



Bid Documents
For

Benzie County Central Schools

SECURITY SYSTEMS UPGRADE

Benzie County Central Schools
9300 Homestead Rd
Benzonia, MI 49616

Distributed by:



CommtechDesign

Contact Bret Emerson
616-863-8132

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August 19, 2022

SECTION 28 0500 – FRONT END

PART 1 - GENERAL

1.01 INTRODUCTION

- A. **Benzie County Central Schools** invites qualified contractors to provide proposals for a Security System Upgrade. This work includes:
1. Bid Category #1
 - a. The base bid is the cost for the installation of all the access control systems including all equipment, cabling, software, labor, installation, configuration and testing.
 - b. Shall be a Vanderbilt system that expands on the existing Vanderbilt system that is in place.
 2. Bid Category #2
 - a. The base bid is the cost for the installation of all the video security cameras, security servers, patch cables including all equipment, software, labor, installation, configuration and testing.
 - b. This scope includes providing and installing the security camera CAT-6 cabling in the following building as shown on the drawings:
 1. High School and Middle School
 2. Betsie Valley Elementary
 3. Lake Ann Elementary
 4. Security Camera cabling in the Homestead Hills Elementary Building will be by others and considered existing for this project.
- B. The Contractor shall pay all costs of the Work including, but not limited to, labor, materials, equipment, tools, transportation, freight, taxes, royalties, patent fees, support facilities, construction equipment, water, heat, utilities, supervision, overhead, and all other items necessary for the proper execution and completion of the Work.

1.02 CONTACTS

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

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

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

Benzie County Central Schools
9300 Homestead Rd
Benzonia, MI 49616

1.03 BID RESPONSE DUE DATES

- A. Bids responses are due and shall be received no later than 9/7/2022 at 2:00PM sharp.
1. Emailed copies of the bid responses shall be sent to the following Email addresses:
 - a. Commtech Design - bids@commtechdesign.com
 - b. Owner representative: Amiee Erfourth - erfourtha@benzieschools.net and Bernie Killeen – killeenb@benzieschools.net
 - c. Physical copies of the bid responses will **NOT** be accepted.
- B. A pre-bid meeting will be held on August 26, 2022, at 12:00 PM. Meet at:

Benzie Central High School
89300 Homestead Rd
Benzonia, MI 49616.
Attendance is **NOT** mandatory

- C. All questions shall be submitted to the owner no later than August 31, 2021 at 2:00PM.
 - 1. All questions shall be sent via email to Bret Emerson and Joni Hodsdon of Commtech Design at bids@commtechdesign.com.

1.04 BUILDING SITES

- A. Work to be completed as part of this bid will be done at the sites as detailed in the drawings and specifications:
- B. Access to the sites
 - 1. Work in HS, MS, Betsie Valley and Lake Ann elementary will be M-F 3:30 PM to 12 AM.
 - 2. All work in the classrooms or hallway shall be completed during the summer or during non-school hours. Non School work hours are
 - 3. No work activity shall disrupt the regular school day schedule or in any way intrude upon the teaching and administration of students.
 - 4. Work in the Homestead Hills Elementary School shall be M-F 7AM to 5 PM.
 - 5. Arrangements can be made for additional time on site during each day as scheduled with the owner.

1.05 OWNERS RIGHTS

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

1.06 BID RESPONSE FORMAT -EMAIL PDF

- A. The owner requires that all responses be a PDF document emailed to the following people:
 - 1. Commtech Design at bids@Commtechdesign.com
 - 2. Owner: Amiee Erfourth - erfourtha@benzieschools.net and Bernie Killeen – killeenb@benzieschools.net
- B. Bid response email format shall be:
 - 1. Email shall be titled: **Benzie Country Central Schools -Security Systems Upgrade - Bidder Name – Response**
 - 2. Attach to the email a single PDF document that is all inclusive of your bid response. This document shall be considered your entire bid response.
 - 3. Send a second email with no attachment titled: **Benzie Country Central Schools - Security Systems Upgrade - Bidder Name – Verification Email**
 - a. **This will be used in case there were any issues with receiving the PDF file with the Response Email.**
- C. Bid response PDF Format shall be:
 - 1. All bid responses shall be submitted on a combined PDF document. Document shall contain:
 - a. First Page shall be cover page with project name and your company logo.
 - b. Include fully filled out and signed Bid Form.
 - c. Single-page synopsis of your bid.
 - d. Familial Disclosure Form
 - e. Iran Form
 - f. Bid Bond (If supplying a check include a copy of the Cashier's Check. Owner may ask for physical check after the bid due date.

- g. Any other forms required in the RFP,
- h. Spreadsheet listing products being proposed.
- i. Description of the bidder's response and the services they will provide.
- j. Any information the bidder wishes to include that was not specifically required.

1.07 DOCUMENTS

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

DWG.	Drawing Name	Bid Category #1 Access Control	Bid Category #2 Video Security
TC501	Security Legends, Schedules & Details	X	X
TC502	Access Control Diagram	X	
TC503	Camera Mounting Details	X	X
TC504	Camera One-Line Diagrams		X
TC505	Camera One-Line Diagrams		X
TC506	Camera One-Line Diagrams		X
TC601A	Betsie Valley Elementary School Security Floor Plan Unit 100	X	X
TC601B	Betsie Valley Elementary School Security Floor Plan Unit 200	X	X
TC601C	Betsie Valley Elementary School Security Floor Plan Unit 300	X	X
TC602A	Lake Ann Elementary School Security Floor Plan Unit 100	X	X
TC602B	Lake Ann Elementary School Security Floor Plan Unit 100	X	X
TC603A	Benzie High School Security Floor Plan Unit 100	X	X
TC603B	Benzie High School Security Floor Plan Unit 200	X	X
TC603C	Benzie High School Security Floor Plan Unit 300	X	X
TC603D	Benzie High School Security Floor Plan Unit 400	X	X
TC603E	Benzie High School Security Floor Plan Unit 500	X	X
TC603F	Benzie High School Security Floor Plan Unit 600	X	X
TC603G	Benzie High School Security Floor Plan Unit 700	X	X

- 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

Specification	Bid Category #1 Access Control	Bid Category #2 Video Security
28 0000	Coversheet	X
28 0500	Front End	X
	Bid Form	X
	Familial Disclosure	X
	Iran Form	X
28 1000	Technology Overview	X
28 1600	Cat-6 Cabling	X
28 3500	Access Control	X
28 3600	Security Recording	X
28 3700	Security Cameras	X
28 7200	Technology Submittals	X
28 7600	Technology Labeling	X
28 7700	Technology Testing	X
28 7750	Technology Training	X
28 7800	Technology Warranty	X

PART 2 - PERSONNEL

2.01 BIDDER

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

2.02 PERSONNEL

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

2.03 BACKGROUND CHECKS

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

PART 3 - WORK REQUIREMENTS

3.01 DOCUMENTS

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

3.02 PRODUCTS

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

PART 4 - WORK SCHEDULES

4.01 PROJECT SCHEDULE

- A. It is the intention of the owner to take possession of the Work by the established completion date or earlier, within the shortest time possible consistent with good construction practices.
- B. The Completion Date
 - 1. For work at the High School, Middle School, Betsie Valley and Lake Ann Elementary shall be February 2023
 - 2. For work at the Homestead Hills project all work shall be completed by June 2023.
- C.

- D. 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
- E. 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, interferences 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 PREVAILING WAGE

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

6.04 TAXES

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

6.05 PAYMENTS

- A. The contractor shall submit an invoice on the AIA form G702/G703 each month. The invoice shall include only work completed at the time of submission.
- B. The contractor can be paid for equipment in storage at the owner's site if the following criteria are met:
 - 1. Note on the AIA invoice form that equipment invoice is for stored material.
 - 2. Provide a listing of all equipment that is being invoiced for and the quantity of each item.
 - 3. Provide pictures of the equipment/boxes that are being invoiced.
 - 4. Provide proof of insurance on the building and equipment where the equipment is stored and that the owner is listed as additionally insured. Provide an Accord Form listing the owner as additionally insured.
- C. The owner will provide payment on the invoice within 30 days of a signed invoice by the engineer and contractor.
- D. The owner will retain 10% of the total cost of the project until the system is considered finally complete as detailed in the project documents.

PART 7 - REVIEW OF BIDS

7.01 OWNER REVIEW

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

7.02 BID BOND

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

7.03 PERFORMANCE BOND

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

7.04 INSURANCE

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

- b. \$1,000,000 Products-completed operations
- c. Automobile Liability Combined Single Limit Liability
- d. \$500,000 each accident
- Or
- e. Split Income Liability
- f. \$500,000 Bodily injury—each person
- g. \$500,000 Bodily injury—each accident
- h. \$500,000 Property Damage—each accident
- 4. Umbrella Insurance
 - a. \$2,000,000 Limit over primary insurance

7.05 REVIEW OF BIDS

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

END OF SECTION

BID FORM
Benzie County Schools
Security System Upgrade



Security Systems Upgrade

TO: Benzie County Central Schools
9300 Homestead Rd
Benzonia, MI 49616

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 to provide and install all the access control systems.
Work shall include all equipment, labor, software, installation, configuration, warranty and testing.

Bid Category #2 \$ _____ (in numbers)

The base bid is the cost to provide and install all the video security systems including cameras, servers, software, cabling and patch cables
Work shall include all equipment, labor, installation, configuration, warranty and testing.

Authorized Signature: _____

Name (printed): _____

Date: _____

Email: _____

Telephone: _____

BID FORM
Benzie County Schools
Security System Upgrade

Addenda

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

Addendum # _____ Dated: _____ Addendum # _____ Dated: _____

Contractor Address: _____ Phone: _____
 _____ Fax: _____
 _____ E-mail: _____

Voluntary Alternates:

Voluntary alternates are allowed and may be considered at the discretion of the owner. For each voluntary alternate, provide a brief written description and attach additional information as 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) \$ _____

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 with mount. Provide with all licensing and configuration.

Type SB Camera \$ _____

Type SC Camera \$ _____

Type SD Camera \$ _____

Type SE Camera \$ _____

Type SF Camera \$ _____

Type SG Camera \$ _____

Type SL Camera \$ _____

STATEMENT REGARDING FAMILIAL RELATIONSHIP

AFFIDAVIT OF _____
(name of affiant)

STATE OF MICHIGAN

COUNTY OF _____

_____ makes this Affidavit under oath and states as follows:

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

Of _____, a bidder on a construction project for
(insert name of contractor)

_____ that involves, at least in part, construction
(insert name of school district)

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

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

3. I have authority to bind the aforementioned contractor with the representations contained herein, and I am fully aware that the school district will rely on my representations in evaluating bids for the construction project.

4. I declare the above information to be true to the best of my knowledge, information and belief. I could completely and accurately testify regarding the information contained in this affidavit if requested to do so.

(signature of affiant)

Dated _____

Subscribed and sworn before me in _____ County,

Michigan, on the _____ day of _____, 200__

(signature)

(printed)

Notary public, State of Michigan, County of _____

My commission expires on _____

Acting in the County of _____

Iran Economic Sanctions Act Certification

I am the _____ of _____, or I am
(title) (Bidder Company)
bidding in my individual capacity ("Bidder"), with authority to submit a binding bid for the Security Systems Upgrade to Benzie County Central Schools. I have personal knowledge of the matters described in this Certification, and I am familiar with the Iran Economic Sanctions Act, MCL 129.311, *et seq.* ("Act"). I am fully aware that the school district will rely on my representations in evaluating bids.

