard web browser.
   C) Shall allow and be equipped with software and hardware to allow viewing of live video on a tablet or smartphone device.

e. NVR throughput:
   A) Server throughput shall be the capacity of the server(s) to process incoming live and recorded video. This shall be a function of the processing power of the NVR/server.
   B) It shall provide for processing, live viewing, remote viewing and recording capacity to record on all cameras at:
      1) 15 frames per second.
      2) Constant recording of all cameras
      3) Compression shall be no higher than 30%. Thus if full bandwidth of the camera is 100 then configuration shall be no less than 70 on a 1 to 100 scale.
      4) 2 users viewing 16 cameras each
      5) 2 users viewing cameras through a wireless smartphone or tablet device. Provide additional server if this is a requirement of the software.
      6) Audio recording of microphones in all indoor cameras
   C) Thoughput shall be calculated at maximum camera resolution of the specified cameras. Any spare throughput required shall be calculated for cameras at 1920x1200.
   D) Throughput shall include processing of the cameras shown plus future additional cameras as noted on the detailed drawings.
   E) Assume that the owner will be viewing live video on 10% of the installed cameras. This shall be taken into account if the server does any processing of the live images.

f. Video image storage: This shall include the amount of disk storage space required to store all the images from the cameras. Storage space shall be calculated based on:
   A) Recording images on all cameras at 15 frames per second,
   B) Assume recording on movement rates of 50%.
   C) Additionally, each camera shall record 1 frame per second when there is no motion.
   D) Storage for 30 days.
   E) Storing images at maximum camera resolution of the specified cameras. Any spare storage required shall be calculated for cameras at 1920x1200.
   F) Audio recording of microphones in all indoor cameras when recording video
   G) Include processing of the cameras shown plus future additional cameras noted on the drawings.

g. Total Capacity shall be calculated by Contractor. Provide calculations if you are asked to present your solution or if you are the chosen bidder.
h. Hard drives shall be internal or part of an external storage array. All discs shall be configured in a RAID 5 redundant style array such that losing any single drive will not mean a loss of recorded images.

9. NVR shall allow connection to a permanent backup device.
10. Each NVR shall have dual power supplies.
11. The NVR shall have Two Gigabit Ethernet connection(s) via an RJ-45 type interface.
12. The NVR shall be 19 inches rack mountable.
13. The NVR Servers shall be supplied with no less than three years of 24x7 maintenance that includes next day replacement of drives and service on the server.
14. Servers shall be from the following manufacturers
   a. Hewlett Packard
   b. Dell
   c. Manufacturer of the VMS
15. Remote viewing for mobile devices.
   a. Provide a server or processing power in the main servers to support remote viewing of images on smartphones or tablet devices.

2.03 UPS SYSTEM
A. Contractor shall provide a UPS system that will support the server and Ethernet switch that attach to the server switch in the main communications room.
B. The rack mount UPS shall be sized to provide 25 percent growth/overhead from the switch to which it is connected.
C. Input shall be:
   1. 120V AC
   2. Input Frequency: 50/60 Hz +/- 3 Hz (auto sensing).
   3. Input Connections: NEMA 5-15P.
   5. Input voltage range for main operations 82 - 144V.
D. Output:
   1. Nominal Output Voltage: 120V.
   2. Output Voltage Distortion: Less than 5 percent at full load.
   3. Output Frequency: (sync to mains) 47 - 53 Hz for 50 Hz nominal, 57 - 63 Hz for 60 Hz nominal.
   5. Waveform Type: Sine wave.
   6. Output Connections: NEMA 5-15R.
E. Batteries and Runtime:
   1. Typical Backup Time at Half Load shall be 15 minutes.
   2. Typical Backup Time at Full Load shall be 10 minutes.
   3. UPS shall be in the main communications room only.

2.04 VIDEO MANAGEMENT SOFTWARE (VMS)
A. The VMS shall be
   1. Scalable video management software hosted on commercial grade servers with Microsoft Windows or Linux operating system.
   2. The VMS shall be a true hybrid system capable of integrating existing or new analog and/or IP cameras into the IP infrastructure.
   3. The VMS shall support virtually all leading IP and analog camera and encoder manufacturers for user choice and design flexibility.
   4. The VMS shall be full featured with client software applications intended for
      a. Live video monitoring
      b. Real-time alarm monitoring and display
      c. Alarm display prioritization
      d. System management
      e. Instantaneous retrieval of archived video
      f. Evidence production on AVI files that can be viewed on any PC
5. The NVR software shall provide for the following:
   a. Shall contain built-in video motion detection.
   b. Pan/Tilt/Zoom control of PTZ cameras via the IP connection and via on-screen controls.
   c. Connectivity to multiple viewing stations (Computers) for viewing live cameras. Display shall show images in groups of 1, 4, 9, or 16.
   d. Support connection to wireless smartphones and tablet devices.
   e. Record during playback.
   f. Playback by date, time, and camera.
   g. On-screen programming.
   h. Remote viewing and access via Ethernet.
   i. Owner shall be able to review recorded video at any time without interrupting the current recording of images from cameras.

6. The system shall support interoperability with IP camera standards including, at a minimum, the Physical Security Interoperability Alliance (PSIA) and the Open Network Video Interface Forum (ONVIF).

7. The recording servers shall support cameras with universal serial bus (USB) communications.

8. The surveillance system server shall support full two-way audio between viewing clients/web viewing clients and remote cameras/devices. Two-way audio integration shall support the following features and functions:
   a. Outgoing audio – microphone inputs to viewing clients shall transmit audio streams to speakers attached to remote IP devices. Selectable options shall be one-to-one (send audio to a specific IP device), and one-to-all (broadcast to all IP devices).
   b. Audio from IP devices with microphones shall be transmitted to, and recorded by, the recording server. The audio shall be transmitted to computers with a viewing client and installed speakers.
   c. Each speaker and microphone shall be assigned to a specific camera/device. The speaker and microphone shall have the capability to be assigned to other devices as well.

9. The NVR shall allow remote alarms by sending an e-mail or bringing up a camera image on the monitoring PC Screen
   a. Alarms may include:
      A) Motion on a cameras image during owner specified hours
      B) Loss of video signal on a camera.
      C) Server or storage equipment failure
      D) Other configurable parameter.
      E) Output shall include an alarm to the access control system or email, phone call or pager notification.

10. Video download and offload shall be able to be written to a USB or DVD drive
    a. Shall be able to be offloaded in a Windows Video file type
    b. Shall be able to be offloaded on a watermarked video image player that is downloaded along with the video to the storage device.

11. Provide for unlimited system operators with personal identification numbers (PINs) with priority levels, operator facilities, system roles, and camera and monitor groupings.
    a. Software shall allow for segmentation of the camera viewing based on logins.
    b. A person shall be able to be setup as a viewer of the cameras and only given access to a user specified amount or location of cameras.
    c. User viewing of cameras shall NOT be limited to actual physical server logins. Logging into the VMS shall be a system login and not a server login.
    d. When logging into the system the system shall allow the owner to choose any one or more cameras to be viewed by that user and shall be able to block any one or more cameras from being viewed.
e. Any user shall be able to be setup so they can only view administrator chosen cameras. This shall be capable across all servers.

f. In example, if a person monitoring a high school is allowed to view camera images then the system shall allow the owner to segment all HS cameras so the person can only see those cameras at the high school.

g. Shall integrate with Active Directory.

