

**THE SCHOOL DISTRICT OF PHILADELPHIA  
Office of Capital Programs  
440 North Broad Street, 3<sup>rd</sup> Floor – Suite 371  
Philadelphia, PA 19130**

TELEPHONE: (215) 400-4730

**RFI Response No. EC-001, EC-002, EC-003**

**Addendum No. 02**

**Subject:** Edwin M. Stanton School – Electrical Upgrades  
SDP Contract No. B-108C 2018/2019

**Location:** Edwin M. Stanton School  
1628 Christian Street  
Philadelphia, PA 19146

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This RFI response & Addendum, dated December 10<sup>th</sup>, 2019 shall modify and become part of the Contract Documents for the work of this project. Any items not mentioned herein, or affected by, shall be performed strictly in accordance with the original documents.

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**BID RFI #EC-001 – Asbestos abatement**

**Question:** Would any asbestos abatement be required for the electrical contractor on this job?

**Answer:** The electrical contractor will provide all environmental abatement per project specifications.

**BID RFI #EC-002 – Painting of new exposed conduits in non-mechanical areas**

**Question:** Are all new exposed conduits in non-mechanical areas to be painted?

**Answer:** All new exposed conduits, junction boxes, and related appurtenances in non-mechanical areas shall be painted to match the adjacent finish where the device is mounted.

**BID RFI #EC-003 – Paint & patch areas of existing wiremold removal**

**Question:** Where existing Wiremold is removed, is the electrical contractor to patch and paint?

**Answer:** The electrical contractor shall patch and paint surfaces where the existing wiremold, conduit, or similar devices and equipment are removed. Paint shall match the adjacent finish where the device was removed.

**End of RFI Responses**

## **ADDENDUM #02 – SDP Review Comment Responses**

### **Specification Revisions:**

#### **\*REMOVED SPECIFICATION\***

**282000 Video Surveillance**

#### **\*ADDED SPECIFICATION SECTIONS\***

**280500 Common Work Results for Electronic Safety and Security**  
**280513 Conductors and Cables for Electronic Safety and Security**  
**282300 Electronic Surveillance (CCTV)**

### **Attached Revised Specifications:**

**280000 Section Cover Sheet**  
**280001 Table of Contents**  
**280500 Common Work Results for Electronic Safety and Security**  
**280513 Conductors and Cables for Electronic Safety and Security**  
**282300 Electronic Surveillance (CCTV)**

### **Drawings Revisions:**

- **Drawing #E3.1: Refer to Keyed Note #2 for all indicated ceiling mounted receptacle locations.**
- **Drawing #E3.1: Refer to Keyed Note #1 for all indicated air conditioning unit receptacle locations.**
- **Drawing #E4.1: Provide 3-pole, 42kAIC rated, 100% rated, 1200A frame, 1200A trip main circuit breaker with Long, Short, and Instantaneous electronic trip unit. Provide Energy Reduction Maintenance Switch with local status indicator.**
- **Drawing #S2.0: Exterior camera at Cafeteria door shall have infrared functionality (“IR”).**
- **Drawing #FA2.0: Provide a smoke detector at the fire alarm control panel in the Main Office.**

**End of Addendum**

DIVISION 28  
ELECTRONIC SAFETY & SECURITY  
SPECIFICATIONS

FOR



THE SCHOOL DISTRICT OF  
PHILADELPHIA

ELECTRICAL UPGRADES

FOR

Edwin M. Stanton  
1628 Christian Street  
Philadelphia, PA 19146

**Contract: B-018C 2018/2019**

Addendum No. 02  
November 27<sup>th</sup>, 2019

Prepared By:





**DIVISION 28: ELECTRONIC SAFETY AND SECURITY**

<b>SECTION</b>		<b>PAGE</b>
280500	Common Work Results for Electronic Safety and Security.....	280500
280513	Conductors and Cables for Electronic Safety and Security.....	280513
282300	Electronic Surveillance (CCTV).....	282300
284621.11	Addressable Fire-Alarm Systems.....	284621.11



SECTION 28 0500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions Specifications Sections, apply to this section.

1.2 SUMMARY

- A. This Specification Section applies to the Contractor responsible for the portion of the work which comprises the Security Systems, including all required labor, materials, apparatus and supervision, and including, but not limited to:
  1. Boxes and raceway (to above accessible ceilings) for all new exterior wall-mounted, interior ceiling-mounted and interior wall-mounted security devices shown on the drawings; low voltage UTP data cables from the security cabinet or rack patch panel to the CCTV cameras. Replacement of all ceiling tiles damaged during the project.
  2. Cameras, equipment cabinet(s), uninterruptible power supplies (UPS), patch panels, server(s), network switches, fiber media converters, patch cables, cords, connections, monitors, workstation(s), configuration, etc., as required for a complete and functional CCTV system with digital recording, local viewing and remote viewing.
  3. Data gathering and compilation for system configuration, database entries, schedule set-up, database partitioning, camera naming, camera group set-up, IP addressing, and all other software loading, configuration and programming for 100% complete and functional security systems.
  4. Individual device and system testing.
  5. Demonstration and training for all systems. Refer to Specification Sections 282300 "ELECTRONIC SURVEILLANCE (CCTV)" and supplementary conditions for additional requirements.
  6. Close-out documentation, including As-Built drawings (paper and electronic), O&M Manuals, updated system wiring diagrams, updated shop drawings, updated data sheets, updated 11"x17" plans of each floor showing security camera locations, warranty documentation, final network configuration files and training documentation.
  7. Full 2-year warranty on all security systems.