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

(signature)

(printed)

(date)

SECTION 28 1000 – TECHNOLOGY OVERVIEW

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 DESCRIPTION OF PROJECT

- A. Bid Category #1: Access Control System
 - 1. Install an access control system in the building(s).
 - a. Provide and install all equipment and software required.
 - b. System shall be Vanderbilt and shall expand on the existing system at the district.
 - 2. Raceways
 - a. Raceways for access control systems are existing by others at all buildings.
 - 3. Install all cabling required connect each door to the security panels
 - a. Provide power to all security devices and door locks from the power supply in the security panel. Provide power supplies
 - b. Security panels shall be located in each communications room. See drawings.
 - c. Extend 120 volt power from the local receptacle panel to the security panels.
 - 4. Install intercoms. Where the intercom is connected to the data network the contractor shall provide all patch cables and configure the network to support the intercoms
 - 5. Configure the system as per the owner’s requirements. Meet with them to determine configuration parameters
 - 6. The extent of the work shall be as shown on the drawing and detailed in these specifications
- B. Bid Category #2: Video Security System
 - 1. CAT-6 cabling
 - a. CAT-6 cabling for cameras is to be provided and installed at:
 - A) High School
 - B) Middle School
 - C) Lake Ann Elementary
 - D) Betsie Valley elementary
 - b. CAT-6 cabling at Homestead Hills shall be by others. Provide patch cables from the cables to the cameras
 - c. Provide all patch cables from the patch panel to the owners Ethernet switches. Switches are by the owner.
 - 2. Provide and install all cameras at all locations noted
 - 3. Provide and install servers and software for monitoring and recording all access control systems.
 - 4. Fully configure all software and hardware required for recording of camera images

5. Install viewing software on owner's computers and devices.
 6. The extent of the work shall be as shown on the drawing and detailed in these specifications
- C. Post installation documentation
1. Each contractor shall provide post installation documentation as per the specifications. Shall include but not be limited to:
 - a. Red-lined as-built drawings
 - b. As-built detailed connectivity of AV and Network Systems
 - c. As-built cable locations and cable labels at each location.
 - d. Mark all splice locations
 - e. Update of all access control locations and equipment at each door
 - f. Camera locations and camera numbers.
 - g. Spreadsheet (hard copy and Excel file) for all network, Wireless, telephones and cameras detailing:
 - A) Mfg. Part number
 - B) IP Address
 - C) MAC Address
 - D) Device number (Camera #, Telephone # etc)

1.03 STORAGE OF MATERIALS

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

1.04 PERMITS

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

1.05 REFERENCE SPECIFICATIONS-CABLING

- A. All work applicable shall conform to the following standards:
- B. ANSI/TIA-568-C.0, "*Generic Telecommunications Cabling for Customer Premises*",
- C. ANSI/TIA-568-C.1, "*Commercial Building Telecommunications Cabling Standard*",

- D. ANSI/TIA-568-C.2, "*Balanced Twisted-Pair Telecommunication Cabling and Components Standard*", ANSI/TIA-568-C.3, "*Optical Fiber Cabling Components Standard*",
- E. ANSI/TIA-568-C.4, "*Broadband Coaxial Cabling and Components Standard*",
- F. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
- G. IA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings including all Updates and Addenda.
- H. TIA-607-C: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
- I. EIA-472 General Specification for Fiber Optic Cable
- J. EIA-472A Sectional Specification for Fiber Optic Communication Cables for Outside Aerial
- K. EIA-472B Sectional Specification for Fiber Optic Communication Cables for Underground and Buried Use
- L. EIA-472C Sectional Specification for Fiber Optic Communication Cables for Indoor Use
- M. EIA-472D Sectional Specification for Fiber Optic Communication Cables for Outside Telephone Plant Use
- N. NEC, 2015, or latest edition available
- O. IEEE 802.3af PoE • Ratified in 2003 • 15.4W at the PSE, with min of 12.95W available to the PD
- P. IEEE 802.3at PoE+ • Ratified in 2009 • 34.2W at the PSE, with min of 25.5W available to the PD
- Q. IEEE 802.3bt-2018 - IEEE Standard for Ethernet Amendment 2: Physical Layer and Management Parameters for Power over Ethernet over 4 pairs

1.06 CONTRACTOR-ALL

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

1.07 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.
- E. **Contractor shall provide a label at each penetration and firestop location detailing the UL rated fireproofing solution that was used in the specific application.**
 - 1. **Apply sticker to the wall near the firestopped conduit.**
 - 2. **Provide a sample of the label to the designer for review as part of the submittals.**

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall be familiar with the location(s) where the work will be done. No additional compensation will be made for items the Contractor claims he was not aware of during bidding.
- B. Work Area:
 - 1. All work areas shall be cleaned at the end of each day. All debris shall be cleaned and removed from the site and disposed of in the approved container for the site.
 - 2. All equipment shall be moved out of common areas and stored in the Contractor's lay down area, or in other approved storage locations on site.
 - 3. Any work that is low hanging, or may otherwise impede the general use of the space, and cannot be removed, shall be flagged and cordoned off by the Contractor.
- C. All equipment and parts shall be installed in a neat and workmanlike manner. Good installation principles shall be used throughout the project.
- D. All cables routed above the drop ceiling or in the ceiling area shall be installed square to the building. Diagonal cable runs are not permissible.
- E. All cut edges of conduits, boxes, raceway, etc., shall be trimmed and filed so that no burrs or rough edges will damage cable as it is installed.
- F. All surface raceways, including conduits in exposed areas shall be painted to match the existing colors of the surrounding area.

- G. If, in the course of the work, the Contractor damages, marks, or misplaces any ceiling tiles, the Contractor shall repair, and/or replace the ceiling tile to the original condition.
 - 1. The Engineer shall decide if ceiling tiles have been damaged. Based on the Contractor's proposed fixes, the Engineer shall decide the best course of action to repair any damage done by the Contractor to the ceiling tiles.
- H. It shall be the responsibility of the Contractor to repair any damage done to the structure or finishes in the building by the Contractor. The building shall be returned to its original condition prior to final sign off of the project.
- I. Firestrop shall be installed to meet national and local codes.

3.02 DOCUMENTS

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

3.03 WORK PLAN-POST BID (CHOSEN CONTRACTOR ONLY)

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

END OF SECTION

SECTION 28 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*",
 3. ANSI/TIA-568-C.2, "*Balanced Twisted-Pair Telecommunication Cabling and Components Standard*", ANSI/TIA-568-C.3, "*Optical Fiber Cabling Components 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:

AWG	Number of 4-Pair Cables in a Bundle																				
	1			2-7			8-19			20-37			38-61			62-91			92-192		
	Temp Rating			Temp Rating			Temp Rating			Temp Rating			Temp Rating			Temp Rating					
	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C
26	1.0	1.0	1.0	1.0	1.0	1.0	0.7	0.8	1.0	0.5	0.6	0.7	0.4	0.5	0.6	0.4	0.5	0.6	NA	NA	NA
24	2.0	2.0	2.0	1.0	1.4	1.6	0.8	1.0	1.1	0.6	0.7	0.9	0.5	0.6	0.7	0.4	0.5	0.6	0.3	0.4	0.5
23	2.5	2.5	2.5	1.2	1.5	1.7	0.8	1.1	1.2	0.6	0.8	0.9	0.5	0.7	0.8	0.5	0.7	0.8	0.4	0.5	0.6
22	3.0	3.0	3.0	1.4	1.8	2.1	1.0	1.2	1.4	0.7	0.9	1.1	0.6	0.8	0.9	0.6	0.7	0.8	0.5	0.6	0.7

- 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
 3. Belden
 4. CommScope
 5. Mohawk
 6. Superior Essex
- B. Approved vendors for CAT-6 termination equipment are:
 1. Hubbell.
 2. Panduit (Net Key not allowed)
 3. Belden
 4. CommScope

2.02 CAT-6 CABLING

- 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:

DC RESISTANCE (max)	23 AWG
Ohms/100m @ 20°C	9.38ohms
DC RESISTANCE UNBALANCED (max)	
Individual Pair %	5%

CHARACTERISTIC IMPEDANCE	
Frequency (f)	Ohms
1-500 Mhz	100 ±15

DELAY SKEW (max)	
ns/100m	45

NOMINAL VELOCITY OF PROPAGATION (NVP)	
% Speed of light	72

INPUT IMPEDANCE	
Frequency (f)	Ohms
1.0-100 Mhz	100 ±15
100-350 Mhz	100 ±20
350-500 Mhz	100 ±25

REFERENCE ELECTRICAL CHARACTERISTICS

FREQ (MHz)	INSERTION LOSS (dB/100m)		NEXT (dB/100m)		ACR (dB/100m)	PS-NEXT (dB/100m)		PS-ACR (dB/100m)	ELFEXT (dB/100m)	PS-ELFEXT (dB/100m)	RL (dB)
	avg	max	avg	min	min	avg	min	min	min	min	min
.772	1.7	1.8	82	76.0	74.2	77	74.0	72.2	-	-	-
1.0	1.9	2.0	80	74.3	72.3	75	72.3	70.3	67.8	64.8	20.0
4.0	3.6	3.8	71	65.3	61.5	66	63.3	59.5	55.8	52.8	23.0
8.0	5.1	5.3	67	60.8	55.5	62	58.8	53.5	49.7	46.7	24.5
10.0	5.7	6.0	65	59.3	53.3	60	57.3	51.3	47.8	44.8	25.0
16.0	7.3	7.6	62	56.2	48.6	57	54.2	46.6	43.7	40.7	25.0
20.0	8.1	8.5	61	54.8	46.3	56	52.8	44.3	41.8	38.8	25.0
25.0	9.1	9.5	59	53.3	43.8	54	51.3	41.8	39.8	36.8	24.3
31.25	10.2	10.7	58	51.9	41.2	53	49.9	39.2	37.9	34.9	23.6
62.5	14.8	15.4	53	47.4	32.0	48	45.4	30.0	31.9	28.9	21.5
100.0	19.0	19.8	50	44.3	24.5	45	42.3	22.5	27.8	24.8	20.1
155.0	24.2	25.2	47	41.4	16.3	42	39.4	14.3	24.0	21.0	18.8
200.0	27.8	29.0	46	39.8	10.8	41	37.8	8.8	21.8	18.8	18.0
250.0	31.5	32.8	44	38.3	5.5	39	36.3	3.5	19.8	16.8	17.3
300.0	35.0	36.4	43	37.1	0.7	38	35.1	--	18.3	15.3	16.8
350.0	38.2	39.8	42	36.1	--	37	34.1	--	16.9	13.9	16.3
400.0	41.3	43.0	41	35.3	--	36	33.3	--	15.8	12.8	15.9
500.0	47.0	48.9	40	33.8	--	35	31.8	--	13.8	10.8	15.2
550.0	49.7	51.8	39	33.2	--	34	31.2	--	13.0	10.0	14.9

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.

Cable Use	Manufacturer	Color	Part number	Rating
Security Camera	Mohawk	Green	M58286	Plenum

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

2.03 UTP JACKS

- A. 8-position modular jacks for termination at user and at the patch panel. Match cable color except where noted on drawings.
 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.
 3. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
 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 or CAT-6A as required.

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 for Security Cameras shall be Hubbell #HXJ6GN-Green

2.04 FACEPLATES

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 #HSB1OW.
 3. Two port surface box shall be Hubbell #HSB2OW
 4. Four Port Surface box shall be Hubbell #HSB4OW
 5. For all plenum rated ceilings and areas the contract shall provide plenum rated surface mount boxes. For Hubbell products. Add a "P" to the end of the part number.

2.06 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.

2.07 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 and 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 #HPRCMB 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.

2.08 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.
- E. Install a sticker on the wall, next to the pass thru, listing the UL approved method that was used to firestop the pass thru or conduit.

2.09 PATCH CORDS

- A. Contractor shall provide one patch cord for each data cable installed. Patch cords shall be at the communications room.
 1. Provide a patch cord for each CAT-6 or CAT-6A cable installed
- B. Patch cords shall match the type of cables installed. Provide CAT-6 patches for CAT-6 cables. Provide CAT-6A patches for CAT-6A cables
- C. Patch cords shall be 8" or 12" long and shall match the color of the cable/jack they are being plugged into.
 1. Provide **Green** Patch Cords for Security Cameras
- D. Patch cords shall be 28 AWG, small diameter cords
 1. CAT-6 cords shall be Panduit #UTP28SP8IN* or equal where * is the color

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.