12. User shall be able to print still images directly to a printer from the NVR or remote user’s terminal.

13. VMS shall provide capability to record on movement or to record at all times. Recording times and duration shall be fully configurable.

a. The processing and recording of the images shall be done based on the following standards. Recording shall be done at:
   A) Video Standards: NTSC.
   B) Video Compression: H.264 or H.265

b. The system shall include a universal driver that shall support any generic network camera responding to the ARP (Address Resolution Protocol). The driver must be able to handle standard video streaming formats including MJPEG, MPEG4 and H.264.

c. The VMS shall save local databases a defined number of days or hours. The database retention settings must regulate how long recordings shall remain in a camera’s database before the recordings are archived.

d. The VMS shall support archiving (an automatic transfer) of recordings from a camera’s default database to another location on a time-schedule, without the need for user action, or initiation of the archiving process.
   A) Archiving shall support that the duration of the camera’s recordings can exceed the camera’s default database capacity.
   B) Archives shall be located on either the recording server computer or on a connected network drive.
   C) If the storage area on a network drive becomes unavailable for recording, the system shall be able to trigger actions such as automatic e-mails to defined personnel.

14. Multiple users shall be able to view the same camera view or sequence simultaneously. The system shall utilize Multi-cast streaming video to allow multiple users to view the same video stream, though not necessarily synchronized with each other, without affecting the bandwidth of the network.

15. Video titling shall provide for a 30-character camera site description (on/off), display time / date (on/off), set the display color (black/white), display a site message (on/off) and define the screen block position for the title. Shall be visible at viewing live and recorded video.

16. The software shall allow control of all aspects of the security viewing, controlling and replaying. The software shall:
   a. Display video from any camera to a specific monitor or screen division, including changing screen division views.
   b. Move system PTZ cameras to a specified preset location.
   c. Activate predefined patterns on system PTZ cameras.
   d. Home position of PTZ Cameras
   e. Start/stop recording an event from any indicated video source.
   f. Activate system relays and send e-mail notification to any recipient via pop3.

17. Shall be ONVIF Compliant.

B. MAPS

1. The software shall provide maps within the software that can be used to provide hot keys/buttons to switch a viewing monitor to a camera identified on the maps.
   a. The contractor shall take existing AutoCAD or PDF files and shall input the maps into the video control software.
   b. Provide buttons on the maps so that the user can click on the camera button on the map and the user will be able to view the camera associated with that button.
c. Load and populate each map with the cameras for each building where cameras are located.

d. Provide a drill-down map control software that allows the user to click on the site plan, then the individual building and then the floor or portion of the floor on that building and finally the camera on that floor.

2. Software and hardware shall allow for remote input of alarm signals and contact closure signals at remote buildings.

3. Software shall allow and control audio recording on individual cameras.

C. Client Software and/or web review

1. The viewing and reviewing software shall be accessible through client pc's. These PC’s shall be the standard desktop PC’s used by the principals and teachers throughout the district.

2. Provide viewing and reviewing software to support video sent to smartphones and tablet devices.

3. The software shall allow the following:
   a. Viewing of any one or more cameras on the system
   b. Tiling of one, two, four, six, eight and up to 16 cameras on the viewing screen.
   c. Review of all recorded video. Interface shall allow searching by motion, recording, time, camera and building.
   d. Shall be able to review video by motion in a certain zone based on motion.

4. Administrative level access shall allow setting and changes of all recording and scheduling parameters.

5. The Contractor shall provide and install all software required as per the drawings. See camera diagram for quantity of user to setup.

6. The software shall be able to be password protected for viewing, with additional levels of security required for changing configuration of the recording and camera functions.

D. Off-Site Control Software:

1. The NVR system shall allow complete monitoring, control, and configuration of all aspects of the video system and cameras to be controlled at locations remote to the NVR server itself.

2. The control and images shall be able to be transmitted via TCP/IP (Ethernet) network.

3. The software shall be able to be password protected for viewing, with additional levels of security required for changing configuration of the recording and camera functions.

E. Video Storage

1. Backups of the images shall be done continually. The oldest data shall be overwritten when the disk becomes full.

2. Provide the connection between the NVR and the internal or external storage. The backup shall be a direct backup and shall not be done via the building Ethernet network.

3. The storage device and all servers shall be supplied with no less than three years of 24x7 maintenance that includes next day replacement of drives and on-site assistance.

   a. Contractor shall be responsible for assisting the owner with the manufacturer warranty in case of a warranty issue. Act as the liaison between the owner and the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Review site and note locations of cameras, conduits and cables prior to installation.

B. Review all ceiling styles on the reflected ceiling plans. Provide mounts as required based on the ceiling style.

3.02 INSTALLATION

A. The Network Video Recorder (NVR) shall be mounted in the main communications room.
1. Mount the NVR in a cabinet/rack. Connect to the local area network as required for complete system connectivity.
2. Connect the NVR and all cameras to the Ethernet network.
   a. No less than two Gigabit Ethernet Connections
3. Connect the power supplies of the NVR to the UPS.
4. After full configuration of the system the contractor shall copy the complete configuration to another of the owner’s servers and shall provide a CD or USB drive copy of the configuration.
   a. Contractor shall keep a copy of the original configuration of the server and all cameras at their site.
   b. Provide the information to the owner on a CD or USB Drive.
   c. The backup of the configuration shall provide the owner an easy way to reconfigure the system in case of a total system failure or a new server installation is required.

B. Fully configure the Video Recording and Control Software.
1. The Contractor shall meet with the Owner prior to installation of the system to discuss all aspects and abilities of the NVR and VMS and the attached cameras.
2. The Contractor shall present all configuration options to the Owner to get their input and let them choose how the system is to be used and configured.
3. The Contractor shall take information from the meeting and record that in meeting minutes. Provide copies of these minutes to the Owner and Designer.
4. The Contractor shall configure and install the system as requested by the Owner and as shown on the drawings and specifications.
5. The servers and storage shall be configured based on the manufacturer’s recommendations.
   a. Discuss drive array and recording processes with the owner and manufacturer prior to installation of the system.
   b. Discuss recording block size with the manufacturer prior to installation.
   c. Meet with the owner and discuss the server(s) setup and present a document from the NVR software and server manufacturer to demonstrate how the system will be configured.
   d. Evenly distribute cameras and recordings across all servers.
6. Configuration of the system shall include but not be limited to the following.
   a. Labeling of all cameras in the system to match the owner approved labeling scheme as well as their chosen specific descriptive name.
   b. Video blanking of any areas on each camera if there are areas that are not to be seen or recorded by the NVR system.
   c. Passwords and logins for users and administrators. Include in this a list of all the users and their access levels.
   d. Recording Frames per second, resolution and long term recording resolution.
   e. Generation and configuration of any presets for PTZ cameras including tours and timing.
   f. Specialized recording times for each camera including additional FPS or resolution at times of the day.
   g. Backup times and all data to be backed up. Configure scheduled backups.
   h. Aiming, focusing and framing of all camera images.
      A) Sit with the owner and review each camera’s view and custom set the aiming, framing and focus of each camera.
      B) Have someone at the camera while reviewing that is able to move and aim and focus the camera.
      C) Download an image from the camera as the owner wishes it to be aimed.
      D) Create a spreadsheet with each camera and have the owner sign off on the aiming of each camera.
   i. Generation of custom views for all user software. Meet with each person that is allowed to view the cameras and help them generate a custom view of the cameras they wish to see.
7. Contractor shall fully load and match all maps to the video security system. Install all maps and load all camera locations and hot buttons to the maps to allow quick connect to the cameras based on clicking on the camera location on the map.
   a. Each camera button shall show the camera number.