- B. Every section described herein is binding upon each Contractor involved insofar as it can or does apply to him or his work.
- C. The following systems and materials requirements described herein are listed and described in detail (quantity, manufacturer's, requirements) on the drawings and in the corresponding specification sections provided. The project description herein is to provide an overview of the project(s) only.
- D. These components shall be fully tested and proven to be 100% operational prior to acceptance.
- E. These systems shall be UL Listed for their application and intended use.

### 1.3 WORK INCLUDED

- A. Furnish, install and connect Security Systems in accordance with these specifications and accompanying contract drawings. This shall include all required labor, materials, apparatus and supervision.
- B. An integral part of the project is the installation of devices and components which will form the Security System including:
  - 1. Boxes, raceway, cables, pathways, 120 VAC power connections.
  - 2. Closed circuit television (CCTV) surveillance system with monitoring and digital recording.
  - 3. All equipment, hardware and software associated with those systems.
  - 4. The collection of database information.
  - 5. Programming.
  - 6. System installation.
  - 7. Configuration.
  - 8. Testing, demonstration and training.
  - 9. Documentation.
- C. This system shall be provided as detailed in the drawings and/or in the specifications.
- D. Provide the services of a single security systems integrator (vendor) to supply, install, terminate, gather programming information, program, test and prove 100% functional, the security systems as described herein. The integrator shall be certified and/or approved by the systems manufacturer(s) to sell, install, service and maintain the provided systems, be able to staff the project as required with properly trained technicians, and shall be able to provide documentation to support same.
- E. Provide all boxes, conduit, hangers, mounting hardware, appurtenances, cabling, terminations and all other work as described in the contract documents and as required in conjunction with the work of the security systems vendor.



- F. The CCTV system head end equipment and monitoring and control equipment, including cabinet, patch panels, network switches, video server(s), fiber media converters, UPS, workstation/server, keyboard, mouse, monitors, mounting hardware, etc. shall be installed where shown or noted on the drawings. Refer to the drawings for specific locations. Provide a new fiber optic cable uplink from the security equipment rack or cabinet to the building network fiber switch in the existing MDF. Additionally, the systems shall be configured to be remotely monitored from the existing School District of Philadelphia Police facility, via the existing WAN. Coordinate the necessary IP addresses, configuration, set up and programming with the Owner.
- G. Penetrations through any corridor block (CMU) walls are considered as fire rated by the Philadelphia City Building Code and shall be appropriately fire-stopped using UL approved means and materials. Fire-stop rating for these instances shall be 2-hours.
- H. The systems are detailed in the related sections. Refer to related sections and project drawings.

#### 1.4 SCOPE OF WORK

- A. Provide the services of a single security systems vendor to furnish, install, terminate, gather programming information, program, test, document, train and prove 100% functional, the security systems as described herein.
- B. Provide the boxes, raceway and pathways as required for the installation of a complete and functioning CCTV surveillance system. At every device location shown, raceway shall extend from device box to above nearest accessible ceiling. Provide the low voltage cables, connections and terminations to all devices provided.
- C. Refer to the floor plans. At every security system device location shown on interior and exterior walls, provide boxes, device rings, covers, conduit, fittings, hangers, mounting hardware, appurtenances, wall penetrations, ceiling penetrations, floor penetrations, sleeves, firestopping, weatherproofing, pull strings and labels as required.
- D. Refer to the Security System floor plans. At every security system device location shown on non-accessible ceilings, provide boxes, device rings, covers, conduit, fittings, hangers, mounting hardware, appurtenances, wall penetrations, ceiling penetrations, floor penetrations, sleeves, firestopping, weatherproofing, pull strings and labels as required.
- E. Refer to the Security System floor plans. At every security system device location shown in stair towers, gymnasiums, boiler rooms and other areas without finish ceilings, provide boxes, covers, conduit, surface raceway, fittings, hangers, mounting hardware, appurtenances, wall penetrations, ceiling penetrations, floor penetrations, sleeves, firestopping, pull strings and labels as required.



- F. Wherever possible, all device boxes and conduit shall be recessed in the wall and ceiling construction in all finished areas. In unfinished areas, finished CMU walls and brick walls provide surface boxes and raceway as noted on the drawings. Paint surface raceway and boxes in finished areas to match surrounding finishes.
- G. Provide a complete and functioning CCTV electronic surveillance and digital recording system with color and day/night exterior PTZ cameras, dome housings, lenses, CCTV power supplies, video transceiver(s), digital video recorder(s), patch cables, monitors, administrative software, viewing software, local viewing monitor, conduit, fittings, boxes, cables, terminations, data gathering, programming, testing, training and all required software licensing.

## 1.5 COORDINATION

- A. Coordinate with the Owner. Provide overall responsibility for all security requirements during all phases of the project, including, but not limited to: camera installation; camera video, power and control distribution; video storage and system control; communication of alarms to the School Police Station; all data gathering for programming and configuration; required interfaces to other building systems; equipment power; ground fault isolation; security equipment set-up; System start-up; System testing; and Operator and Maintenance training.
- B. Coordinate all contract document requirements to ensure all equipment is correctly powered, grounded, and protected.
  - 1. Provide conduit, raceways, sleeves, boxes, J hooks, grounding, low voltage power circuits and penetrations (including firestopping).
- C. Provide all conduit, boxes, wires and cables as shown on the drawings and as required for proper operation. Provide labels on all conduit stubs, cables (both ends) and termination points.
- D. Furnish and install and test for proper operation all security components including, but not limited to:
  - 1. Power supplies for CCTV equipment.
  - 2. CCTV cameras, lenses, housings and recorders.
  - 3. CCTV monitors, switchers, recorders and keyboards.
  - 4. Connection to CCTV workstation(s), including uplink to the District LAN, as coordinated with the District IT personnel.