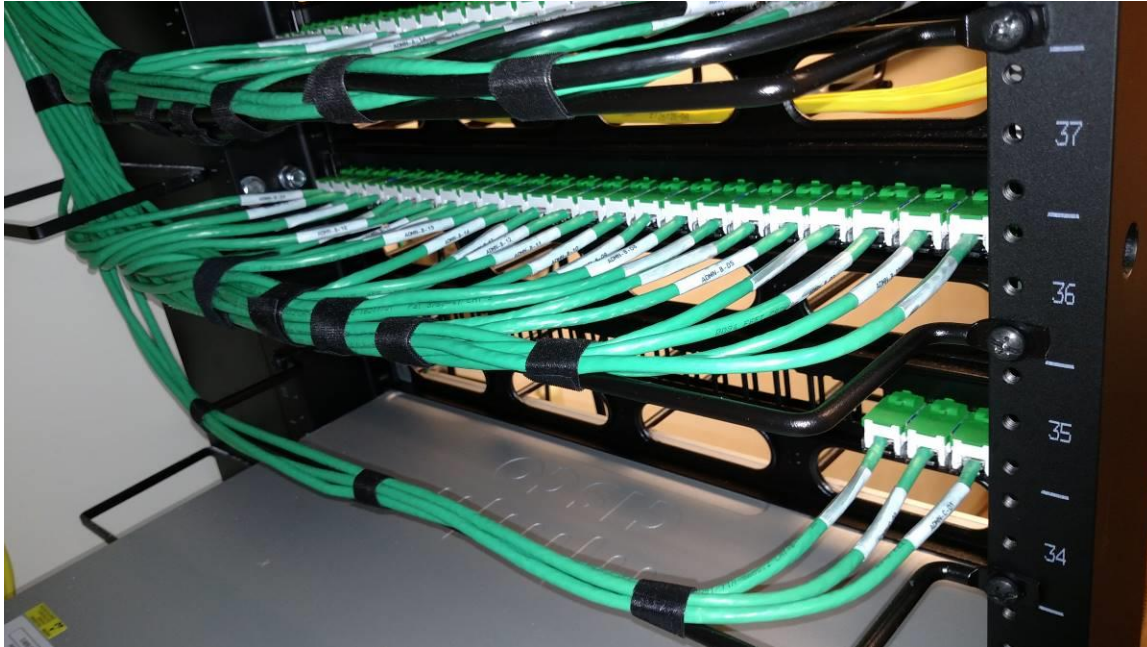
3.02 PREPARATION

- 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 UTP 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.
- H. Patch Cords
 - 1. Install patch cords at camera and at the communications room
 - 2. Verify length of patch cables as required prior to ordering.

END OF SECTION

SECTION 28 3500 – PHYSICAL ACCESS CONTROL SYSTEM (PACS)

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes parts and equipment required for installation and termination of a building-wide Physical Access Control System (PACS). This system shall be referred to as the “security system”, “system” or PACS 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 and alarm monitoring. 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
 - 3. Video and Audio intercoms
- 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 door hardware and security devices being installed as part of this project.
- B. PACS 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. Prior to ordering equipment and installation, 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.
 - 1. 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. Generate a testing plan and have that plan approved by the owner and engineer prior to installing the system.
- E. 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.
- F. Conduct all testing of the system
- G. Conduct user training on the system
- H. Provide as-built documentation of the installed 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. National Electrical Code (NEC)
 - 9. NFPA 80 National Fire Protection Agency - Fire Doors & Windows (edition is jurisdiction dependent).
 - 10. NFPA 101 National Fire Protection Agency - Life Safety Code (edition is jurisdiction dependent).
 - 11. NFPA 105 National Fire Protection Agency - Smoke Control Door Assembly (edition is jurisdiction dependent)
 - 12. ANSI 117.1 1992 Edition Providing Accessibility and Usability for Physically handicapped People.
 - 13. A.D.A.A.G Americans with Disabilities Act Accessibility Guidelines.

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 manufacturer for panels and power supplies are:
 - 1. Altronix
 - 2. Life Safety
- C. Approved vendor for Physical Access Control System (PACS) equipment is:
 - 1. Vanderbilt
 - a. Software would be SMS
 - 2. 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.
- D. 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/intrusion detection system shall be an all-encompassing system that is large enough to serve numerous employees and be extended to numerous buildings. The system shall, collect data and monitor doors and entrances at:
 - 1. No less than 8 Buildings
 - 2. Support no fewer than 500 users

- B. The original installation will be for the building(s) noted on the drawings. The system installed shall not preclude the extension of the system to other buildings.
- C. The system shall include all equipment, software, cabling, data collection points, card readers and hardware to monitor and control the specified buildings and provide reports to a security station as required by the owner.
- D. 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.
- E. The system shall keep records of all access control card presentations.
- F. The system shall connect to and interoperate with all the door hardware that which is existing and being added as part of this project.
- G. 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.
- H. 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. The Vanderbilt system is in place and operational. The server is existing.
 - 2. Add onto the software to support new panels and devices.

2.05 ACCESS CONTROL SYSTEM SOFTWARE

- A. Software shall be Vanderbilt

2.06 SECURITY ENCLOSURE

- A. Shall be provided to hold power supplies, controllers, access control panels, card reader panels, input/output cards (now to be referred to as security panels) and any other components required for a complete access control system.
- B. Security enclosures are the physical boxes and cabinets that support the intelligent controllers, I/O boards, power supplies and power distribution equipment.
- C. Security panels shall be wall mounted and large enough to hold power equipment and access control system controllers and cards.
- D. Security panel shall be:
 - 1. UL: Listed: UL 294 approved
 - 2. Enclosure shall accommodate power supply and sub-assemblies such as controllers and security cards to be provided as part of the project.
 - 3. Primary power input shall be 115VAC
 - 4. Physical
 - a. Size enclosure as required to hold power supplies and security panels. Provide multiple enclosures where required.
 - b. Made of 16 AWG sheet metal

- c. Shall have conduit knockouts or custom cut holes for access to the panels for cabling.
- d. Be equipped with an internal cam lock
- e. Be equipped with a tamper switch that shall be wired to the I/O for software alarm when the panel is opened.
- f. Shall have space for batteries to support the access control system.
- 5. Equip with a backplate that shall support direct mounting of the security panels and power devices
- 6. Equip with magnetic cable supports that attach to the backplate to support cables.
- E. Security Enclosure shall be Altronix Trove series or equal.
- F. OR. Shall be Vanderbilt direct panels and hardware

2.07 POWER SUPPLIES AND POWER DISTRIBUTION

- A. Power supplies and power equipment shall be provided that support the entire access control system, security panels/controllers, door locks and all other field equipment of the access control system.
- B. All power supplies shall be connected to 120VAC power with a hardwired connection. Install cable and connect to power.
 - 1. Provide and install conduit, wiring and connections required for 120-volt power connectivity.
- C. Power supply shall be mounted to the enclosure. Shall include:
 - 1. Shall provide power to the panels in the enclosure and field devices.
 - 2. Shall include multiple 12 or 24 volt outputs. Shall be settable on the panel
 - 3. Input voltage of 120VAC with a fuse
 - 4. Classified as a Power-Limited stand-alone power supply with stand-by battery and suitable to power sensors and electro-mechanical devices (e.g. electric door strikes), as defined in the National Electrical Code/NFPA70/NFPA72
 - 5. Shall be sized for outputs of 1 thru 16 unique outputs.
 - 6. Battery connection for charging on-board batteries.
 - 7. Fire alarm disconnect
 - a. Shall support Normally Open or Normally Closed trigger
 - b. Shall be set to latching or non-latching
 - 8. LED indicators for:
 - a. AC input
 - b. DC output
 - c. Battery discharged or no battery
 - 9. Over Voltage protection
 - 10. Short Circuit protection
 - 11. Power supply shall be Altronix #eFlow series or equal.
 - a. Provide actual part that provides for all power and control of the system as required to meet the manufacturers requirements and these specifications.
 - 12. Equip with an Ethernet Module for panel control and monitoring:
 - a. Shall support remote supervision, control and monitoring over an Ethernet connection.
 - b. Connect to the owner's network and setup monitoring.
 - c. Altronix #Linq2 or equal
 - 13. OR. Shall be Vanderbilt direct panels and hardware
- D. Access Power Controllers
 - 1. The Power Controller shall have the following characteristics:
 - a. Powered by 12 VDC or 24 VDC from the power supply/charger board or via 8-Pin connector to stack with Voltage Regulator for dual voltage (12VDC & 24VDC) outputs from a single 24VDC input, up to 6 Amps
 - b. Spade lug connectors to facilitate the transfer or sharing of 12VDC and/or 24VDC power between Access Power Controllers or Power Distribution Modules

- c. 8 trigger inputs to correspond with similarly numbered triggered controlled outputs, with each trigger input being in one of the following forms:
 - 1) Normally open (NO) contact
 - 2) Open collector
- d. 8 independently trigger-controlled outputs with the following output options:
 - 1) Fail-Safe filtered and electronically regulated power outputs
 - 2) Fail-Secure filtered and electronically regulated power outputs
 - 3) Form "C" relay outputs, rated 5 amps @ 28 VDC/VAC.
 - 4) For each triggered output, LED indication of an active output.
 - 5) Bi-colored LEDs for visual verification of voltage (12VDC or 24VDC) per output
 - 6) An unswitched auxiliary power output, rated at 2.5 amps (fused) or 2 amps (PTC), used in lieu of a trigger-controlled output.
 - 7) Fuse protected
- e. FACP (Fire Alarm Control Panel) interface
 - 1) input options from the FACP:
 - A) polarity reversal
 - B) Normally Open - Non-Latching or Latching with reset
 - C) Normally Closed - Non-Latching or Latching with reset
 - 2) Ability for the FACP to trigger any of the trigger-controlled outputs
 - 3) Trigger indications:
 - A) LED indicator on the module
 - B) Form "C" output relay contact rated 1 amp @ 24 VDC
- f. Current protection
 - 1) access control module: 10 amp fuse
 - 2) individual outputs: 2.5-amp Class 2 rated PTC device
- 2. Access power controller shall be Altronix #ACMS8 or equal.
- 3. OR. Shall be Vanderbilt direct panels and hardware
- E. Power Distribution board with voltage regulator.
 - 1. The Power Distribution Module shall be a UL Listed Sub-Assembly board level product comprised of fused protected outputs to furnish 12 VDC, 24 VDC or 24 VAC power to surveillance, security, access control systems and components, and other security-related equipment.
 - 2. Power distribution module shall include:
 - a. The Power Distribution Module shall employ a single distribution board.
 - b. The Power Distribution Module shall output 5VDC to 24VDC up to 10A each or 16VAC to 28VAC up to 14A each.
 - c. Fused protected outputs.
 - d. Individual voltage LEDs indicate 12VDC (Green) or 24VDC (Red and Green)
 - 3. Modules shall provide for:
 - a. Dual Power Supply Inputs.
 - b. Outputs shall be switch selectable as to route power via Input 1 or Input 2.
 - c. Shall be stacked with a voltage regulator and connected via eight (8) pin connector.
 - d. Individual voltage LEDs indicate 12VDC (Green) or 24VDC (Red and Green).
 - e. Eight (8) individually fused device protected outputs.
 - 4. Power distribution board shall be Altronix #PDS8 or equal
 - a. Equip with a voltage regulator Altronix #VR6 or equal.
 - 5. OR. Shall be Vanderbilt direct panels and hardware
- F. Battery Backup
 - 1. The enclosure shall have battery backup UPS circuit with built-in battery charger that shall provide automatic battery backup UPS power in event of AC line failure.
 - 2. Each controller enclosure panel shall have a battery for power failure. Battery shall be fully enclosed in a metal cabinet.
 - 3. The battery shall provide for full UPS operation for a minimum of 30 minutes