8. Recorded images and offloaded images shall be able to be time-stamped with the date, camera number and exact time down to the second when the video was recorded.
   a. This shall be able to be seen on the viewing station and shall be attached to the video when it is offloaded and viewed on an outside player.
   b. Setup the server and software to obtain time from the national standard time.

C. Connect the storage to the new NVR servers and the rest of the servers.
   1. Configure the storage to provide service to all users and all storage requirements.
   2. Meet with the owner prior to installation and present all options to the owner in regards to the configuration options. Assist the owner in deciding which options best meet their needs.
   3. Publish a plan and configuration parameters of the storage and ensure that everyone agrees with the plan.
   4. Install the storage and connect to all servers.

D. Ethernet systems configuration shall be coordinated with the IT department. The owner will work with their contractor to switch the network to a security VLAN and other QoS parameters as required by the security system.
   1. Meetings shall be scheduled with the Owner to discuss the configurations of all electronics and the capabilities of the system.
   2. The owner shall be made aware of all the capabilities of the video security system and all possible configurations and shall be able to decide all aspects of the programming and configuration.
   3. The Contractor shall generate a report on the requirements of the owner and shall work with the owner to help determine the configuration of all the data electronics to meet the security systems needs.
   4. From the meetings the owner and contractor shall generate a plan for all configuration issues of the data network including but not limited to:
      a. IP Numbering Scheme
      b. VLAN settings
      c. Quality of Service (QoS) settings
      d. Network Prioritization
      e. New data connections.
      f. Wireless connectivity for Visitors, Students and Administrators.
      g. Wireless Security
   5. The network electronics shall be configured to synchronize internal clocks to a designated internal NTP server.

END OF SECTION 28 3600
SECTION 28 3700 – SECURITY CAMERAS

PART 1 - GENERAL

1.01 SECTION INCLUDES
   A. This section includes parts, cameras and equipment required for installation of the video surveillance cameras.
   B. This shall include new IP video cameras and their software/configuration equipment as shown on the drawings and detailed in the specifications.

1.02 COORDINATION
   A. All cables shall be coordinated with the installation of the raceways.
   B. All cameras shall be installed in the ceilings in relation to the lights and other obstructions.

1.03 DESCRIPTION
   A. Provide new IP cameras for video surveillance. See the detailed security drawings for location and quantities.
   B. Cameras shall be pure IP cameras without the use of external encoders/decoders where possible.
   C. Power for interior and exterior cameras shall be provided via the POE switch or via a centralized power supply in the communications room.
      1. The switches installed provide standard Type 3 PoE (15.4 watts) on each port. If a camera requires additional power above Type 3 PoE then the contractor shall provide that power supply and any additional required power cables.
   D. PTZ cameras that require additional power above that provided from a Type 3 PoE connections shall be provided with a power supply.
      1. Provide any and all camera, power and control cables required for complete system connectivity and functionality.
   E. It shall be the Contractor's responsibility to provide all power to cameras based on the above methods. Take into account the Manufacturers recommendations.

PART 2 - PRODUCTS

2.01 2.01 MANUFACTURERS
   A. Approved Manufacturers for IP cameras:
      1. Hanwha
      2. Axis
      3. Bosch
      4. Sony
      5. Avigilon

2.02 CAMERAS GENERAL REQUIREMENTS
   A. Cameras shall provide full color images and some shall change to black and white in low light.
   B. Cameras shall support text overlay of image in viewing to allow naming/numbering of each camera on the screen and when video is offloaded.
   C. The Contractor shall review the site with the Owner prior to ordering the lens for each camera.
      1. Finalize the needs of the Owner with the camera position to ensure that the correct lens is purchased for the camera.
   D. Where noted on the drawings, provide a vandal resistant dome to the camera.
   E. Where cameras require more power than PoE 802.af then the contractor shall provide power to the camera from a centralized power supply in the comm. room.
F. External Cameras
1. Each exterior camera shall be equipped with a heater/blower or other device to keep camera functional and keep lens/casing from fogging or condensation from forming.
2. Provide mounts for exterior cameras based on their installation location. Provide fully enclosed mounts. See drawings and conduct a field survey prior to ordering to ensure that he correct mounts are provided.
   a. Exterior mounts shall allow cable entry to the dome via the support. No cables shall be exterior to the mount or dome.

2.03 CAMERAS -1920x1080 RESOLUTION OR BETTER
A. Interior fixed IP dome camera: 1920X1080 Resolution (2 Megapixel). Color/Black and White with audio microphone
   1. Camera shall be capable of the following:
      a. Plenum-rated backbox
      b. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
      c. Dome shall be clear exterior, smoked on interior cameras
      d. Power through PoE 8023.af
      e. Network interface via an 8-pin RJ-45 connector.
      f. Compatible with the Video Recording System
      g. Minimum frame rate capability shall be 25 frames per second at maximum camera resolution. 30 FPS at all other camera resolutions.
      h. Indoor operating temp range or 0C to 50C
      i. Zipstream recording
      j. Edge recording via onboard SD Card
      k. Audio Microphone for audio recording. Shall be built into the camera.
   2. Compression shall be H.264, Motion or JPEG.
   3. Camera/lens shall meet or exceed the following requirements:
      a. 1 /3 inch progressive Scan RGB CMOS.
      b. Picture element that is 1920 (H). x 1080 (V)
      c. Remove electronic varifocal lens with Remote zoom and focus
      d. Auto Iris
      e. Wide dynamic range
      f. Light sensitivity of .16 lux for Color, .03 lux for black and white. Lens shall automatically flip based on light input.
      g. Horizontal field of view of 90 deg. To 34 deg.
   4. Interior Fixed IP day/night Dome Camera shall be Axis #3375-V or equal.

2.04 CAMERAS -5 MEGAPIXELS OR ABOVE RESOLUTION
A. Exterior fixed IP dome camera: 3072x1728 Resolution (5 Megapixel). Color/Black and White
   1. Camera shall be capable of the following:
      a. Weatherproof backbox.
      b. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
      c. Dome shall be clear.
      d. Power through PoE 802.3.af
      e. Network interface via an 8-pin RJ-45 connector.
      f. Compatible with the Video Recording System
      g. Minimum frame rate capability shall be 25 frames per second at maximum camera resolution.
      h. Internal Video buffer slot for SD Card. No card required.
   2. Be manufactured with an all-metal body, vandal resistant casing and support operation between -40 to +50°C (-40 to +122°F) and be both IP66 and NEMA 4X-rated.
   3. Compression shall be H.264, Motion or JPEG.
   4. Camera/lens shall meet or exceed the following requirements:
      a. Picture element that is 3072(H). x 1728 (V)
      b. Varifocal lens with Remote zoom and focus
      c. Auto Iris
d. Light sensitivity of .16 lux for Color, .04 lux for black and white. Lens shall automatically flip based on light input.
e. IR illuminator built-in. 850nm IR light to reach 100ft.
f. Shall have settings for wide dynamic range and dynamic contrast.
g. UL listed.