## 1.6 DEFINITIONS

- A. Owner or District:
  - 1. "Owner" or "District" when used in this specification refers to The School District of Philadelphia (SDP), 440 N. Broad Street, Philadelphia, PA 19130.
- B. Engineer:
  - 1. "Engineer" when used in this specification refers to FXB Engineering, 5 Christy Drive, Suite 307, Chadds Ford, PA 19317.





- C. Contractor:
  - 1. "Bidder", "Contractor", "this Contractor" "or Security Contractor" when used in this specification refers to the Contractor responsible for all work under this Section. Specific Sections of the Specification refer to specialized work and require persons with specialized skill sets. They are detailed as follows:
    - a. Division 28 Section "CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY"
    - b. Division 28 Section "ELECTRONIC SURVEILLANCE (CCTV)"
- D. Sub-Contractor:
  - 1. Any reference to, or letting of work contained in these specifications to any Sub-Contractor or Manufacturer does not relieve this Contractor of his responsibility for all work, material and equipment in this specification.
- E. Provide:
  - 1. The term "Provide" when used separately shall mean to "Furnish and Install".
- F. Furnish:
  - 1. The term "Furnish" when used separately shall mean to obtain and deliver to the project site, for installation by others.
- G. Install:
  - 1. The term "Install" when used separately shall mean to mount in place, connect and make operable.
- H. Gauge of Materials:
  - 1. The sizes of copper conductors and thickness of metals shown on the drawings or mentioned herein shall be understood to be American Wire Gauge for conductors and US Gauge for sheet metal. Minimum wire size for all security cabling shall be #18 AWG, except for LAN-based protocols, where approved by the Engineer.
- I. Singular Number:
  - 1. Any reference made to an item in the singular number shall apply equally to as many identical items that work may require.

## 1.7 REGULATIONS AND CODES

- A. All applicable laws, ordinances, rules and regulations of public bodies bearing on the conduct of the work, including but not limited to the following are hereby incorporated and made part of these specifications.
  - 1. Department of Labor and Industry.
  - 2. National Fire Protection Association.
  - 3. Americans with Disabilities Act.



- B. Should any change in the drawings and/or specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, the Engineer shall be notified prior to the time of submitting bids. After signing of the Contract, each Contractor shall be responsible for the completion of all work necessary to meet the above-mentioned requirements without additional expense to the Owner.
- C. The Contractor shall comply with all rules, regulations and recommendations of any public utility serving this project.
- D. The Contractor is responsible to obtain any required permits to complete work.
- E. The entire installation and all security systems shall be installed in accordance with:
  - 1. The latest edition of the National Electrical Code approved by the governmental body having jurisdiction, including amendments thereto.

#### 1.8 DRAWINGS AND SPECIFICATIONS

- A. The drawings are generally diagrammatic and indicative of the work to be installed. Exact locations of equipment and points of termination shall be approved by the Engineer. Should it be found that any system or equipment cannot be installed as shown on the drawings, the Engineer shall be consulted before installing or making changes to the layout.
- B. The drawings and specifications are intended to function as a common set of documents. Anything shown on the drawings but not in the specifications, or mentioned in the specifications and not shown on the drawings, shall be equally binding as if both noted on the drawings and called for in the specifications.
- C. The Contractor shall provide complete and 100% operational systems, and is solely responsible to ensure that the Owner's requirements are met.
- D. If necessary components or details are not listed but will affect the outcome of the systems, the Contractor shall notify the Engineer, who will make a determination as to the best solution to meet the intent of the Specification and the Owner's requirements. The Engineer will issue an addendum to all bidders, and the additions shall be reflected in the Contractors bid. After contract issuance, any cost for components that are missing shall become the responsibility of the Contractor.
- E. The scale of the drawings is believed to be accurate. The Contractor shall verify the actual dimensions in the field prior to starting the work. Any deviations from the drawing scaled dimensions shall be brought to the attention of the Engineer prior to starting the work. No consideration for changes due to dimensional variances will be considered during installation or after the work has been installed.



## 1.9 FAMILIARITY WITH CONTRACT REQUIREMENTS

- A. It is the responsibility of the Contractor, prior to submitting his bid on this Project, to satisfy himself as to the:
  - 1. Nature and location of the work.
  - 2. Character, quality and quantity of the materials which will be required.
  - 3. Character of equipment and facilities needed preliminary to and during the execution of the work.
  - 4. General and local conditions, and of all other matters which can in any way affect the work under this contract.
  
- B. Failure to make an on-site inspection prior to submitting a bid, or failure to comply with any or all the above requirements will not relieve this Contractor from the responsibilities of properly estimating the requirements or costs of successful completion of the work nor from the responsibility for the faithful performance of the provisions of this Contract.