2.08 ACCESS CONTROL MODULE/CONTROLLER

- A. The Contractor shall provide intelligent controller modules / cards for the security system that utilize a true distributed processing technology with local processing at each controller.
 - 1. Shall provide for an open architecture.
- B. One module per communications room or immediate adjacent enclosures shall provide for communications with the server/software via on-board 10BaseT/100BaseTX Ethernet port and support TLS encryption as a minimum security implementation.
- C. In the event system communications is lost or the server/cloud fails, all networked intelligent controller, (controllers or security panels or modules, terms will be used interchangeably) shall provide complete control, operation, and supervision of all monitoring and control points based on the latest database information.
- D. The controller shall provide centralized biometric template management and support a wide range of reader technologies, including OSDP, Wiegand, magnetic stripe and biometric.
 - 1. Control module shall support, as a minimum the following open standards:
 - a. PSIA Area Control,
 - b. SNMPv3/v2c,
 - c. OSDP and OSDP SC.
 - 2. The controller shall utilize a cryptographic module, like OpenSSL FIPS Object Module RE, that is validated to FIPS 140-2 thus providing a certified implementation of Transport Layer Security.
 - 3. Security on the controller shall include:
 - a. Host/Controller connection protected by TLS 1.2/1.1 or AES-256/128
 - b. Controller/IO Expansion connection protected by AES
 - c. Generate and load custom peer certificates for TLS
 - d. Port based network access control using 802.1X
 - e. Crypto memory chip
 - f. FIPS 140-2 user of OpenSSL
 - g. HTTPS protection for installer web pages
 - h. Secure cookies
 - i. SNMPv3/v2c
 - j. DIP switch toggle sets 5-minute time to disable webpage access
 - k. Disable default login credentials
 - l. Authorized IP address filtering
 - m. IP Client Proxy
 - n. Bulk erase controller and periphery devices during replacement
 - o. Strong password enforcement
 - 4. Door Control on controller shall support:
 - 5. One or two-reader ports: Clock and Data, Wiegand, or RS-485
 - a. Eight programmable inputs, four relays, diagnostic LEDs
 - 6. Access Control shall support:
 - a. 240,000 Cardholder capacity
 - b. 50,000 Transaction buffers
 - c. If/Then Macro capability
 - d. Adjustable cardholder capacity
 - e. Supports up to 520 inputs and 516 outputs
 - 7. Card Formats supported shall include:
 - a. 16 card formats per active reader, 8 per offline reader
 - b. Entire card number reported on invalid read
 - c. 19-digit (64-bit) User ID and 15-digit PIN numbers maximum
 - d. PIV, CAC, TWIC card compatible
 - e. 255 Access Levels per card holder
 - f. Activation/Deactivation Date or Date & Times
 - 8. Card Reader Functions shall include:
 - a. Multiple card format support by reader
 - b. Paired reader support
 - c. Alternate reader support

- d. Elevator support
 - e. Turnstile support
 - f. Biometric device support
 - g. Open Supervised Device Protocol (OSDP) and OSDP SC compliant
 - h. Occupancy count
 - i. Support of multi-occupancy rules
 - j. Anti-pass back support
 - k. Area-based, reader-based, or time based
 - l. Nested area, hard, soft, or timed forgiveness
 - m. Supports host-based approval rules
 - n. Keypad support with programmable user commands, card input
 - o. Shunt relay support
 - p. Strike follower relay support
 - q. Threat level and Operating Modes
 - r. Host controlled OSDP reader passthrough
 - s. Elevator floor override
- E. 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, electric strikes 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. Controllers shall mount in enclosure on the wall where noted on the drawings.
 4. Provide the quantity of controllers required for all electronic door locks, card readers and all other devices noted on the drawings and specifications.
 - a. Each controller shall have onboard LED’s for self-diagnosis.
 5. Each controller shall support IP communications. Additional communications shall be via RS-232 and or RS-485.
 6. Shall include a real-time on-board clock synchronized with Server.
 7. 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.
 8. The link to other systems shall take place at the controller as well as through the I/O boards so that in the event of failure or an alarm. the rest of the system shall continue to function correctly.
 9. The maximum time for door opening from the proper presentation of a card shall be less than one second.
 10. ADA assisted Openers
 - a. Controller shall interface with ADA openers and ADA door buttons.
 - b. At some doors, there are assisted openers. At these doors, the controller shall completely work with the opener. Include equipment, cabling, connections and programming to allow the doors to function as per below:
 - 1) When approaching from the exterior and doors are locked:

- A) Present a card and then door shall be unlocked. Push the auto opener and the door shall open.
 - 2) When approaching from the exterior and doors are unlocked:
 - A) Push the auto opener button and the door opens.
 - 3) When approaching from the interior and doors are locked:
 - A) Push the auto opener button and the door shall unlock and open.
 - 4) When approaching from the interior and doors are unlocked:
 - A) Push the button and the door opens.
 - 11. 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.
 - 12. Controller with Ethernet connectivity shall be Mercury LP Series or equal
 - 13. Controller with RS-485 connectivity shall be Mercury MR Series or equal
 - 14. OR. Shall be Vanderbilt direct panels and controllers
- F. I/O Cards/Modules shall be installed in the enclosures and attached to the controller to allow input and output to the field devices throughout the building(s).
 - 1. Provide additional modules or boards to support all control, access and security points shown on the drawings and described in the specifications.
 - a. I/O boards shall pop in and pop out. Replacing a board for a certain point shall not require shutting the entire controller down.
 - 2. Modules shall be installed to connect to the field devices, including but not limited to:
 - a. Door contacts,
 - b. Request to exit devices,
 - c. Push buttons/Panic buttons
 - d. Toggle Switches
 - e. Assisted door opener devices and door opener buttons
 - f. Motion sensors.
 - g. Strobe lights
 - h. Embarrassment alarms / exit alarms
 - i. Lockdown buttons with Lockdown Status Light
 - j. Other field devices noted
 - k. All other security devices required and shown on the drawings.
 - 3. Modules shall translate information from the field devices to the controller and thus the server for records and access control.
 - 4. 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.
 - 5. Output types shall be digital/analog for control of doors. In addition to the door output, the control module shall contain auxiliary outputs for ON/OFF control of other devices.
 - 6. Shall provide inputs and outputs to monitor and control non-reader-based system points, such as door contacts, motion sensors, gate actuators, ADA Buttons and ADA openers etc.

2.09 CREDENTIALS

- A. Proximity Cards/
 - 1. All cards are existing

2.10 DOOR LOCKING DEVICES

- A. 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.
- B. 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.

2.11 READER DEVICES

- A. 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 and 2.4Ghz (Bluetooth) compatibility.
 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 12 volts DC.
 7. Reader must be capable of providing a read range up to 4" for proximity cards without modification.
 8. Mobile credential range shall be
 9. Reader shall operate in a temperature range of minus -31°F to 150°F.
 10. Reader shall be designed for both surface mounting and mounting on a single-gang electrical box.
 11. Reader shall have a tri-color light emitting diode (LED. and audible tone for noting of accepted read or rejected card read.
 12. Reader shall flash the LED green momentarily and emit a short beep to indicate that a card was read.
 13. Shall communicate via Wiegand or RS-485
 14. Card readers on single-gang boxes shall be HID Signo #40 or equal.
 15. Card readers on the frame of a door shall be HID Signo #20 or equal.
 16. Card readers on the intercom shall be HID MultiClass SE #RP10 or equal.
 17. Keypad Reader."KR: on drawings
 - a. Card readers with numeric keypad, on a single-gang backbox shall be HID Signo #20K or equal

2.12 DEVICES AT THE DOOR

- A. Door Contacts; "DC" on drawings
1. Contractor shall install magnetic door contacts in the top of each door required to be monitored. See drawings for door contact "DC" locations.
 2. Install industry standard magnetic door contacts into the top of the door and the matching contact into the header of the door.
 3. Contacts shall be compatible with the security/access system provided. Each contact point shall be defined in the software and shall be given an alphanumeric designation.

4. Contacts shall connect back to the controller via wire installed by the Contractor.
 5. In locations where there are double doors, two contacts shall be installed and the connections shall be made so that the opening of each door is detected.
 6. When the contact is installed in the recessed part of a metal doorframe, an appropriate, solidly attached metal support shall be used. The tolerance "gap" shall be adjusted to the frame and the door.
 7. Wire door contacts back directly to an I/O card in the controller panel. DC's shall not be wired through Request to Exit devices.
 8. Door contacts shall be 1" diameter.
 9. Door Contacts shall be GRI 184/12 or equal
- B. Motion request to Exit Connections: "MX" on drawings
1. On doors marked with a "MX" the Contractor shall install and connect a motion based request to exit switch that is mounted above the door.
 2. Refer to the doors on the drawings with "MX."
 3. Contractor shall connect all "MX" doors to the security/access system to shunt the alarm when a person engages the MX switch at the door. This shall allow persons to leave the building without triggering the alarm even when the doors are locked and armed.
 4. Contractor shall provide all cabling and programming required for all request to exit connections. These cables shall be directly back to the controller panel and shall not be tied directly to door contacts
 5. Each "MX" shall include a configurable sensor pattern and shall have a LED indicator light.
 6. MX shall be Honeywell #IS310 or equal.



- 7.
- C. Hard-wired Request to Exit devices "RX" on drawings
1. These devices are located in the latch retraction devices or electric lock devices.
 2. These devices are provided and installed by the door hardware contractor.
 3. Security contractor shall wire from the RX to the I/O panel in the network controller.

2.13 AUTO OPERATOR DOOR INTERFACES

- A. Assisted Opener "AO" on drawings
1. The contractor shall wire to the assisted door openers where shown on the drawings.
 2. The wiring shall allow integration of the working of the door locks, card readers and the push to open buttons.
 3. The work shall include wiring and integration at the doors and at the controller panel to allow the Assisted Openers to work as required by the owner. See specs and drawings for additional information.
 4. Connect cabling to the security panel and the assisted opener and assisted opener buttons to complete system connectivity and configuration.
- B. Assisted Opener Buttons. "AB" on drawings
1. Assisted opener button is provided by others.
 2. Wire from the "AB" devices inside the vestibule and inside the building to unlock the door and then trigger the door to open when exiting the building.
 3. Provide all cabling to connect the AB devices to the access control system.
 4. Configure the security system to unlock doors as people exit the building and push the opener buttons to exit.

2.14 FIELD DEVICES

- A. Fire alarm interface "FA" on drawings
1. Wire from the Fire Alarm panel to the access control system.

2. Provide cable and an input on the access control system to trigger events when the Fire alarm is triggered.
3. Consult with the owner to determine what shall occur during a fire alarm and configure the system to complete those tasks.
4. Minimally all Magnetic locks shall release upon a fire alarm event.

2.15 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 Alarm Controls #TS-18 or Schlage 660 series or equal.



or

B. 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



b.

2.16 INTERCOM –IP BASED

- A. Intercom (Audio/Video) at doors; “IC” on drawings
 1. At locations shown on the drawings, the Contractor shall install audio/video (IC) Intercom devices to allow visitors to contact the office to announce themselves and to gain entry into the building.
 - a. Connectivity of the components shall be via manufacturer CAT-6 cables to the data network. This shall be from the exterior interfaces, throughout the system and to the Ethernet network inside the building.
 - b. Shall connect to standard SIP devices for audio and video connectivity.
 - c. Shall interface with standard video security software to allow recording of camera on each intercom.
 - d. Power and data shall be via the Ethernet network and CAT-6 cabling.
 2. Audio/video intercoms “IC” at the door shall have the following characteristics:
 - a. Device shall have a single, 1-touch, push-button for calling into the interior base station. This shall open a 2-way communications path between devices.
 - b. Shall have a color camera inside the intercom that is viewable at the interior base station.
 - c. Include the backbox for custom mounting. Provide weather proof equipment outdoors.
 3. Outdoor, Surface mounted audio/video intercom, IP based,
 - a. Surface mounted with Stainless Steel panel shall be Aiphone #IX-DVF or equal.
 - 1) Equip with Surface box, Aiphone #SBX-IDVF
- B. Base Station (BS) There shall be an audio/video intercom station at the noted offices.
 1. The audio/video intercom shall be connected to the IP network and logically attached to all intercoms at the doors.
 2. The audio portion of the station shall have a volume control.
 3. The video portion of the station shall control camera view.
 4. There shall be a door release button that interfaces with the access control system and unlocks the door that is calling.
 5. Shall include:
 - a. SIP 2.0 Compliant allowing integration with Cisco Unified Call Manager®.
 - b. ONVIF® Profile S Compliant
 - c. 802.3af PoE, Class 0
 - d. 7" TFT LCD touchscreen
 - e. Hands-free or push-to-talk communication
 - f. 8 customizable speed dial buttons
 - g. 2 contact outputs, 4 trigger inputs
 - h. 8Ω 1/2 watt speaker output provides better coverage for announcements
 - i. 600Ω audio input.