5. Exterior Fixed IP day/night Dome Camera shall be Axis #P3227-LVE or equal.

2.05 CAMERAS 360 DEGREE OF 180 DEGREE VIEW-SINGLE IMAGER
A. Interior or outdoor fixed IP dome camera with 180/360 Degree coverage: 6 megapixel (3072x2048) resolution. Color and Black/White camera
   1. Camera shall be capable of the following:
      a. Dome shall be clear.
      b. Power through PoE 802.af
      c. Network interface via an 8-pin RJ-45 connector.
      d. Compatible with the Video Recording System
      e. Minimum frame rate capability shall be 30 frames per second at all camera resolutions
      f. Multiple windows for images. Images shall be de-warped in each window.
         1) Overview: 2048x2048 to 160x160
         2) Panorama: 2560x960 to 192x72
         3) Double panorama: 2560x1920 to 256x144
         4) Quad view: 2560x1920 to 256x144
         5) View area 1-4, 16:9 : 1920×1080 to 256x144, 4:3 : 1920x1440
         6) to 320x240
         7) Panorama corner left/right: 2368x1184 to 192x72
         8) Double panorama corner: 2048x2048 to 320x240
         9) Corridor: 2560x1920 to 256x144
      g. Settings or 360 view or 180 view
      h. All image shall be able to be dewarped for live viewing and viewing of recorded video. Overall image shall always be present and recorded.
   2. Compression shall be H.264
   3. Outdoor rated: -40 °C to 50 °C (-40 °F to 122 °F)
   4. Camera/lens shall meet or exceed the following requirements:
      a. Picture element that is 3072 (H). x 2048 (V)
      b. Light sensitivity of .16 lux for Color, .03 lux for B/W
      c. UL listed.
   5. Exterior Fixed IP day/night Dome 180/360 Camera shall be Axis #M3057-PLVE or equal.

2.06 CAMERA ACCESSORIES
A. Camera Mounts:
   1. The Contractor shall provide all appropriate camera mounts. Refer to the drawings and conduct a site survey to determine each camera mounting type required.
      a. Complete this prior to ordering cameras.
      b. Review Reflected ceiling drawings from architect.
   2. Exterior cameras will be mounted to the wall of the building in most cases.
      a. Where the camera is to look along the wall of a building the contractor shall provide a pendant mount that mounts the camera parallel to the ground.
      b. Mount shall extend the camera out from the building a few inches to allow viewing in 360 horizontal degrees
   3. The security cameras shall be mounted to building structure where shown on the drawings.
      a. Contractor shall provide a mount that best corresponds to the structure and can be securely mounted.
      b. Mount the camera at a height as shown on the drawings or at the optimum height to allow the best field of view and future service via extension ladder.
1) Unless specified the cameras on the exterior of a building should not be installed more than 15’ above grade.

c. When mounting the cameras, take into account the light and mount the camera so that it does not block light.

d. The camera mount shall provide a route for cables extending from the raceway to the camera. Cables shall not be installed outside the camera dome or camera mount.

e. The Contractor shall install a conduit to allow cable installation to the camera.
   1) This shall include installing conduits from the inside of the building to the outside of the building to support exterior cameras.
   2) Core through the outside of the building. Coordinate location with owner and architect prior to drilling.
   3) Install ¾ conduit or sized as per the mount.
   4) Except for corner and parapet mounts no conduits shall be visible after installation.
   5) At no time shall a cable be visible. Install flexible conduit and seal appropriately around holes made in the building
   6) Repair wall after installation.
   7) No cable shall be visible after camera installation.

4. Dome-type cameras interior to a building may be installed in the lay-in ceiling.
   a. Provide supports so that the camera’s weight is supported from the “T” bars of the drop ceiling.
   b. Provide a backbox and escutcheon to make a tight fit from the dome to the drop ceiling tile.
   c. Locate the cameras to cover the area required by the Owner. Work with the Owner prior to installation.

5. Dome-type cameras interior to a building may be installed as a pendant mount from the building structure.
   a. Provide a backbox at the building structure. Install a down pipe and camera mount to attach the camera to the downpipe. Size the pipe as required.
   b. The camera mount shall keep the camera level and shall extend down to a level of no more than 11’ AFF.
   c. Locate the cameras to cover the area required by the Owner. Work with the Owner prior to installation.

6. Dome-type cameras interior to the building may be required to be mounted to a wall.
   a. Where there is a wall mount requirement, the Contractor shall install a wall-mount. Ensure that it is securely mounted.
   b. Route the cable through the wall and through the mount to connect to the camera.

7. Pole mount cameras shall be completely secured to the pole with manufacturer’s specified mounts.
   a. Shall attach to the pole with straps or screws based on the type of pole installed.
   b. Mount shall keep the cable as it routes from the pole to the camera totally enclosed and shall not subject the cable to the weather.
   c. When mounting the camera, the cable shall route through the pole. Drill a hole into the pole. Install oxidizing gel around the steel. Then install a rubber grommet.

B. Camera and Power Cable:
   1. Cables for transmission of the image and to provide power to the camera shall be plenum-rated.
   2. Power cable (if required) shall be sized based upon the power requirements of the camera and other components in the camera, such as PTZ motors and heater.
   3. See the drawings for the contractor responsible for installing CAT-6 cabling from the comm room to the camera.
4. The Security contractor shall install all patch cables between the termination of the user CAT-6 cable and the camera as well as the patch cable from the patch panel to the Ethernet switch in the comm. room.

C. All cables shall be supported in the ceiling a minimum of every 5 feet. Support can be provided by installing cable inside cable tray or conduit, or by installing J-hooks every 5 feet.
   1. J-hooks shall provide a smooth steel support for cables as they route through the ceiling.
   2. Each hook shall have a galvanized finish.
   3. Steel, UL listed, ultimate static load limit 50 pounds, rated to support Category-3 and higher cables, and optical fiber cables.

D. Power Supplies:
   1. For interior PTZ cameras and external cameras (where PoE Power is insufficient) the power supply shall be centrally located in a communications room.
   2. Provide all power supplies and cabling for connection to the electrical circuit.

2.07 CAMERA INSTALLATION ACCESSORIES
A. Firestopping shall be completed inside and around all conduits after cable installation. 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.

B. Weatherproofing shall be completed inside and around all conduits supporting exterior cameras after cable installation. Contractor shall install the best weatherproof for each individual installation.
   1. Weatherproof around all conduits that extend through the building to the cameras on the exterior wall or soffit.
   2. Seal all cameras so that all camera housing does not allow water into the conduit or into the building.
   3. Seal so there is no infiltration of water or condensate.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine all pathways prior to installation of all cables.
B. Identify locations of all user conduits and backboxes prior to cable installation.
C. Review site and note locations of cameras and conduits prior to installation.