## 1.10 STANDARDS AND REFERENCES

- A. Products of workmanship that are specified by association, trade, or federal standards shall comply with the requirements of the following reference standards, except when more rigid requirements are specified or are required by applicable codes.
- B. ANSI/NFPA 70 - National Electrical Code.
- C. ANSI/TIA/EIA-568B1-3 - Commercial Building Telecommunications Cabling Standard.
- D. ANSI/TIA/EIA-569A - Commercial Building Standards for Telecommunications Pathways and Spaces.
- E. ANSI/TIA/EIA-606A - The Administration Standard for the Telecommunications Infrastructure of Commercial Building.
- F. ANSI/TIA/EIA-607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- G. Building Industries Consulting Service International, (BICSI) Telecommunications Distribution Methods Manual.
- H. Electrical Code Compliance:
  - 1. Comply with applicable Federal, State and Local code requirements of the authority having jurisdiction.
- I. FCC Compliance:
  - 1. Comply with U. S. Federal Communications Commission Class 8 standard for allowable radiation from network equipment and wiring.
- J. IEEE - Institute of Electrical and Electronic Engineers.
- K. CCIR - Centre of Communication Interface Research.
- L. NTSC - National Television System Committee.
- M. NFPA 72G - Notification Appliances for Protective Signaling Systems.
- N. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.
- O. ASTM - American Society for Testing and Materials.
- P. FM - Factory Mutual System.
- Q. FS - Federal Specification.



- R. MIL - Military Specification.
- S. NEMA - National Electrical Manufacturers Association.
- T. UL - Underwriters Laboratories, Inc.

#### 1.11 SUBMITTALS

- A. The Contractor shall meet submittal requirements as listed under Division 01 Section “Submittals”, plus all other requirements listed in the following:
  - 1. Division 28 Section “ELECTRONIC SURVEILLANCE (CCTV)”.
- B. All systems provided shall be fully documented. Provide a bill of materials, product data, proposed Sub-Contractors list, shop drawings, proposed sequences of operations and contract close-out documentation, as detailed below.
- C. All submittals shall bear the Contractor's approval stamp, signed or initialed certifying that the Contractor has fully reviewed the contract documents and the proposed system documentation, and has verified that the system, materials, devices, equipment, dimensions, functions, electrical requirements and coordination of the information is in accordance with the requirements of the work and the contract documents. Any submittal without the Contractor's approval stamp will not be considered and will be returned for resubmission.
- D. Bill of Materials:
  - 1. As part of the initial submittal package, provide a complete list of materials and equipment proposed for use on this project, including quantities, manufacturer, model numbers and a brief description of each item.
  - 2. The review of this Bill of Material by the Engineer shall in no way relieve the Contractor from compliance with all requirements of the contract documents. The Contractor shall be completely responsible to provide the necessary quantities of parts, equipment, devices, hardware, mounting brackets, appurtenances, etc., as required for a complete and 100% functional system.
- E. Product Data:
  - 1. Submit manufacturer’s standard product data sheets for all equipment proposed.
  - 2. Product data shall include at a minimum a brief description of the product proposed, standard features, physical characteristics, dimensions, weight, mounting details, electrical specifications, connection requirements and sequence of operation.
  - 3. Product Data shall also include all Nationally Recognized Testing Laboratory (NRTL) listing data for the proposed product, both as an individual component and as part of a system.
  - 4. Product Data shall be submitted with or immediately following the Bill of Materials submittal listed above. Only products listed in the Bill of Materials shall be submitted with the Product Data package.
  - 5. Provide 3-ring binders, including a cover sheet listing the Project Name and Address, Owner’s Project Number, Engineer’s Project Number and the Specification Sections covered by the submitted documentation. Provide a complete index and tabs for the product groups.



F. Sub-Contractors:

1. The Contractor shall submit for approval a complete list of Sub-Contractors proposed for use on this project.
2. The list shall include, in itemized form, the name and address of the Sub-Contractor and the portions of the work to be performed by each Sub-Contractor.
3. Provide copies of certifications from the system manufacturer that the proposed Sub-Contractor is authorized to distribute, sell, install, program, service and warrant the specific system(s) proposed. Provide copies of certifications from the manufacturer that the Sub-Contractor's service personnel have successfully completed training provided by the manufacturer for the specific system(s) proposed.

G. Shop Drawings:

1. The Contractor shall submit to the Engineer, a complete package of shop drawings for the proposed systems, in accordance with the requirements of this section, Division 01 Section "Submittals" and/or as called for in the individual specification sections of Division 28 following.
2. Shop drawings submitted for review shall identify the Project Name and Address, Owner's Project Number, Engineer's Project Number, Contractor, Sub-Contractor or supplier, pertinent drawing number, detail and specification section number, as appropriate.
3. Provide shop drawings to the Engineer or Construction Manager in the proper quantities as required Division 01 Section "Submittals" and/or as elsewhere in these documents. In addition to all other requirements, the following minimum quantities shall apply:
  - a. Owner review: 3 Half-Size (15" x 22") and 1 full-size paper copies of all shop drawings. 1 CD of all shop drawings in electronic format (AutoCAD).
  - b. Engineer review: 1 Half-Size (15" x 22") and 1 full-size paper copy of all shop drawings. 1 CD of all shop drawings in electronic format (AutoCAD).
4. At a minimum, the shop drawings shall include the following:
  - a. Symbols, legends, notes and general information sheet.
  - b. Floor plans and elevations noting the locations of all security devices, CCTV cameras, security equipment cabinets, security network panels, reader interface panels, branch panel boards with 20A 120 VAC security circuits, network switches, CCTV recorders, workstations, monitors, etc.
    - 1) Floor plans shall also show the conduit, raceway and/or cabling layout of the proposed routing between security devices, panels and central equipment locations.
  - c. Security system details, customized for this project, showing junction and device box rough-in locations, conduit sizes, device mounting details, terminal strip locations and cabling requirements.
  - d. Security device schedules and system component integration matrix.