6. The interior audio/video intercom shall be Aiphone #IX-MV7-HB or equal
- C. IP Adapter for control of doors
 1. Provide an adapter in the comm room near the access control panel to interface between the intercom system and the intercom
 2. Provide a 4 contact inputs and 10 relay outputs. Provide quantity required for control of all doors equipped with an intercom (IC)
 3. Relay adapter shall be Aiphone #IXW-MA Programmable Relay Adaptor:
- D. Mobile App Gateway
 1. Provide and install software and hardware to facilitate the user of a mobile app for Apple or Android that allows the exterior intercom to call a mobile device such as a telephone or tablet.
 2. Integrate the intercom with the owners network and the cellular network.
 3. Load application on no less than five (5) of the owners users.
 4. Gateway shall allow system to call cloud-based mobile apps, giving users the ability to answer calls from visitors remotely and release the door. Compatible with iOS and Android mobile devices.
 - a. PoE compliant.
 - b. DIN rail mountable.
 - c. Simultaneous Call Paths: 8.
 - d. Supports up to 9,999 IXG apps.
 - e. Power Source: PoE.
 - f. Consumption: Standby 2.1 W, Max 2.9 W.
 - g. LAN: Ethernet (10 BASE-T, 100 BASE-TX).
 - h. Packet Delivery: Unicast, Multicast.
 - i. Protocol: IPv4/v6, TCP, UDP, SIP, HTTPS, RTP, RTCP, SRTP, SRTCP, IGMP, MLD, SFTP, DHCP, NTP, DNS, MQTT, ICE, DTLS, SDP.
 - j. Channel: 8.
 - k. Encryption: TLS 1.0, 1.1, 1.2.
 - l. Operating Temperature: 14 to 122 degrees F (minus 10 to 50 degrees C).
 - m. Dimensions (HxWxD): 4-1/4 x 8-1/4 x 2-3/8 inch (108 x 210 x 60 mm).
 5. Provide and install Aiphone Gateway #IXGW-GW
- E. Cabling for the audio/video interfaces at the doors and other components shall be plenum rated.
 1. Provide the type and quantity of cables required for connectivity. Review manufacturer's requirements and provide adequate cabling.
 2. Install a wrap-around cable at each termination point of the interconnection cables. The label shall detail which device the cable connects to.
 3. Install cabling to allow the office device to release the lock on the door where the exterior intercom is located.
 4. Install cabling and configure the system to support integration between the intercom and the push button that is installed at ADA height.

2.17 RACEWAYS

- A. Raceways for access control are by others.
 1. Install pass thru's in the ceiling for cable routing

2.18 WIRES AND CABLES

- A. The contractor shall be responsible for supplying and installing all cabling to make the system operational.
 1. Size conductors as required to transmit all power and signal to all devices.
 2. All cabling shall be Plenum rated
 3. All cabling shall be installed in raceways and in accessible ceiling spaces through cable supports.
 4. Provide manufacturer specified cabling based on use and length of signal transmission from panel to device.
 5. Generate drawings showing the cables required and get those reviewed by the designer prior to installation.

6. All cabling shall be labeled at each end with laser printed wrap-around labels
- B. 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.
 - 2. Flame Resistance: NFPA 262 Flame Test.
 - C. Plenum Rated, 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.
 - D. 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.
 - 2. Flame Resistance: NFPA 262 Flame Test.
 - E. 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.
 - F. 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.
 - G. 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.
 - H. 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.
 - 2. Flame Resistance: NFPA 262 Flame Test.
 - I. 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.
 - 2. Flame Resistance: NFPA 262 Flame Test.
 - J. 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.
 - K. 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.
 - 2. Flame Resistance: NFPA 262 Flame Test.
 - L. 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.
- M. 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.
 2. Flame Resistance: NFPA 262 Flame Test.
- N. 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.
 2. Flame Resistance: UL 1666 Riser Flame Test.
- O. 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.
 2. Flame Resistance: NFPA 262 Flame Test.
- P. 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.
- Q. 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.
 2. Flame Resistance: NFPA 262 Flame Test.
- R. 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.
 - a. Jute Filler: Electrical grade, dry.
 - b. Binder: Helically wound synthetic fiber.
 - 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.

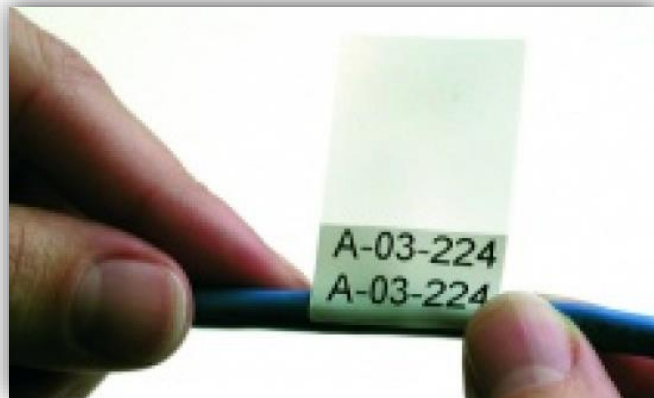
3.02 PREPARATION

- 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. Install all cabling required for complete system connectivity. Cabling shall be plenum rated.
2. Care shall be taken to avoid crimping or bending the cable past the manufacturer's recommended bend radius.
3. 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.
4. Adhere to all pulling tensions and bend radii during installation.
5. All cables shall route neatly in the ceiling. Whether they route in cable tray or J-hooks, the cables shall be neat and orderly.
6. Support cables at a minimum of every 5 feet.
7. 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.
8. 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.
9. When installing cables in the communications room, all cable shall route neatly through the cable tray and cable ladder.
10. Provide a service loop of the cables on the wallfield.
11. 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.



12.
 - 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.
 4. Firestop as per AHJ requirements.
 - 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. Provide 5' minimum in the coil for future movement of the panel.
 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.

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 or browser-based links on up to 5 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 200 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.
 - 6) Create user groups within the system.
 - 7) Enter each user in any owner dictated group
 - b. Number each door and any input and outputs associated with that door 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) Door Groups for access and locking and unlocking schedules.
 - 4) Building locking and unlocking schedules for each building
 - 5) Administrative levels and super administrators
 - 6) 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.
 - 7) Snow-Day override schedule that shall change when doors unlock and lock and which users or user groups are allowed to access the building during a snow day. Snow day shall revert back to regular scheduling after 11 PM that day.
 - 8) Setup all user logins to allow specific viewing of portions of the system based on login ID.
 - A) Detail in the setup that persons rights in working in the system.
- d. Lockdowns and Secure
 - 1) Create different locking schedules and processes for Lockdowns and Secure situations.
 - 2) Work with the owner to determine what doors are locked or unlocked in a lockdown or secure situation.
 - 3) Make all settings and groups required for each situation.
- e. 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.
- f. 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. Enclosure and power
 - 1. Contractor shall mount the enclosure on top of ¾" fireproof plywood.
 - 2. Mount enclosure in the location noted. Coordinate other equipment and wallfield systems.
 - 3. Locate the 120 volt power outlet and install enclosure in relation to power
 - 4. Size the enclosure to support all PACS devices noted on the drawings and in the specifications.
 - 5. Provide magnetic cable support devices in the panel to route cables inside the panel to the controllers and power devices
 - 6. Power.
 - a. Install cabling and raceway to connect the power supply in the enclosure to the 120 volt power outlet.
 - b. Shall be hard-wired power. Plug-in power is not allowed
 - c. Provide an electrician for connection of the power supplies if required by AHJ.
 - 7. Battery backup
 - a. Provide and connect the batteries to the power supply for the enclosure
 - b. Test the battery supports the panel by removing 120 volt power after the system is fully up and operational.

8. Network connectivity
 - a. Provide and install CAT-6 cable from the enclosure for the power supply to the communications rack. Connect to the Ethernet switch
 9. Other Controllers and I/O Board connectivity.
 - a. Provide and install cabling to connect the Ethernet controller to the other controllers and I/O boards via RS-485.
 - b. Do not install RS-485 between communications rooms. Each comm room shall have an Ethernet attached Controller.
- B. Controller:
1. Controller(s). shall be mounted in the enclosure as shown on the drawings.
 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/buildings 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. Label the outside of the panel with the door numbers and list of devices that are connected in that panel. Shall be laser printed adhesive labels.
 6. Label the inside of the panel door with the layout of the panel and which controllers attach to which devices. Include door numbers on the diagram.
 7. 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. Cabling shall be neatly bundled. See example below of adequate cabling being routed into a panel.
 8. Network connectivity
 - a. Provide and install CAT-6 cable from the controller to the communications rack. Connect to the Ethernet switch
 - b. Connect on the Ethernet to the Switch.
- C. Fire Alarm integration "FA"
1. Wire from the enclosure/controller to the Fire Alarm system
 2. Provide all cabling and i/o ports to accept inputs from the fire alarm or trigger the fire alarm panel.
 3. Work with the fire alarm provider to support integration between the PACS and Fire alarm. That may include:
 - a. Release of Hold opens for doors in a lockdown
 - b. Release of magnetic locks during a fire alarm event
 - c. Release of electronic locks during a fire alarm event.
 - d. Others as defined by the owner.



- e.
- f. Typical routing and cable organization in an access control panel.
- g. Route all cables along a central path.
- h. Label the cables as they enter the panel for the door to which they connect.
- i. Support cables along the backplate
- j. Label all interconnection cables with wrap-around labels that detail what they connect to.

3.06 DOOR LOCKINCONNECTIVITY

- A. Electric Strike "ES" on drawings
 - 1. The note devices shall be installed by the door hardware contractor.
 - 2. Power supplies shall be located in the comm room. Provide and install power supplies. Connect power supplies to the controller panel.
 - 3. Install all cables required to be connected this device to the security system
 - 4. Review door hardware specifications to determine if a wiring harness is being provided 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 from security panel to 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.
- B. Latch Retraction device. "LR" on drawings
 - 1. The Latch Retraction devices shall be provided by the door hardware supplier.
 - 2. Power supplies shall be located in the comm room. Provide and install power supplies. Connect power supplies to the controller panel.

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 LR device, thru the hinge, to the power supply controller and finally to the security panel.

3.07 READER 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.
 - a. Conduct a site visit prior to ordering card readers.
 - b. If the wrong reader is ordered then the contractor shall provide the correct reader.
 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. Wire and configure the card readers so that when the lock is engaged the light on the reader is red and when the door is unlocked the light is green.
 7. Garage Doors and Pedestals: At the garage doors and at pedestals the card readers shall be installed with a box that has a cover for the top of the card reader.