3.02 PREPARATION
A. Visit each camera installation location to verify the type of mount prior to ordering the cameras.
B. If another contractor is installing the CAT-6 cabling then the contractor shall coordinate cable location with that contractor.
C. Green Tape walk thru.
   1. Contractor shall walk the entire site with the owner and identify each camera location with the owner prior to installation.
   2. Discuss the type of camera and its proposed field of view.
   3. Make adjustments as required by the owner and by the building structure to minimize interference and blocking of the camera image.
4. Install a piece of green tape on the wall or ceiling at each camera location after agreement on the location is reached.
5. Remove green tape after installation of cameras

D. Camera naming spreadsheet.
1. Create an Excel spreadsheet showing the following:
   a. Camera number
   b. Camera part number
   c. IP address
   d. MAC address
   e. Owners chosen camera name
   f. Provide to the owner and designer.

3.03 INSTALLATION

A. Each camera shall be installed to provide maximum field of view and security.
B. Exterior cameras shall be mounted securely to the structure and shall be sealed to prevent water or any other environmental condition to enter the camera.
   1. Provide the correct mount for the location of each exterior camera.
   2. Where the mount is to the outside of a building then the contractor shall install a conduit from the exterior camera to the inside of the building for the camera cable(s).
   3. Review mounting location to determine optimum height of camera to cover all areas and provide the clearest pictures. Mount at appropriate height.
   4. Work with the Owner to focus and align all cameras for maximum coverage.
   5. Contractor shall change lenses for different focal lengths based on the actual installation location of the cameras and the requirements of the Owner.
   6. Seal around all conduit openings and the camera mount to seal from water and air infiltration.
   7. Install patch cable through the conduit and connect to the CAT-6 cable on the interior of the building.
C. Interior cameras shall be mounted in the lay-in ceiling, supported from the open ceiling or to the wall with a structural mount.
   1. The Contractor shall work with the Owner to determine the location of all the cameras.
   2. Work with the Owner to determine the direction of the lens and its focal length.
   3. Ensure that the camera is mounted securely to the drop ceiling and is supported from the T-bar.
   4. Where interior cameras are mounted to the wall, the Contractor shall provide a mount that will allow all cables to route through the mount. Cables shall not be “free-floating” from the wall to the camera.
   5. When a camera is pendant mounted the contractor shall install a down-pipe and conduit support to mount the camera at the correct height as determined by the owner.
D. Contractor shall focus and aim all cameras
   1. Camera aiming and focusing shall be a process where the owner has input at each stage.
   2. The process for aiming and focusing shall be as follows:
      a. Meet with the owner and determine the desired view of each camera. Determine where images shall overlap and what they are focusing etc.
         1) Add this information to the camera naming spreadsheet.
      b. Install the cameras and aim as per the meeting notes.
      c. Meet with the owner and review each camera view on the monitor. Make notes of any changes required.
      d. Schedule a time to make all changes.
         1) Changes shall be made while the owner is reviewing the live image through the VMS Software. The contractor shall have a person at the camera that can aim and focus the camera.
         2) Once the owner agrees on the image aim and focus generate a still picture of that image and keep it in a file.
3) Print the aimed view and provide as part of the submittal at project substantial completion.

E. Camera naming
   1. The contractor shall work with the owner and engineer to determine the naming and numbering convention for the cameras.
   2. Determine the naming and then apply that to each camera. Enter the designation of the camera into the video security system.
   3. On all cameras the contractor shall affix a label with the camera number to the exterior case of the camera. This shall be visible when standing near the camera.

F. Fiber to copper transceivers.
   1. Install to a cabinet or to the rack
   2. Provide all fiber and copper cables required or connectivity.
   3. Configure as required to pass Ethernet signals.
   4. Label each for the cameras to which it connects.

G. Video Decoders
   1. Install the decoder at the location shown on the drawings.
   2. Where installed behind an LCD the device shall be attached to the LCD mount and shall be hidden from view.
   3. Install all patch cables required for connectivity to the network and Display.
   4. Configure the Decoder to show the IP video stream or streams the owner wishes to view.

H. Microphones
   1. Configure microphone on interior cameras to record audio when there is motion in the area.
   2. Work with the owner to determine which cameras require the microphone to be turned on and recording during motion

END OF SECTION 28 3700
SECTION 28 7200 – TECHNOLOGY SUBMITTALS

PART 1 - GENERAL

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

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enet Switch</td>
<td>Rainbos</td>
<td>XR-243T</td>
<td>Cam type “CA”</td>
</tr>
</tbody>
</table>

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

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

PART 2 - PRE-INSTALLATION SUBMITTALS

2.01 PRODUCT DATA SHEETS
A. Product data sheets shall consist of the manufacturers detailed specification sheets or “cut-sheets” for each product that is to be installed by the contractor or any subcontractors.
B. Product data sheets shall minimally include, but shall not be limited to:
   1. Part Number
   2. Manufacturer
   3. Description of the product
   4. Physical dimensions and characteristics of the product
5. Picture or manufacturers drawing of the item, where applicable
6. Electrical characteristics of the product including heat-load for active electronics.
7. Optical characteristics of the product for Fiber-Optic equipment and cable.
C. Provide product data sheets for all equipment and cabling that is to be installed by the contractor

2.02 SHOP DRAWINGS
A. Shop Drawings shall consist of detailed drawings showing actual connectivity and cable types for the systems noted below:
   1. Access Control system connectivity
B. Shop drawings shall also be provided for systems that the contractor intends to connect differently than what is shown on the contract drawings or where no connectivity is shown.

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

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

2.05 SUBMITTAL REQUIREMENTS
A. Submittals shall be provided for approval prior to installation of the work.
B. Any equipment installed that does not have an approved submittal associated with it can and will be removed from the project and replaced with other equipment as defined by the Designer. All replacement costs shall be the responsibility of the Contractor.
C. It shall be the responsibility of the Contractor to provide the submittals for review in sufficient time to not delay the installation. Work with the Construction manager on the schedule.
D. It shall be the responsibility of the contractor to ensure they have provided and have on hand “Reviewed” or “Furnish as Corrected” submittals for all equipment they install.
PART 3 - AS-BUILT DOCUMENTATION

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

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

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

3.04 PROJECT DELIVERABLES
   A. Provide a copy of all submittals and manuals and pamphlets. Shall be separated by equipment type with dividers in the binders.
   B. All spare parts shall be provided in a box. The Contractor shall detail which component each spare part is for.
   C. The contractor shall provide one set of full sized as-built prints. Provide a PDF of the as-built prints on the USB drives.
      1. Provide a clean set of the latest drawings with red lines marked for all field changes or bulletins.
   D. The As-Built drawings shall include:
      1. Changes to be reflected on the drawings for Video Security Systems shall include:
         a. Camera locations
         b. Cabling Paths
         c. Camera numbers
         d. Comm room where camera connects to.
      2. Changes to be reflected on the drawings for Access Control/Alarm Systems shall include:
         a. Changes to hardware installed at each door. Update each door for all devices installed and connected
         b. Changes to the panel locations
         c. Door numbers
d. Changes to the schematic connectivity of any system shown on the drawings.