- e. Security system Ethernet network riser diagram, including Owner's network connection, with the following information:
    - 1) Layer 3 network switch model numbers and locations.
    - 2) Ports (active and spare).
    - 3) Network Power supplies model numbers and locations.
    - 4) Miscellaneous network equipment, including patch panels, patch cords, etc.
    - 5) Workstations and/or server.
    - 6) Cable types and quantities.
  - f. Security system RS485 and/or RS232 riser diagrams, including connection to security Ethernet network, with the following information:
    - 1) Panel and controller model numbers and locations.
    - 2) Device locations, addresses and dipswitch settings.
    - 3) Cable shield grounding connection details.
    - 4) Cable types and quantities.
  - g. 120 VAC circuit information, including panel board identification and circuit numbers.
  - h. Battery load calculations for all back-up batteries at network and field panels to ensure the proposed batteries can support the documented panel loads for the specified outage duration.
- H. Sequences of Operations
- 1. Provide Sequences of Operation for the overall security system and CCTV camera location. The sequences of operation shall be customized for this project and shall not be the manufacturer's standard descriptions for generic systems.
  - 2. See the Division 28 technical specification sections for additional sequence of operation requirements.
- I. Contract Close-out Documentation
- 1. Provide Operation and Maintenance (O&M) Manuals, As-Built contract drawings, updated Bill of Material, updated Product Data sheets, updated Shop Drawings (including updated calculations), updated Sequences of Operation, final test reports, warranty documentation, final network configuration files and training documentation.
  - 2. Operation and Maintenance Manuals:
    - a. Provide manufacturer's standard O&M Manuals for all components, outlining operating instructions, maintenance and repair procedures, recommended spare parts, programming, testing and trouble-shooting procedures.
    - b. Provide a complete parts list for all pieces of equipment.



- c. Provide in both a 3-ring binder format with tabbed sections, and electronic format on CD, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
  - 1) 5 hard copies and 1 electronic copy for the Owner.
  - 2) 1 hard copy and 1 electronic copy for the Engineer.
- d. See the Division 28 technical specification sections for additional O&M Manual requirements.
3. As-Built Contract Drawings:
  - a. Maintain at all times on the job site 1 set of contract drawings and update this set regularly in red with any and all approved changes during the course of the contract. All updates shall include a brief description.
  - b. After the project is complete, use this As-Built documentation to provide updated contract documents in CAD format (AutoCAD version 2000). Provide paper copies, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
    - 1) 2 full-size and 5 half-size (15" x 22") for the Owner.
    - 2) 1 full-size and 1 half-size (15" x 22") for the Engineer.
4. Updated Bill of Material:
  - a. Provide a complete and updated final list of materials and equipment used on this project, including quantities, manufacturer, model numbers and a brief description of each item.
5. Updated Product Data Sheets:
  - a. Provide 3-ring binders of all previously submitted and reviewed product data sheets, updated as required, including a cover sheet listing the Project Name and Address, Owner's Project Number, Engineer's Project Number and the Specification Sections covered by the submitted documentation. Provide a complete index and tabs for the product groups. Provide paper copies, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
    - 1) 5 binders (hard copies) and 1 CD (electronic) for the Owner.
    - 2) 1 binder (hard copy) and 1 CD (electronic) for the Engineer.



6. Updated Shop Drawings:
  - a. Provide paper and electronic copies of all previously submitted documentation, including floor plans, details, schedules, wiring diagrams, schematics, risers and battery calculations. Provide paper copies and electronics, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
    - 1) Hard (paper) copies:
      - a) 2 full-size and 5 half-size (15" x 22") for the Owner.
      - b) 1 full-size and 1 half-size (15" x 22") for the Engineer.
    - 2) Electronics:
      - a) 1 CD with MSWord and AutoCAD format for the Owner.
      - b) 1 CD with MSWord and AutoCAD format for the Engineer.
7. Updated Sequences of Operation:
  - a. Provide the final Sequences of Operation for the overall security system and for the operation of each CCTV camera location, as configured, tested and demonstrated.
  - b. Provide copies of the updated Sequences of Operation, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
    - 1) 5 hard copies and 1 CD (electronic) for the Owner.
    - 2) 1 hard copy and 1 CD (electronic) for the Engineer.
8. Final Test Reports:
  - a. Provide the final system test reports, demonstrating that all devices, panels and equipment have been tested, individually and as a system, and that the system operates according to the sequences of operation, as outlined.
  - b. Provide copies of the final test reports, quantities as required elsewhere in these documents. In addition to other requirements, the following minimum quantities shall apply:
    - 1) 5 hard copies and 1 CD (electronic) for the Owner.
    - 2) 1 hard copy and 1 CD (electronic) for the Engineer.
9. Warranty Documentation:
  - a. Provide all system and component warranties, as required.





10. Training Documentation:

- a. Provide all training documentation used in the course of the contract, including the sign-in sheets, texts and video recording of training sessions, quantities as required elsewhere in these documents.