3.08 DEVICES AT THE DOOR

- A. Door Contacts "DC" and Garage contacts "GC":
 1. Install contacts where shown on the drawings. For door contacts, install them at the top of the door.
 2. Work with door provider and installer on timing of door contact installation.
 3. Install raceways to allow installation of the door contacts if no raceway is provided inside the wall.
 4. Drill into the door frame and door to allow installation of the door contact and the associated cable. No cable shall be visible after installation.
 5. Where door frames are filled, they shall be drilled out to allow installation of the door contact. Surface mount contacts are not allowed unless specifically noted on the drawings.
- B. Motion Request to Exit devices: "MX" on drawings
 1. Where shown on the drawings install a passive infrared motion-based request to exit device.
 2. Associate this with one or more doors so that when it senses motion it shunts the door contact.
 3. Wire this back to the panels in the comm. rooms.
 4. Install above the door.
- C. Request to Exit Devices "RX" on drawings
 1. When the RX is shown, wire from this device in the lock/pushbar, back to the controller in the comm room.
 2. Set this up to shunts the door contact when triggered.
- D. Embarrassment Alarm, "EA". Shall be mounted to the wall or ceiling. Determine at location in the field.
 1. Provide raceway and backbox for the alarm.

2. Wire to the security systems. This alarm shall engage for a set length of time when the lockdown button is pressed.
 3. Set the owner requested length of time. Test that the alarm goes off either when the contact is re-engaged or the time expires.
- E. Door Release "DR" and Release Button "RB"
1. The door release is meant to release a magnetic lock when exiting from a secure side to an unsecure side.
 - a. Wire back to the PACS and configure to unlock the door.
 2. The Release Button is meant to release an electronic lock when entering from the secure side to the other side of the door.
 - a. Wire back to the PACS and configure to unlock the door.
 - b. Work with the owner to set a schedule to when this RB can be engaged and when it will not operate. Such time may be after hours or during a lockdown.
- F. Door Position switch. "DP"
1. Wire back to the access control system.
 2. Configure the system to note and use the position of the door to allow or disallow different events
 3. Work with the owner on configuring the system to act, alarm or not allow something based on the door position switch state.
- G. Wave Switch
1. Install the wave, no-touch switch where noted. Mount to a single-gang box.
 2. Weather-proof around plate
 3. Connect to the security system and set to work during times when the owner wants the switch to be active
 4. Configure the switch to trigger an output as per direction by the owner or as noted on the drawings.

3.09 ASSISTED OPENER FOR ADA

- A. Assisted Opener: "AO" and assisted button "AB" on drawings
1. Where an assisted opener is shown the contractor shall wire to this opener and associated opener buttons ("AB") to work as noted on the drawings and as below:
 2. Operation sequence when the doors are locked entering from outside -valid id card
 - a. If the person presents a valid card then the latch shall retract inside the exterior door.
 - b. The door shall hold unlocked for 15 seconds.
 - c. The control board shall allow the exterior push button to be energized. Once the push button is energized then the exterior door shall be opened if the button is pushed.
 3. Operation sequence when the doors are unlocked entering from outside
 - a. Push the ADA button Exterior door opens
 4. Operation sequence when the doors are locked entering from outside -no card or invalid card
 - a. If the person pushes the exterior opener button, then the auto opener shall not engage because the opener button is not energized.
 - b. The exterior opener button is not energized unless the PACS notes that the door is unlocked.
 5. Operation sequence when the doors are locked, exiting from interior
 - a. When a person pushes the interior opener button then that shall communicate with the interior auto opener and open that door.
 - b. The control board of the auto opener shall communicate with the access control system and instruct it to retract the latch on the interior door.
 6. Operation sequence when the doors are locked, exiting from vestibule
 - a. When a person pushes the vestibule opener button then that shall communicate with the exterior auto opener and open that door.
 - b. The control board of the exterior auto opener shall communicate with the access control system and instruct it to retract the latch on the exterior door.

3.10 ALARM DEVICES

- A. The contractor shall connect the alarm devices to the PACS
- B. PACS shall take input from the alarm devices and trigger an output or event. Work with the owner to setup the event or output.
 - 1. Output may be one of the following:
 - a. Trigger of a light or strobe
 - b. SMS message output
 - c. Email message to owner defined group of users.
 - d. Output to an alarm system.
- C. Motion sensors "MS" and "MT"
 - 1. Install motion sensors as shown on the drawings. These are to monitor areas in the buildings when the system is armed.
 - 2. Provide cabling and mounts for each Motion sensor
 - 3. Locate each motion sensor to best support the monitoring of the general area where installed.
 - 4. Test motion sensing area and document test.
- D. Glass Break "BK"
 - 1. Install glass break sensors as noted on the drawings.
 - 2. Install based on manufacturers recommendations. Wire to PACS controller
 - a. Where multiple glass break sensors are located in close proximity to each other, they must be wired to a nearby centrally located junction box.
 - b. The glass break sensors must be wired in series with each other to said junction box with a single cable pair wired to the access control/intrusion detection system.
- E. Testing
 - 1. Fully test alarming and outputs of the system with the owners SMS and Email systems and/or the owner's security office.
 - 2. Test interaction with the access control system where they are connected.

3.11 FIELD DEVICES.

- A. These devices shall be connected to the PACS and shall provide inputs or act upon outputs to accomplish their tasks.
- B. Wire from each of these devices to the PACS
- C. Configure each device as an input or receiver of an output.
- D. Test each device.
- E. Contact Closure "CC" or Security Contact "SC"
 - 1. This shall be either an input or output
 - 2. Use this connection to trigger the system at the other end or receive a trigger or contact closure from the other device.
 - 3. An input may set in motion multiple outputs. Configure each as per the owner's requirements.
- F. Doorbell "DB"
 - 1. Install the pushbutton at the door
 - 2. Wire back to the sounder
 - 3. Install the sounder at the location noted.
 - 4. Provide power from the PACS to the sounder
 - 5. Connect button to the sounder.
- G. Key Switch "KS"
 - 1. Mount the key switch in a backbox. Provide the faceplate
 - 2. This shall turn something on or off thru the PACS or may be used to momentarily reset a device. Configure as per the owner's needs.
- H. Strobes
 - 1. The strobes shall light and possibly flash based on the status in the PACS
 - 2. Install interior strobes to the ceiling or wall as directed.
 - 3. Set the strobes to trigger for set length of time of until turned off based on an input to the PACS

3.12 DEVICES AT THE OPERATOR DESK

- A. These devices shall be connected to the PACS and shall provide inputs to the system. Setup actions that occur after the device initiates a trigger to the PACS.
 - 1. Work with the owner and configure the system to initiate or stop any devices based on the input from the device.
- B. Wire from each of these devices to the PACS
- C. Test each device.
- D. Toggle Switch: "TS", Push Button "PB, Panic Device "PD" and Desktop Console "CO" Lockdown button "LD"
 - 1. Wire each button and each light if so equipped
 - 2. Provide the correct cable to support full use of the button or switch or control of the LED light
 - 3. Install the toggle switch on the desk or under the desk.
 - a. Mount to a backbox with blank stainless steel plate if it is not possible to mount directly to a desk.
 - 4. Mount each device to the furniture at location identified by owner.
 - 5. 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.
 - 6. Meet with owner to discuss how buttons shall be configured.
 - 7. Lockdown button shall have a light and it shall be lit when the system is in "LOCKDOWN". When the lockdown button is reset the light shall go out and the entire system shall return to regular schedule.

3.13 AUTOMOBILE GATE DEVICES

- A. Long Range Reader "LR"
 - 1. The Long Range Reader shall be mounted from a pole or from the wall of the building.
 - 2. Configure the reader to read just from one lane of traffic.
 - 3. Connect the LRr with outdoor rated cabling. Wire back to the PACS
 - 4. Provide a manufacturer's mount or a custom mount to point the reader at the location where the bus will pass by.
 - 5. Install the reader at a location and height where the Car Tag will not hit the reader.
- B. Car Tag
 - 1. Work with the owner to determine the ID numbers of the Car Tags.
 - 2. Enter all data for car tags into the access control system database and assign a vehicle name or number to each tag.
 - 3. Owner to install car tags on the vehicles
 - 4. Generate a custom report that the owner can generate that shows which buses are in the garage and which buses are out of the garage.
- C. Pedestal
 - 1. Pour a concrete pad for the pedestal.
 - 2. Route conduits into the base of the pedestal.
 - 3. Set the height of the head of the pedestal so that it is accessible from cars or trucks.
 - 4. Custom cut the box at the head of the pedestal so that it accepts the card reader and other equipment.
 - 5. Locate the pedestal so that it can be accessed when driving up to the pedestal.

3.14 INTERCOMS AT THE DOORS

- A. IP Intercoms
 - 1. Intercom at the door shall be installed based on the type chosen and specified in specs and drawings.
 - 2. Where the Intercom is surface mounted.
 - a. Surface mounted units shall be connected to the interior of the building with a conduit and steel backbox.
 - b. Where possible route the cables through the door or wall framing and extend to the intercom.
 - c. Install raceway from bottom of intercom to lower pushbutton.
 - d. Ensure installation of lower button to meet ADA requirements

3. Flush-mounted intercoms
 - a. Provide and install the custom backbox at the intercom location.
 - b. Provide notice to electrician to allow them to install conduits to accessible ceiling.
 - c. Review and ensure raceway from bottom of intercom to lower pushbutton is installed.
 - d. Ensure installation of lower button to meet ADA requirements
4. Wire the lower pushbutton to the intercom to support initiation of an intercom call
5. The intercom device shall be located at a place where it is accessible and where it can be mounted to see the person calling.
 - a. Camera shall be positioned to cover the maximum area possible.
 - b. Install a connection cable from the exterior interface to the interior unit and door lock.
 - c. Install any baluns, adapters, or other devices required to send the signal from the exterior intercom to the network.
 - d. Provide CAT-6 patch cables
6. IP Programmable Relay.
 - a. This device shall be mounted in the main communications room.
 - b. Connect to the Ethernet network with appropriate CAT-6 cabling
 - c. Connect to the controllers to allow the base station to unlock the associated door.
 - d. Integrate so that the base station only controls the door that the call was initiated from.
7. Base stations shall be located as shown on the drawings.
 - a. The devices shall be configured to allow the Owner to unlock the door when a person calls in and is determined to be acceptable for entry.
 - b. The master control devices shall interface with the access control system through the IP Programmable relay to interrupt any alarms and momentarily unlock the door.
 - c. Configure they device to allow the user to determine which door the call is coming from and then unlock only that door.
 - d. Provide all cabling and other equipment required to connect the base station to the Ethernet network. CAT-6 cable, Plenum Rated.

END OF SECTION

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. Genetec
 - 2. Milestone
 - 3. Avigilon
 - 4. Digital Watchdog
 - 5. Hanwha
- 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 SYSTEM SECURITY HARDENING.

- A. Security for video security systems is something that is extremely important for today's system.
- B. Contractor shall implement and configure the system and cameras with owner and designer to implement hardening of the system.
 - 1. Implement all cyber security aspects and equipment to work towards network security of the video security system and to minimize any denial of service or malware/virus activity on the security system
- C. Contractor shall implement the VMS with recommended configurations to support maximum network and system security. This work shall include but not be limited to:
 - 1. Run components on dedicated virtual or physical servers.
 - a. All video security services shall be installed and run the VMS only on dedicated virtual or physical servers without any other software or services installed.
- D. Mobile Server
 - 1. Only enable ports that the VMS Mobile server uses.
 - 2. Use a "demilitarized zone" (DMZ) to provide external access.
 - a. Work to setup the Mobile server in a DMZ, and on a computer with two network interfaces:
 - A) | One for internal communication
 - B) | One for public Internet access
 - b. This allows mobile client users to connect to the Mobile server with a public IP address, without compromising the security or availability of the VMS network.

2.03 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 8 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) 4 users viewing 16 cameras each
 - 5) 5 users viewing cameras through a wireless smartphone or tablet device. Provide additional server if this is a requirement of the software.
 - C) Throughput shall be calculated at maximum camera resolution of the specified cameras. Any spare throughput required shall be calculated for cameras at 3840x2160.
 - 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 3840x2160.
 - F) Include storage 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 One (1) 10 Gigabit Ethernet connection(s) via an RJ-45 copper or Fiber Optic type interface. Verify prior to ordering servers.
 - a. If the interface is a fiber Optic connection then provide the equal SFP module for the Ethernet switch that is being used to connect the Ethernet Switch
- 12. The NVR shall be 19 inches rack mountable.
- 13. Where multiple servers are provided the contractor shall provide a KVM switch and rack mounted LCD and keyboard.
 - a. Provide one, (1), TRIPP LITE #B020-008-17
- 14. 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.
- 15. Servers shall be from the following manufacturers
 - a. Hewlett Packard
 - b. Dell
 - c. Manufacturer of VMS Software
- 16. 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.