3. Changes to be reflected on the drawings for Cabling Systems shall include:
   a. Route of exterior conduits and exterior cabling
   b. Route of backbone cabling, fiber and copper
   c. Route of major cable paths from outlet to comm room.
   d. Rack/cabinet locations.
   e. Faceplate locations
   f. Rack layout of all components in each rack.
   g. Changes to the schematic connectivity of any system shown on the drawings.
   h. Cable numbering for each faceplate.

E. Documentation for the specific systems shall include. Provide the following for each system:
1. Contractor warranty dates based on Substantial completion date and contact information for warranty work.
2. Data cabling
   a. Testing Documentation for copper and fiber cabling
      A) Include software to read the test results.
      B) Testing Documentation; This shall include actual cable test results.
         Tabbed Sections in the binder:
            1) Telecommunication Horizontal Cabling Detailed cable test reports
            2) Telecommunications Fiber backbone cabling
            3) Summary report
   b. Signed Cabling Warranty from manufacturer
3. Video Security
   a. Picture of focused and approved camera image labeled with the camera number and IP address
   b. Master user password list
   c. Spreadsheet of each camera that shall include:
      A) Camera Part number
      B) Firmware revision
      C) IP address
      D) MAC Address
      E) Camera Name
      F) Building where it is located
   d. Training “Cheat Sheet”
   e. Manufacturers Camera Warranty
   f. Server/NVR Warranty
   g. Manufacturer contact information for warranty work
   h. Software Upgrade Protection (SUP) warranty including end date
   i. Warranty certificate for all PC’s
4. Access Control
   a. Part list/diagram for each access control panel. To include
      A) Panel name and IP address (if applicable)
      B) Doors which are connected to this panel
      C) Panel location. Building and room number
   b. Diagram showing which devices and doors that are attached to each panel
   c. Training “Cheat Sheet”
   d. Server Warranty
   e. Software Upgrade Protection (SUP) warranty including end date
   f. Warranty certificate for all PC’s

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

END OF SECTION 28 7200
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. CAT-6, access control and audio / video cabling
   1. Laser-printed, self-adhesive wrap around shall be Brady LAT-18-361 or equivalent.
   2. Label shall be 1.00-inch width x 1.33 inch high.
   3. Labels shall come on a sheet with 7 labels per row with a white and transparent matte finish.
   4. Sheet size shall be 8-1/2 inch x 11 inch.
   5. Printable area shall be a minimum of 1.00-inch width x 0.50 inch high.
   6. All labels shall be printed through a laser printer using labeling software.
   7. The Contractor shall submit a proposal for the labeling scheme for all audio and video wiring. The Engineer shall approve of the scheme prior to all labeling.
B. 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. CAT-6 patch panels in comm rooms
   1. Laser-printed, labels shall be used to label Cat-6 Patch panels
   2. Label the side of the patch panel for the panel number in the comm room. “Panel A” etc. label on two spot on each panel
   3. The panels shall be labeled 1-24. Use factory numbering or paper numbering if no factory numbering is provided.

2.02 SECURITY CAMERA LABELING
A. Laser-printed, labels shall be used to label all Security Cameras
   1. Label the camera with a White or Clear label with black lettering.
   2. Label shall include the camera number.
   3. May include the IP address. Consult with owner to determine if this is required
   4. Label shall be a minimum of 3/4 inch tall and legible when standing beneath or near the camera as long as camera is not above 15; AFF

2.03 ACCESS CONTROL PANEL LABELING
A. Label the front of each access control panel to detail the doors that are connected to the panel.
   1. Label the front panel and detail each door number
   2. Label shall include the panel name and IP address
   3. Text shall be a minimum of 3/8 inch tall
   4. White label with black numbers
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 DATA CABLING LABELING EXECUTION
A. Cable labels for CAT-6 user cables from the faceplate to the patch panel shall be installed within 4 inches of the end of the cable sheath.
   1. The location identifier is made up of 3 fields, and a sample might look like this:

      A-X-YY

      The A stands for the communications room where the cables are terminated.
      The X represents that the Patch panel in that comm. room.
      The YY represents the cables number in that panel 01-48.

      This system of identification provides the Owner with an easy way to keep track of cables, and where they are located or terminated.

   2. The cable label shall be similar to the label below:

      | A-X-YY |
      | A-X-YY |
      | A-X-YY |

   3. Provide a sample label to the Engineer for approval prior to installation of all labels.
   4. Labels shall be installed at each end of each cable. Shall be within 4” of the termination.
   5. Shall be at a uniform distance from termination on the patch panels. See pic below:
B. Paper inserts shall be supplied for all faceplates and patch panels labels.
   1. Paper inserts for the faceplate shall detail the exact location identifier for each cable.
   2. They shall fully cover the background of the insert space on the faceplate, but all numbers and letters of the identifier shall be visible after installation of the plastic cover plate.
   3. The paper insert for a standard faceplate will look like this:

<table>
<thead>
<tr>
<th>Top Label Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2-24 A-2-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bottom Label Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2-26</td>
</tr>
</tbody>
</table>

4. Provide a sample label to the Engineer for approval prior to installation of all labels.

C. CAT-6 Patch panels shall be labeled for the panel they are numbered in the comm room and for the cameras (1-24 or 1-48)
   1. See below diagram:
      a. Install labels at each end detailing the panel number.
D. CAT-6 Patch panels for Wireless Access Points shall be labeled for the WAP number
   1. See below diagram:
      a. Install labels below each outlet on the patch panel detailing the WAP number
      b. Meet with the owner and obtain the WAP number and label the panel with that WAP number. Install laser printed label
      c. Example below shows WAP number of BU (for Butler building) -0XX etc.

<table>
<thead>
<tr>
<th>Panel A</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>BU-021</td>
<td>BU-022</td>
<td>BU-023</td>
<td>BU-024</td>
<td>BU-025</td>
<td>BU-026</td>
<td>BU-027</td>
<td>BU-028</td>
<td>BU-029</td>
<td>BU-030</td>
<td>BU-031</td>
<td></td>
</tr>
</tbody>
</table>

**TYPICAL PANEL LABELING**

3.04 VIDEO SECURITY LABELING

A. Cameras shall be labeled with the camera number in a visible location.
   1. Affix a label to the camera housing that details the camera number
   2. Shall be in a location that is visible from a standing position.
   3. Shall be laser printed.
   4. Label the camera cable patch panel to include the number of each camera connected to that cable. This camera cable label at the patch panel shall be by video security contractor
      a. Install an adhesive sticker below the cable in the patch panel as the factory number (1-24) is most likely on top of the panel.

B. Label the CAT-6 Patch Panel for security Cameras in each comm room
1. Install an adhesive label on each port on the patch panel that attached so the security camera cable.

   DDD = the camera number within that building

C. CAT-6 Patch panels for security cameras shall be labeled for the camera number
   1. See below diagram:
      a. Install labels at each end detailing the panel number.