1.12 SUBSTITUTIONS AND SAMPLES

- A. No substitutions shall be made without approval. Any substitutions and resulting approvals shall be made in accordance with the requirements of Division 01 Section "Substitutions." The words "equivalent", "approved equal" and "equal" shall mean equal in all respects in the opinion of the Engineer.
- B. When shop drawings are submitted on equipment different from the equipment specified in this and related sections, the Contractor shall relate each item of the submitted equipment to its specified equivalent.
- C. All costs involved due to substitution of equipment in lieu of that shown on the drawings shall be borne by the Contractor making such substitutions. This shall include but shall not be limited to cost or fees for changes:
  1. In the building layout, structure or construction
  2. In the requirements of related equipment
  3. To the arrangement of equipment
  4. To the work performed, or to be performed by this Contractor or by Others under this and other sections of the specifications
  5. In connection with resubmission of drawings for approval, if required, by local authorities or insuring agencies having jurisdiction over the work.

1.13 PERFORMANCE OF EQUIPMENT

- A. All materials, equipment and appurtenances of any kind, whether or not shown on the drawings, hereinafter specified or required for the completion of the work in accordance with the intent of these specifications, shall be completely, satisfactory, and acceptable in operation, performance, and capacity. No approval, either written or verbal, of any drawings, descriptive data of samples of such material, equipment and/or appurtenances, shall relieve the Contractor of his responsibility to turn over the same to the Owner in perfect working order at the completion of the work.
- B. Any material, equipment, or appurtenances, the operation, capacity or performance of which does not comply with the drawings and/or specification requirements, or which is not new, or which is damaged prior to acceptance by the Owner, will be deemed to be defective material and shall be removed and replaced with proper acceptable materials, equipment and/or appurtenances or put in proper acceptable working order, satisfactory to the Engineer without additional cost to the Owner.



- C. All associated systems provided under this specification, including the Security System or other similar systems shall be furnished by manufacturers who have been regularly engaged in the manufacture of these products for a period of not less than 5 years.
- D. This Contractor shall deliver to the Engineer, prior to commencement of work, a statement from the manufacturer or his authorized representative, certifying that the Contractor is completely trained and certified to install proposed systems.
- E. All details of the installation of all equipment shall be electrically and mechanically correct. All equipment shall operate without objectionable noise or vibration as determined by the Engineer and Owner. If objectionable noise or vibration is produced and transmitted to occupied portions of the building by apparatus, conduit or other parts of a system, any corrections to eliminate noise and vibration shall be made by the Contractor without cost to the Owner.

#### 1.14 METHODS AND MATERIALS

- A. All items of labor, material and equipment not specified in detail or shown on the drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the specifications or drawings.

#### 1.15 SERVICE RESPONSE

- A. Include in the contract for the first year after Owner acceptance.
  - 1. The Contractor's Service personnel shall respond to:
    - a. A routine service call shall be responded during the next business day (no more than 24 hours response time.)
    - b. A minor system malfunction shall be responded to in 4 hours. "Minor" meaning less than 15% of the system capabilities are involved, as determined by the Owner.
    - c. A major system outage shall be responded to in 2 hours. "Major" meaning 15% or more of the system capabilities are involved, as determined by the Owner.
  - 2. Response is defined as performing diagnostics and/or trouble shooting the problem, not merely returning a phone call.
  - 3. Provide a toll-free technical phone support for the major system components for the first year.
  - 4. Provide an escalation process with names and phone numbers to ensure timely problem resolution.



#### 1.16 WARRANTY

- A. The Contractor shall submit a written 2-year full warranty for the entire security system(s) provided as part of this project. Where manufacturers standard guarantee provides for a longer period, the longer period shall apply or where otherwise noted.
- B. Where defects in the material, equipment and/or workmanship become evident within the guarantee period, the Contractor shall be responsible for replacing such material and equipment with the approved type of new items; and/or correcting the defective workmanship without any costs to the Owner.
- C. The warranty shall include free software upgrades for 1 year, and periodic system diagnostics to ensure correct system operation.
- D. During the warranty period, service shall be provided as detailed in the Service Response paragraph above.

#### PART 2 - PRODUCTS

##### 2.1 GENERAL

- A. All materials and equipment supplied by this Contractor shall be new, of the best of their respective kinds, without imperfections and blemishes, and shall be protected from the elements prior to installation in the building.
- B. Major items of equipment shall be the best grade and quality used for the purpose in commercial practice and shall have the manufacturer's name, address and catalog number on a plate securely affixed in a prominent place. All equipment or apparatus of any 1 system must be the product of 1 manufacturer, or equivalent products of a number of manufacturers, which are suitable for use in a total system solution.
- C. When available, all materials and equipment shall bear the label of approval of the Underwriters' Laboratory, Inc.