2.04 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.
 - 4. Cord Length: 6 feet (1.83 meters).
 - 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.
 4. Crest Factor: Up to 5:1.
 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.
- 2.05 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
 - g. Export of tamper evident video on recordable CD's or DVD's.
 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 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.
 8. 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.

9. 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.
10. User shall be able to print still images directly to a printer from the NVR or remote user's terminal.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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 liason 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 Middle School 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.

END OF SECTION

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 MANUFACTURERS

- A. Approved Manufacturers for IP cameras:
 - 1. Axis
 - 2. Hanwha
 - 3. Bosch
 - 4. Avigilon
 - 5. Digital Watchdog

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 the 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 -1080P RESOLUTION OR BETTER

A. Interior/exterior fixed IP dome camera: 1920X1080 Resolution (2 Megapixel). Color/Black and White

1. Camera shall be capable of the following:
 - a. Plenum-rated backbox for indoor installations
 - 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 802.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. Outdoor version shall be -40F to 149F
2. Compression shall be H.264, H.265 or Motion JPEG.
3. Camera/lens shall meet or exceed the following requirements:
 - a. 1 /2.8 inch progressive Scan RGB CMOS.
 - b. Picture element that is 1920 (H). x 1080 (V)
 - c. Remote electronic varifocal lens with Remote zoom and focus
 - d. Auto Iris
 - e. Wide dynamic range
 - f. Light sensitivity of .1 lux for Color, .02 lux for black and white. Lens shall automatically flip based on light input.
 - g. Horizontal field of view of 100 deg. To 36 deg.
4. Interior Fixed IP day/night Dome Camera shall be Axis #P3265-V or equal.
5. Exterior Fixed IP day/night Dome Camera shall be Axis #P3265-VE or equal.

2.04 CAMERAS DUAL SENSOR, BACK-TO-BACK -HALLWAY

A. Outdoor, multi-sensor fixed IP dome camera with configurable coverage:

1. Combined resolution of 4 MP. Qty of two, (2) 1920x1080 sensors. Color camera
2. Camera shall be capable of the following:
 - a. Wall or ceiling mount.
 - b. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
 - c. Dome shall be clear.
 - d. Power through PoE 802.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 30 frames per second at all camera resolutions
 - h. Multiple windows for images. Images shall be de-warped in each window.
 - i. Settings for back to back hallway viewing
 - j. Outdoor Rated: -30 °C to 50 °C (-22 °F to 122 °F)
3. Compression shall be H.265
4. Camera/lens shall meet or exceed the following requirements:

- a. Picture element Qty of two, (2) 1920x1080 sensors
 - b. Light sensitivity of .17 lux for Color, 0 lux for Black/white
 - c. Included IR blaster
 - d. UL listed.
5. Interior/Exterior Fixed IP day/night Dome with two imagers. Camera shall be Axis #P3715-PLVE or equal.

2.05 CAMERAS -5 MEGAPIXELS OR ABOVE RESOLUTION

- A. Exterior fixed IP dome camera: 2592x1944 Resolution (5 Megapixel). Color/Black and White
- 1. Camera shall be capable of the following:
 - a. Exterior-rated backbox
 - b. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
 - c. Dome shall be clear.
 - d. Power through PoE 802.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 30 frames per second at maximum camera resolution. 30 FPS at 3072x1728 resolution.
 - h. Internal Video buffer of 1GB
 - 2. Be manufactured with an all-metal body, vandal resistant casing and support operation between -40 to +55°C (-40 to +122°F) and be both IP66 and NEMA 4X-rated.
 - 3. IK10 Rated
 - 4. Compression shall be H.264, H.265 and Motion JPEG.
 - 5. Camera/lens shall meet or exceed the following requirements:
 - a. 1.27" Progressive Scan
 - b. Varifocal lens with Remote zoom and focus
 - c. Auto Iris
 - d. Light sensitivity of .13 lux for Color, .0 lux for black and white. Lens shall automatically flip based on light input.
 - e. Provide the correct lens for the installation based on field of view as desired by the owner.
 - f. Shall have settings for wide dynamic range and dynamic contrast.
 - g. UL listed.
 - 6. Exterior Fixed IP day/night Dome Camera shall be Axis #P3267-LVE or equal.

2.06 CAMERAS 4K RESOLUTION

- A. Exterior fixed IP dome camera: 3840x2160 Resolution (4k). Color/Black and White
- 1. Camera shall be capable of the following:
 - a. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
 - b. Dome shall be clear.
 - c. Power through PoE 802.af
 - d. Network interface via an 8-pin RJ-45 connector.
 - e. Compatible with the Video Recording System
 - f. Minimum frame rate capability shall be 25 frames per second at maximum camera resolution. 30 FPS at 3840x2160 resolution.
 - g. Internal Video buffer of 1 Gigabit
 - 2. Be manufactured with an all-metal body, vandal resistant casing and support operation between -40 to +5°C (-40 to +122°F) and be both IP66 and NEMA 4X-rated.
 - 3. Compression shall be H.264, or H.265
 - 4. Camera/lens shall meet or exceed the following requirements:
 - a. Picture element that is 3840 (H). x 2160 (V)
 - b. Have electronic Varifocal lens with Remote zoom and focus
 - c. Auto Iris
 - d. Light sensitivity of .19 lux for Color, .04 lux for black and white. Lens shall automatically flip based on light input.
 - e. Provide the correct lens for the installation based on field of view as desired by the owner.

- f. Shall have settings for wide dynamic range and dynamic contrast.
 - g. UL listed.
5. Exterior Fixed, 4K IP day/night Dome Camera shall be Axis #P3268-LVE or equal.

2.07 CAMERAS 360 DEGREE VIEW-SINGLE IMAGER

- A. Interior, fixed IP dome camera with 180/360 Degree coverage:
 - 1. 12-megapixel, (2880x2880) resolution. Color and Black/White camera
 - a. Camera shall be capable of the following:
 - 1) Dome shall be clear.
 - 2) Surface mount vertically or horizontally
 - 3) Where installed into a drop ceiling provide a recessed ceiling mount.
 - 4) Power through PoE 802.af
 - 5) Network interface via an 8-pin RJ-45 connector.
 - 6) Compatible with the Video Recording System
 - 7) Minimum frame rate capability shall be 15 frames per second at all camera resolutions
 - 8) Camera shall support multiple windows for images with the overall image
 - a) Images shall be de-warped in each window.
 - 9) Settings for 360 view or multiple de-warped views.
 - 10) All image shall be able to be dewarped for live viewing and viewing of recorded video. Overall image shall always be present and recorded.
 - b. Compression shall be H.264 or H.265
 - c. Indoor rated: 0 °C to 0 °C (32 °F to 113 °F)
 - d. Camera/lens shall meet or exceed the following requirements:
 - 1) Picture element that is 2880 (H). x 2880 (V)
 - 2) Light sensitivity of .32 lux for Color, .06 lux for B/W
 - 3) UL listed.
 - e. Interior Fixed IP day/night Dome 180/360 Camera, 12 MP shall be Axis #M3068-P or equal.

2.08 CAMERAS 180 DEGREE VIEW-MULTIPLE SENSOR

- A. Indoor and Outdoor, multi-sensor fixed IP dome camera with aimable coverage
 - 1. Combined resolution of 8 MP. Qty of four, (4) sensors. Color camera
 - a. 180 degrees horizontal by 90 degrees vertical
 - 2. Camera shall be capable of the following:
 - a. Dome shall be clear.
 - b. Surface mount vertically or horizontally
 - c. Where installed into a drop ceiling provide a recessed ceiling mount.
 - d. Back to back mounting for 360 degree coverage
 - e. Power through PoE 802.af
 - f. Network interface via an 8-pin RJ-45 connector.
 - g. Compatible with the Video Recording System
 - h. Minimum frame rate capability shall be 12 frames per second at all camera resolutions
 - i. Multiple windows for images. Images shall be de-warped in each window.
 - j. Outdoor Rated: -30 °C to 50 °C (-22 °F to 122 °F)
 - 3. Compression shall be H.264
 - 4. Camera/lens shall meet or exceed the following requirements:
 - a. Picture element that is 4320 (H). x 1920 (V)
 - b. Light sensitivity of .17 lux for Color, .05 lux for B/W
 - c. UL listed.
 - 5. Interior/Exterior Fixed IP day/night Dome 180 degree Camera shall be Axis #P3807-PVE or equal.

2.09 CAMERAS 360/270 DEGREE VIEW-MULTIPLE SENSOR

- A. Outdoor, multi-sensor fixed IP dome camera with configurable coverage:
 - 1. Combined resolution of 8 MP. Qty of four, (4) 1920x1080 sensors. Color camera

2. Camera shall be capable of the following:
 - a. Wall, pole or corner mount.
 - b. Adjustable fixed camera mounting bracket that allows 360 degree mounting.
 - c. Dome shall be clear.
 - d. Power through PoE 802.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 12 frames per second at all camera resolutions
 - h. Multiple windows for images. Images shall be de-warped in each window.
 - i. Settings for 360 degree view or 270 degree view with downward pointing fourth imager
 - j. Outdoor Rated: -30 °C to 50 °C (-22 °F to 122 °F)
3. Compression shall be H.264
4. Camera/lens shall meet or exceed the following requirements:
 - a. Picture element Qty of four, (4) 1920x1080 sensors
 - b. Light sensitivity of .17 lux for Color, 0 lux for Black/white
 - c. Included IR blaster
 - d. UL listed.
5. Interior/Exterior Fixed IP day/night Dome 360/270 degree Camera shall be Axis #P3727-PLE or equal.

2.10 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.
 - 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.
 5. 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.
 - a. J-hooks shall provide a smooth steel support for cables as they route through the ceiling.
 - b. Each hook shall have a galvanized finish.
 - c. Steel, UL listed, ultimate static load limit 50 pounds, rated to support Category-3 and higher cables, and optical fiber cables.
 - C. 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.
- 2.11 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.

END OF SECTION

SECTION 28 7200 – TECHNOLOGY SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 PRE-INSTALLATION SUBMITTALS

- A. The contractor shall provide material submittals to the Construction Manager or directly to the designer, whichever is managing the project.
- B. Prior to beginning work, the chosen Contractor shall provide PDF files of all material submittals.
 - 1. Highlight the part number of each item specifically. Submittals that are not highlighted will be rejected and sent back immediately.
 - 2. Match camera submittals with the camera type on the drawings. see Security Equipment Schedule on TC501. Provide marking on the PDF File detailing which camera type is being submitted.
 - 3. Provide the PDF with the following file names
 - a. Site - Spec Section - Description
 - b. In Example: **Kent City 28 1600: Data Cabling submittal**

1.03 AS-BUILT DOCUMENTATION

- A. The contractor shall provide As-Built documentation to the Construction Manager or directly to the designer, whichever is managing the project.
- B. Provide the As-Built in hard and soft copy
 - 1. Hard Copy shall include all Red-lined Drawings showing what was actually installed and where it was installed.
 - 2. Soft copy on USB Drives (PDF or Microsoft Word or Excel) shall include all documents provided in the hard copy plus any configuration or data files. Include XLS files for all spreadsheets.