<table>
<thead>
<tr>
<th>Panel A</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>101</td>
<td>102</td>
<td>107</td>
<td>108</td>
<td>201</td>
<td>105</td>
<td>208</td>
<td>145</td>
<td>146</td>
<td>147</td>
<td>174</td>
</tr>
<tr>
<td>Panel A</td>
<td>101</td>
<td>102</td>
<td>107</td>
<td>108</td>
<td>201</td>
<td>105</td>
<td>208</td>
<td>145</td>
<td>146</td>
<td>147</td>
<td>174</td>
</tr>
</tbody>
</table>

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

3.05 ACCESS CONTROL SECURITY LABELING

A. Security Panels shall be labeled on the outside to indicate panel number and communications room number

<table>
<thead>
<tr>
<th>Security panel</th>
<th>IP address 111.111.10.112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel 04</td>
<td>Comm room XXX</td>
</tr>
</tbody>
</table>

1. Install a label on the inside of the panel that details:
   a. Door numbers that are connected to this panel
   b. Diagram of panel showing where each door is connected to the panel
   c. Panel name as shown in the access control system
   d. IP address of the panel

B. Access Control cables shall be labeled.
   1. The cables at the door devices shall be labeled where they connect to the device at the door
   2. The cables at the panels in the communications rooms shall be labeled with the door number
   3. Cable labels shall be installed within 3 inches of the end of the cable sheath.
      a. The cable label shall be similar to the label below:

      125A-DC
      125A-DC
      125A-DC

      b. Provide a sample label to the Engineer for approval prior to installation of all labels.

      125A-DC

      The 125A stands for the Door Number.
      The DC stands for Door Contact. This could be any of the field devices: RX, ES, EL, MX, KP etc.
SECTION 28 7700 – TECHNOLOGY TESTING

PART 1 - GENERAL

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

PART 2 - PRODUCTS

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

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

2.03 PUNCHLIST PROCESS
A. The contractor shall be required to go through a punchlist process prior to substantial completion and final completion/payment of each project.
B. Contractor shall be responsible for reviewing their own work and checking to ensure it has met the project requirements.

C. The contractor shall:
   1. Review your work in each room
   2. Review the specifications and drawing and review their work to ensure it meets requirements
   3. Create a punchlist document showing what work is not yet done and what as-builts are yet to be completed. Send document to designer.
      a. Provide a date when contractor punchlist work will be completed.
   4. Schedule a punchlist and substantial completion meeting with designer.
   5. Present updated punchlist document to the owner
   6. Walk the site with the contractor and demonstrate all systems and review the work completed. Demonstrate how all work is completed

D. Designer will create an “Owner Punchlist” document
   1. This will be provided to the contractor
   2. Contractor shall review the list, fix/upgrade/replace all equipment and cabling and finish work on the punchlist
   3. Return punchlist to the designer showing when the work was fixed/completed and a signature on the sheet showing that the contractor has reviewed each item.

E. Meet onsite with the designer to review the finished work.

PART 3 - EXECUTION

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

3.02 CATEGORY UTP/STP CABLE TESTING
   A. Cable tests for CAT 6 cables shall be provided for each user CAT-6 cable.
      1. Prior to beginning the testing, the Contractor shall provide the Engineer with a notice that testing will begin. Written notice shall be given at least 3 business days prior to testing beginning.
      2. Tester shall be calibrated each day with manufacturer provided calibration cable.
      3. Tests shall be saved under each cables unique location identifier.
      4. Contractor shall provide the correct cables and probes specifically for the cable and modular jacks that are being tested.
      5. During the test the tester shall be set to check all “Network Tests.”
      6. Test results shall be provided in hard copy and soft copy. Along with the soft copy, provide a copy of the software required to read the test results.
      7. Contractor shall supply 2 copies of the paper results and 2 copies of the file results.
      8. Provide all paper results in 3-ring binders. Binders shall have a cover that shows the job name, job number, building and closet where the cables were tested, and the range in the location identifiers of the cables tests provided.
      9. Tester shall be set to match the cable being tested.
     10. Contractor is responsible for ensuring that all cables pass the tests. Any cable found not to pass shall be removed and replaced at the Contractor’s expense.

3.03 SECURITY SYSTEM COMMISSIONING
   A. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall conduct a final inspection, and pre-test all equipment and system features. Contractor shall correct any deficiencies discovered as the result of the inspection and pre-test.
B. Contractor shall submit a request for the Acceptance test in writing to the owner no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification from Contractor that all Work is complete and has been pre-tested, and that all corrections have been made.

C. During Acceptance test, Contractor shall demonstrate all equipment and system features to the owner. Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by the owner.

D. If the contractor has submitted all necessary paperwork and the system seems to be in working order according to the engineer then the system can be considered Substantially Complete after the engineer puts that in writing.

E. Security System Substantial Completion.
   1. The access control system shall be considered substantially complete as soon as:
      a. All doors are connected, configured in the system and are working as required.
      b. All security devices are connected and have been tested and shown to be fully functional. All cables are labeled at each end.
      c. Intercoms are functioning and able to release lock on a door.
      d. All users are entered into the system and all cards/fobs have been distributed.
      e. All locking and unlocking schedules are defined and are working.
      f. User accounts are setup
      g. As-built drawings have been updated to reflect any changes in the connectivity.
      h. All manufacturer literature has been turned over to the Owner.
      i. Maps are setup and populated in the system.
      j. Training has been completed.
      k. Copy of the system configuration has been provided to the owner via a CD or thumb drive.
   2. The video security system shall be considered substantially complete as soon as:
      a. All cameras are connected and functional.
      b. The system is fully configured and recording images as required.
      c. User accounts are setup
      d. As-built drawings have been updated to reflect any changes in the connectivity.
      e. All manufacturer literature has been turned over to the Owner.
      f. Maps are setup and populated in the system.
      g. Training has been completed.
   3. The contractor shall schedule a substantial completion meeting where all security systems shall be demonstrated and shown to be in working order and configured as per the specs and the owner’s requirements.
      a. If the system is deemed to be in working order then the engineer shall sign a letter stating that the systems are Substantially Complete. The system is not Substantially Complete until a letter is provided to the contractor and owner.
   4. After substantial completion the systems shall be in good working order for a period of 30 days.
      a. In the event that the system or systems should fail or not work as required during the 30-day period, the Contractor shall be on site the same day to fix and configure the system to make it work as designed.
      b. A new 30-day period will begin as soon as the system has been demonstrated to be in good working order and the engineer acknowledges in writing that the system has been fixed and is again considered substantially complete.
   5. Once the system has been considered Substantially Complete and has been working for 30 consecutive days with no interruption in service, the system shall be thought of as “Finally Complete.”
   6. Warranty shall begin immediately after the system is deemed Finally Complete.

3.04 AV SYSTEMS
   A. Classroom AV system testing:
1. The Contractor shall make up a spreadsheet that will be used for testing the equipment and connectivity in each room. There shall be a separate piece of paper for each room.

2. The spreadsheet shall include a list of the equipment in each room and the cables in each room. The contractor shall note the serial number of each of the active components on the spreadsheet.

3. The spreadsheet shall also list each connectivity point and shall contain a space to note that each audio and video connection was tested and that it passed the test.

4. Spreadsheet shall include space for noting who tested the connections and the date of the test. All information on the sheet shall be printed by a printer except the name of the person performing the tests, the date, and the “PASS” column.

5. This spreadsheet shall be submitted to the Engineer and Owner prior to project completion. Shall be submitted showing that each piece was tested.