## PART 3 - EXECUTION

### 3.1 INSTALLATION GENERAL

- A. All work shall be installed in a first class, neat and workmanlike manner by Technicians skilled in the trade involved. The quality of workmanship shall be subject to the approval of the Engineer. Any work found by the Engineer to be of inferior quality and/or workmanship shall be replaced and/or reworked until approval of the Engineer is obtained. Any cost involved in obtaining said approval shall be the responsibility of the Contractor.
- B. The Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the drawings. Outlets, equipment or wiring improperly placed because of the Contractor's failure to obtain this information shall be relocated and reinstalled by the Contractor without additional expense to the Owner.
- C. Each Contractor, upon request of the Construction Manager or Engineer, shall expedite the work of a specific area, section or part of the project to make provision for, or to permit the installation of another part of the work, or to protect equipment already installed.
- D. All wire, cable, wiring devices and equipment shall be installed in such a manner as to preserve access to any existing equipment or to any new equipment installed under this specification or under other specifications or contracts for this building and with sufficient space provided for proper operation and maintenance.
- E. The drawings are generally indicative of the work to be installed but do not indicate all bends, fittings, boxes, mounting hardware, etc., which may be required. Contractor shall carefully investigate the structural and finish conditions affecting his work, arrange his work accordingly, and furnish such fittings as may be required to meet such conditions.
- F. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts, equipment, architectural or structural features will be avoided. In the instance where interference between the work of two or more Contractors results, the Construction Manager or Engineer shall decide which work is to be relocated. The Construction Manager or Engineer may decide to move a Contractor's work regardless of which is work first installed. Such relocation shall be at no additional cost to the Owner.
- G. The Contractor shall strictly adhere to all Category 6 installation practices when installing unshielded twisted-pair (UTP) cabling.
- H. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building construction where required.
- I. The Contractor shall provide all patch cords with terminations for equipment used.



- J. The system installation shall be coordinated with all other trades working in the buildings.
- K. Limit the size and amount of holes required during installation. All penetrations shall be patched, painted, and brought to their original fire rating and appearance.
- L. Cables shall be installed in a manner that will not impede frequency response. Conduit bodies (i.e. "LB" fittings, etc.) and bridle rings shall not be used in the cable distribution system.
- M. All cables shall be installed per the Manufacturer's recommendation. No cables shall exceed the minimum bend radius, have kinks, abrasions, or otherwise be damaged in any manner. No cables shall be visible after installation nor shall any cable be installed in any manner that exposes it to harm or physical damage.

### 3.2 CONDUIT INSTALLATION

- A. All security system cables, including, but not limited to, Series 6 (RG6) CCTV coax, Type CL2 or CL3 low voltage power, Category 5e or 6 UTP and multi-conductor copper shall be installed as follows:
  - 1. Interior locations exposed – EMT (3/4" minimum).
  - 2. Interior locations concealed inside walls – EMT (3/4" minimum) stubbed up to above accessible ceiling.
  - 3. Interior locations concealed inside walls to door frame rough-in boxes - EMT (1/2" minimum) or flexible metal conduit (1/2" minimum, where permitted by the NEC and where approved) stubbed up to above accessible ceiling.
  - 4. Interior locations above non-accessible ceiling – EMT (3/4" minimum).
  - 5. Interior locations above accessible ceiling – EMT (3/4" minimum) or flexible metallic conduit. Multiple cables may be installed in each conduit. Conduits shall be sized as required for a 40% maximum fill, but no smaller than 3/4". All cables installed in plenum spaces shall be plenum rated.
  - 6. Exterior locations below grade – Schedule 40 PVC (1" minimum).
  - 7. Exterior locations above grade (or where exposed) – IMC (3/4" minimum).
- B. See drawings for additional requirements.

### 3.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer. Inspect equipment to ensure that no damage has occurred during shipment. Do not install damaged equipment; remove from site and replace damaged equipment with new.



- B. Store materials in original packages and containers, inside a well-ventilated area protected from weather, damaging fumes, construction debris, moisture, soiling, extreme temperatures or humidity; laid flat and blocked off ground to prevent sagging and warping or damage due to traffic. Comply with instructions and recommendations of manufacturer for special delivery, storage and handling requirements. Any equipment returned or exchanged will be in the original container. Any loss due to improper storage, handling or inadequate packaging shall be the sole liability of the Contractor.
- C. Handle wire and cable carefully to avoid abrading, puncturing and tearing the wire, cable insulation and sheathing. Ensure that dielectric resistance and characteristic impedance integrity of transmission media are maintained.

### 3.4 TESTING

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- B. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- C. Contractor shall test each and every component installed or interfaced, to ensure proper configuration and operation. Contractor shall coordinate with the other trades to resolve any problems during final field testing.
- D. Contractor shall test the system "Off-Line" and shall prove all components to be fully operational to the satisfaction of the Owner prior to system acceptance.

### 3.5 TRAINING

- A. Training shall be provided to designated personnel on every integrated and separate security system. Training shall be based on the system manufacturer's recommendations and shall include, at a minimum, the following: set up and operate equipment correctly, modify factory configurations, assign equipment identifiers and groups, assign schedules, set up and modify user interfaces, perform testing, gather performance statistics, perform maintenance and perform trouble-shooting procedures.



- B. For the CCTV system, provide a minimum of eight (8) persons from the Owner with the training necessary to enable them to view cameras, operate the recording and switching equipment, configure monitor views, program schedules, program sequencing, assign camera names, set up and generate reports, search and export video clips, modify the configuration of the system and perform basic system trouble-shooting. In addition, maintenance staff shall be trained to clean and adjust cameras, monitors and equipment. Operator training shall be for a minimum of two (2) hours. System administrator training shall be for a minimum of two (2) hours. Maintenance training shall be for a minimum of two (2) hours.
  
- C. All training shall be provided by Manufacturer's direct factory trained engineers or by Contractor personnel specifically authorized by the manufacturer to conduct training. All training shall be documented and recorded for future referral. Include cost to provide five (5) copies of that training recording in a digital format acceptable to the Owner. Original recordings, Master recordings and all copies of training sessions shall be accounted for and turned over to the Owner.
  
- D. Coordinate training sessions with the Owner and provide the Owner and the Engineer at least two (2) weeks written notification prior to any scheduled training.