PART 2 - PRE-INSTALLATION SUBMITTALS

2.01 PRODUCT DATA SHEETS

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

- D. Provide a PDF of all the Equipment being submitted. Each actual part number shall be highlighted on the PDF in yellow.
 - 1. Group Product Data Sheets by:
 - a. Data Cabling
 - b. Access Control
 - c. Video Security

2.02 SHOP DRAWINGS

- A. Shop Drawings shall consist of detailed drawings showing actual connectivity, equipment to be installed and cable types for the systems noted below:
 - 1. 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 Files for all Product Data Sheets.
 - 1. All Product Data sheets shall be PDF files grouped as shown in 2.01/D
 - 2. The Contractor shall highlight the actual part number on the sheet of the component that they are submitting.
 - 3. If no part number is highlighted or marked with an arrow, then the entire submittal package will be rejected and sent back for re-submission.
- C. The Contractor shall provide 1 set of PDF of Shop Drawings.
 - 1. Shop drawings shall be marked for the specification section of the bid documents to which they pertain. Mark the Detail (TCXXX/Y) to which the Shop Drawing refers.
 - 2. All shop drawings that are required to be drawn on the building background shall be provided on full-size drawings the same scale as those in the bid documents.
 - 3. All lines on the shop drawings shall be highlighted or completed in ink that is not the same color as that provided in the bid documents.
 - 4. The contractor shall provide a drawing legend detailing all symbols used in creation of the shop drawings.
- D. The Contractor shall provide one of each product sample required to be submitted.
 - 1. Provide a cutsheet with each product sample detailing the specifics of the product and what it is proposed to be used for.

2.05 SUBMITTAL REQUIREMENTS

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

PART 3 - AS-BUILT DOCUMENTATION

3.01 MATERIALS

- A. The Contractor shall provide the following to the Designer prior to the issuance of the final payment.
 - 1. Approved submittals and equipment user manuals.
 - 2. As-Built Documentation as detailed below.
 - 3. All spare parts and cover plates for all components of the systems
 - 4. Manufacturer warranty cards for all components.

3.02 AS-BUILT PROCESS

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

3.03 PREPARATION

- A. All documents for As-Builts and test results shall be neat and clearly labeled with listing of the project and documents included in each binder.
- B. Quantity:
 - 1. Submit Red Lined, As-Built floorplans for the Systems detailed in 3.04/D.
 - a. Provide one set of physical documents, full size,
 - b. Provide PDF Scans of the As Built Floorplans.
 - 2. Submit Electronic files for As-Built Documentation
 - a. Provide PDF Files. Provide a Coversheet that details:
 - A) Client name.
 - B) Project name.
 - C) Manual title (e.g., "Project Close-out Manual for security system upgrade").
 - D) Date; date format: <month> <day>, <year> (e.g., "January 1, 20xx").
 - E) Installer and General Contractor names and contact information
 - F) Warranty contacts for all systems.
 - b. Submit Electronic files to Owner, Designer and Construction Manager via email or dropbox or directly through USB Drives.
 - 3. Submit (2) USB Drives with all As-Built documentation and software configurations.
 - a. Software configurations shall be provided for:
 - A) Video security NVR and camera/user database
 - B) Access control system configuration and database

3.04 PROJECT DELIVERABLES

- A. Provide a copy of all submittals and manuals and pamphlets.
- B. Provide a copy of all Warranty documents and contact numbers for Warranty requests.
- C. The contractor shall provide one set of full sized as-built prints. Provide a PDF of the as-built prints on the USB drives or via Email or Dropbox.
 - 1. Provide a clean set of the latest drawings with red lines marked for all field changes or bulletins. See above for systems to be included on the As-Built prints
- 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

SECTION 28 7600 – TECHNOLOGY LABELING

PART 1 - GENERAL

1.01 WORK INCLUDED

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

PART 2 - PRODUCTS

2.01 CABLE LABELING PRODUCTS INTERIOR

- A. 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.

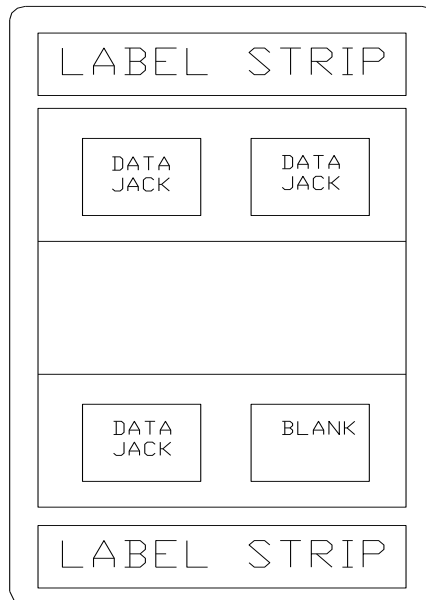
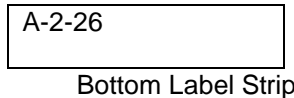
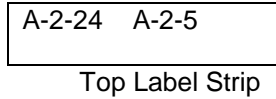
2. The cable label shall be similar to the label below:

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:



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.

Panel A	01	02	03	04	05	06	07	08	09	10	11	Panel A

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.

Panel A	01	02	03	04	05	06	07	08	09	10	11	Panel A
	101	102	107	108	201	105	208	145	146	147	174	

- 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

Security panel	IP address 111.111.10.112
Panel 04	Comm room XXX

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.

END OF SECTION

SECTION 28 7700 – TECHNOLOGY TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

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

PART 2 - PRODUCTS

2.01 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.

END OF SECTION

SECTION 28 7750 – TECHNOLOGY TRAINING

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 SYSTEM DESCRIPTION

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

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 GENERAL TRAINING REQUIREMENTS

- A. The Contractor shall provide training on all systems installed or upgraded as part of the contract.
 - 1. The Contractor shall involve the personnel from the Owner's office in the implementation and configuration of the systems.
 - 2. Prior to the cutover of the system, the Contractor shall work with the Owner on the training that will be provided. The Owner and the Contractor shall schedule the training at a time beneficial to both.
 - 3. Each system is to have training provided as part of the installation.
 - 4. Each training session shall include.
 - a. This training will give an overview of the capabilities of each system, and the methods to be employed in utilizing the system.
 - b. The Contractor shall provide a syllabus detailing what will be discussed at the training, and notes for the Owner to refer to during the life of the system. The notes shall list directions for general use of the system and possible fixes to general issues that could occur.
 - c. Training shall include as-built diagrams of the connectivity, a walk-thru of the system, a demonstration of actual user interface with the system, and directions on its general use.
 - d. This training is only meant to give an overview of each system. In depth training shall be provided for an in-depth analysis of certain systems as described below.
 - 5. For all training, the Contractor shall pay all expenses.
- B. Create cheat sheets for all systems that the users can keep after the training.
 - 1. Cheat sheet shall include details on how to use the system.
 - 2. A copy of the cheat sheet shall be laminated and installed at the system location.
 - 3. For individual training the contractor shall provide a cheat sheet for each person being trained.
 - 4. Cheat sheet shall be laminated.
 - 5. Provide a cheat sheet in each classroom or conference room.
 - 6. Submit these for approval to the designer and owner prior to training. Have the cheat sheets at the training.

3.02 DATA CABLING TRAINING

3.03 VIDEO SECURITY 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. The training shall include two separate training tracks:
 - a. Configuration Training of the Administrators of the Video security system
 - b. General 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. Configuration Training: Video Security
 - 1. A minimum of 10 hours of training shall be provided on the configuration of the video security system to minimum of 4 of the Owner's representatives.
 - a. This training will give an overview of the capabilities of the system, and the methods to be employed in utilizing the systems.
 - 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 systems. The notes shall list directions for general use of the system and possible fixes to general issues that could occur.
 - c. 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) Configuring the cameras including frame rates, resolution etc.
 - F) Changing number of images per camera/per second.
 - G) Setting passwords and levels of security. Adding user accounts.
 - H) Adding and changing parameters on the maps.
 - I) Setting integration of the video security and access control.
 - J) Setting schedules of the access control system and interoperations
 - d. The training shall be provided on the schedule below.
 - 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 formal class to review how the system works and allow the owner to ask questions and the contractor shall be available to make changes and discuss implementation questions.
 - 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. Work with the owner prior to the class to identify specific items that should be included in the training.
 - D) Training 4. Training shall occur three months after Final Completion. This shall be an opportunity for the contractor to update any software and shall include training on any procedures the owner feels they need more information on.
 - E) 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.

- C. General User training:
1. This training shall be for users of the system such as principals, secretary's and administrators.
 2. The goal of the training is to allow the users to become familiar on 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 8 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. 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) Training 4. Training shall occur three months after Final Completion. This shall be an opportunity for the contractor to update any software and shall include training on any procedures the owner feels they need more information on.
 - E) 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.

3.04 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 access control system.
 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. The training shall include two separate training tracks:
 - a. Configuration Training of the Administrators of the Video security system
 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. Configuration Training: Access Control and Video Security

1. A minimum of 16 hours of training shall be provided on the configuration of the Access control and video security system to minimum of 4 of the Owner's representatives.
 - a. This training will give an overview of the capabilities of the systems, and the methods to be employed in utilizing the systems.
 - 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 systems. The notes shall list directions for general use of the system and possible fixes to general issues that could occur.
 - c. 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) Adding users and removing users as administrators and as employees.
 - E) Setting alarms and time schedules for buildings to be alarmed.
 - F) Responding to alarms and clearing the system of faults.
 - G) Identifying the physical location of a control card in a security panel.
 - H) Adding and changing parameters and icons on the maps.
 - I) Setting integration of the video security and access control.
 - J) Use and management of the snow day button and lockdown button.
 - d. The training shall be provided on the schedule below.
 - 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 formal class to review how the system works and allow the owner to ask questions and the contractor shall be available to make changes and discuss implementation questions.
 - 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. Work with the owner prior to the class to identify specific items that should be included in the training.
 - D) Training 4. Training shall occur three months after Final Completion. This shall be an opportunity for the contractor to update any software and shall include training on any procedures the owner feels they need more information on.
 - E) 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

SECTION 28 7800 – TECHNOLOGY WARRANTY

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 SYSTEM DESCRIPTION

- A. The project is not complete until all paperwork has been provided.

1.03 COORDINATION

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

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 MATERIALS

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

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall fully examine all components of the system to make sure that all manuals and paperwork are included in the final submittal.
- B. Examine all equipment and cabling to ensure that it is labeled as per the drawings and specifications.

3.02 GENERAL WARRANTY

- A. Warranty Period shall be 1 years after a signed copy of Substantial Completion. This shall be the Warranty Period.
- B. See further specifications for additional warranty requirements that may be longer for certain systems.
 1. Contractor shall be responsible for generating and submitting the Substantial Completion document to the designer for review and signature.
- C. Warranty shall include each and every part, cable or software system provided as part of this project. This includes cabling, Networking, Wireless, Audio/Video systems and Access Control and Video Security systems.
 1. During the Warranty Period:

- a. If any part is broken due to a manufacturing defect or installation defect, the Contractor shall fix and/or replace the broken item at their own expense.
 - b. If any equipment loses connectivity or fails for any reason the contractor shall be onsite to diagnose and fix or replace equipment and upgrades software.
 - c. The Contractor shall also supply all configuration and programming necessary to keep all electronic equipment to the latest revision of software during the warranty period.
 - d. If the “system” goes down, and needs configuration to be brought back up, the Contractor shall be liable for any programming or reconfiguration.
 - e. During the warranty period, the Contractor shall make the Owner aware of any software upgrades that are available.
 - f. Contractor shall install all software upgrades for that warranty period or as detailed below for specific systems.
 - g. If the system does not run well during the warranty period the contractor shall be onsite to diagnose and fix the system.
- D. The contractor shall be onsite within 24 hours after a call from the owner or designer regarding system or equipment issues.

3.03 EXTENDED CABLING 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. This does include Fiber Optic cabling and termination equipment.
- 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 finally 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 that is provided as part of this project shall be provided with a three-year (3) 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 five-year (5) video security recording system and security camera warranty that provides for all software updates during the 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 five-year (5) access control system software warranty that provides for all software updates during the years after Substantial Completion.

1. Contractor shall be required to install all software and firmware updates during the three years.

END OF SECTION