6. After installation of all cables and components, the contractor shall test each cable and device to ensure that it works as intended.
   a. Test that the remote works for the projector.
   b. Test that the VCR, DVD and PC video images are able to be seen on the projector and on the projection screen.
   c. Test that the audio from each device is played through the speakers.
   d. If so equipped, connect and demonstrate the document camera.
   e. Pull down the projection screen and note that the image from the projector fully fills the screen.
   f. If the system is deemed to be in working order then the engineer shall sign a letter stating that the systems are Substantially Complete. The system is not Substantially Complete until a letter is provided to the contractor and owner.

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

END OF SECTION 28 7700
SECTION 28 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.

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 CLASSROOM AUDIO/VIDEO SYSTEM TRAINING
A. Training on the classroom audio/video distribution system shall be as follows:
1. Contractor shall provide a minimum of eight (8) - 1 hour, in depth training classes on the connectivity and use of the classroom audio/video system. Each class shall be capable of having 12 teachers in the class.
2. Training class shall be on-site utilizing the actual equipment installed as part of the system.
3. Demonstrate all uses of the system and how it works.
4. 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.
5. The Owner and Contractor shall meet and decide on the syllabus prior to training.
6. 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.

3.04 VIDEO SECURITY AND ACCESS CONTROL TRAINING
A. The Contractor shall provide training as part of this contract
1. The Contractor shall involve the personnel from the Owner’s office in the implementation and configuration of the security systems.
2. Prior to the cutover of the systems, 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. The training shall include 2 distinct training tracks. The first is Configuration Training of the security systems and the second is Remote User Training.
4. Contractor shall be at each site four (4) separate times to train and updated users at each building. These will be scheduled as detailed below;
5. Training class shall be on-site utilizing the actual equipment installed as part of the system and a PC connected to the existing data network. Coordinate with the Owner’s IT department on setting up the user interfaces.
6. Training shall include all travel and other expenses.
B. Remote User training:
1. This training shall be for users of the system such as principals, secretaries and administrators.
2. The goal of the training is to allow the users to become familiar with the user software. They shall be able to set up their own interface screen and shall be able to view live and stored video and control the locking/unlocking of doors.
3. A minimum of 16 hours per building shall be provided for training. This shall be open to no less than four users at each building. This training is designed to allow the owner and their staff to fully review and print video and configure the access control system.
   a. Video Security Training shall include but not limited to:
      A) As-built diagrams of the connectivity.
      B) A demonstration of actual user interface with the system, and directions on its general use.
C) Review of live and stored video.
D) Printing images. Storing video, Writing video clips to storage media.
E) Interface and control of the system via the map software.

b. Access Control Training shall include but not limited to:
A) As-built diagrams of the connectivity.
B) A demonstration of actual user interface with the system, and directions on its general use.
C) Setting locking and unlocking schedules for each building.
D) Responding to alarms and clearing the system of faults.
E) Use and management of the snow day button and lockdown button.

c. Thoroughly review the use of the remote viewing software and how each user can individually set up their screen to review the cameras they want to view.
A) Training 1. Shall occur during configuration and installation prior to substantial completion. This shall be a formal training class that will detail the system and how it works.
B) Training 2. To take place approximately 3 weeks after substantial completion. This shall be a training class that will allow the owner to ask questions about the system and have the contractor fix/implement items that were not understood or yet used.
C) Training 3. Training one month after Final Completion. This shall be an update to the training and shall review the owners list of questions and concerns. Be prepared to make changes to schedules and camera views during this training session.
D) The owner shall be able to specify what is to be covered at each training session. This may require that the contractor review current settings or change settings on the system while demonstrating how this can be done.

END OF SECTION 28 7750
SECTION 28 7800 – TECHNOLOGY WARRANTY

PART 1 - GENERAL

1.01 SECTION INCLUDES
   A. This section includes directions for the Contractor regarding system and equipment warranties.

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

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Provide manufacturers warranty for all equipment installed
   B. Provide contractor warranty for workmanship and equipment
   C. Provide software upgrade protection (SUP) warranty as detailed in the specifications.

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

PART 3 - EXECUTION

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

3.02 GENERAL WARRANTY
   A. The Contractor shall warranty the installation and all the parts contained therein for a period of not less than 1 year after receipt of a completely signed copy of the Notice of Substantial Completion.
   B. This shall include each and every part, cable or software system provided as part of this project. This includes cabling, Networking, Wireless, Audio/Video systems and Access Control and Video Security systems.
      1. If any part is broken due to a manufacturing defect or installation defect, the Contractor shall fix and/or replace the broken item at their own expense.
      2. If any equipment loses connectivity or fails for any reason the contractor shall be onsite to diagnose and fix or replace equipment and upgrades software.
      3. The Contractor shall also supply all configuration and programming necessary to keep all electronic equipment to the latest revision of software during the year.
4. If the “system” goes down, and needs configuration to be brought back up, the Contractor shall be liable for any programming or reconfiguration.
5. During the year, the Contractor shall make the Owner aware of any software upgrades that are available.
6. Contractor shall install all software upgrades for that year or as detailed below for specific systems.
7. If the system does not run well during the year the contractor shall be onsite to diagnose and fix the system.

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

3.03 EXTENDED CABLELING WARRANTY
A. The Contractor shall provide to the Owner a “Link Warranty” on all the components of the voice/data cabling system. This includes all components from the faceplate, through the jacks, cable, and back to the patch panels, not including patch cords.
B. Cable shall be installed that is covered as part of the complete warranty on the data cabling system. Cable that cannot be covered under the warranty shall not be installed.
C. The warranty shall be provided through the manufacturer of the faceplate, jacks, and patch panels. All components shall be by the same manufacturer.
D. The warranty shall guarantee that if any part or piece of the “Link” is found to be defective for a period of no less than 15 years, then that part or piece shall be replaced or fixed at no cost to the Owner.
E. The Contractor shall be responsible for installing the system in such a manner that the manufacturer will provide this warranty to the Owner.
F. The Contractor is responsible for compiling and submitting all the paperwork required to receive the warranty. This includes gathering all the information, completing any required forms, and submitting these forms and any other records to the manufacturer as required.
G. It shall be the Contractor’s responsibility to receive the approved warranty notification from the manufacturer and provide that and all the associated paperwork to the Owner.
H. The installation shall not be considered complete until the Owner has received notification, from the manufacturer, that the entire cabling system is covered by their warranty.

3.04 SERVER WARRANTY
A. Each Server and or NVR shall be provided with a three-year next day replacement warranty.
   1. The warranty shall include that the contractor be onsite and replace the server and any software required.
   2. Coordinate with the manufacturer to facilitate the server replacement.
   3. Re-install the server and connect to the network.
   4. Re-implement the existing owner’s software and configure based on the final initial implementation.
   5. Keep a copy of the original configuration of the system to allow easy implementation of the new server.

3.05 VIDEO SECURITY SOFTWARE WARRANTY
A. As part of the project the contractor shall provide a three-year (3) video security recording system and security camera warranty that provides for all software updates during the three years after Substantial Completion.
   1. Contractor shall be required to install all software and firmware updates during the three years.

3.06 ACCESS CONTROL SOFTWARE WARRANTY
A. As part of the project the contractor shall provide a three-year (3) access control system software warranty that provides for all software updates during the three years after Substantial Completion.
   1. Contractor shall be required to install all software and firmware updates during the three years.

END OF SECTION 28 7800