END OF SECTION 28 0500



SECTION 28 0513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the contract, including General and Supplementary Conditions Specifications Sections, apply to this section.

1.2 SUMMARY

- A. Section Includes:
  - 1. CCTV Coaxial Cabling.
  - 2. UTP cabling.
  - 3. 50/125 -micron, laser-optimized multimode optical fiber cabling.
  - 4. RS-232 cabling.
  - 5. RS-485 cabling.
  - 6. Low-voltage control cabling.
  - 7. Control-circuit conductors.
  - 8. Identification products.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- F. RCDD: Registered Communications Distribution Designer.





#### 1.4 SUBMITTALS

- A. Provide submittals as listed under Division 28 Section “Common Work Results for Electronic Safety and Security” and as identified herein.
- B. Product Data: For each type of product indicated.
  - 1. For coaxial cable, include the following installation data for each type used:
    - a. Nominal OD.
    - b. Minimum bending radius.
    - c. Maximum pulling tension.
- C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- D. Seismic Qualification Certificates: For pathways, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified elsewhere, include the following:
  - 1. Allowable pulling tension of cable.
  - 2. Cable connectors and terminations recommended by the manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.



- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Test cables upon receipt at Project site.
  - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
  - 2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
  - 3. Test each pair of UTP cable for open and short circuits.

#### 1.7 PROJECT CONDITIONS

- A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
  - 1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.
- B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### **PART 2 - PRODUCTS**

#### 2.1 COAXIAL CABLE AND CONNECTORS

- A. General Coaxial Cable Requirements: Security baseband video type, recommended by cable manufacturer specifically for CCTV applications. RG6/U (Series 6) Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss (100kHz-1GHz) of 23 dB.



- B. NEC Type CMP, 18 AWG solid copper conductor (6.5 Ohm/M feet DC R), plenum insulation, bare copper braid (95%) shielding.
- C. RG6 BNC compression, 75 Ohm connectors, crimp-style.

## 2.2 UTP CABLE

- A. Refer to Division 27 specifications for Category 5e or 6 UTP requirements.

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## 2.3 OPTICAL FIBER CABLE

- A. Description: Multimode, 50/125-micrometer, 6-fiber, nonconductive, tight buffer, optical fiber cable.
  - 1. Comply with ICEA S-83-596 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.3 for performance specifications.
  - 3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
    - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
    - b. Riser Rated, Nonconductive: Type OFNR or ONFP, complying with UL 1666.
  - 4. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
  - 5. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- B. Jacket:
  - 1. Jacket Color: Aqua for 50/125-micrometer cable.
  - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
  - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

## 2.4 RS-232 CABLE

- A. Provide cables by one of the following manufacturers:
  - 1. Anixter, Inc.
  - 2. Belden Inc., Electronics Division.
  - 3. Berk-Tek, a Nexans Company.
  - 4. BIW Cable Systems, a Draka USA Company.



5. Champlain Cable Corporation.
6. Chromatic Technologies, a Draka USA Company.
7. Coleman Cable.
8. General Cable Technologies Corporation.
9. KRONE Incorporated.
10. Mohawk/CDT, a division of Cable Design Technologies.

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

A. Provide cables by one of the following manufacturers:

1. Anixter, Inc.



2. Belden Inc., Electronics Division.
3. Berk-Tek, a Nexans Company.
4. BIW Cable Systems, a Draka USA Company.
5. Champlain Cable Corporation.
6. Chromatic Technologies, a Draka USA Company.
7. Coleman Cable.
8. General Cable Technologies Corporation.
9. KRONE Incorporated.
10. Mohawk/CDT, a division of Cable Design Technologies.
11. West Penn Wire/CDT, a division of Cable Design Technologies.

B. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

C. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 CONTROL-CIRCUIT CONDUCTORS



- A. Provide low voltage control and power cables, by one of the following manufacturers:
1. Anixter, Inc.
  2. Belden Inc., Electronics Division.
  3. Berk-Tek, a Nexans Company.
  4. BIW Cable Systems, a Draka USA Company.
  5. Champlain Cable Corporation.
  6. Chromatic Technologies, a Draka USA Company.
  7. Coleman Cable.
  8. General Cable Technologies Corporation.
  9. KRONE Incorporated.
  10. Mohawk/CDT, a division of Cable Design Technologies.
- B. West Penn Wire/CDT, a division of Cable Design Technologies.
- C. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- D. Class 2 Control Circuits: Stranded copper, power-limited cable, complying with UL 83, concealed in building finishes.
- E. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.
- F. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 18 AWG, stranded (7 x 30) tinned copper conductors, plastic insulation, individual aluminum foil-polypropylene tape shielded pairs each with stranded tinned copper drain wire, 100% shield coverage and fluorinated-ethylene-propylene jacket.
1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- G. Plenum-Type, Multiconductor, Readers and Wiegand Keypads Cable: 6 conductors, No. 18 AWG, stranded (7 x 28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum foil-polyester tape shield with 100% shield coverage plus tinned copper braid shield with 85% shield coverage and fluorinated-ethylene-propylene jacket.



1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- H. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19 x 29) tinned copper conductors, PVC insulation, unshielded and PVC jacket.
1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- I. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19 x 30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded and plastic jacket.
1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- J. Plenum-Type, Paired Input Cable: 1 pair, twisted, No. 18 AWG, stranded (7 x 30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum foil-polyester tape shield (foil side out), with drain wire, 100% shield coverage and plastic jacket.
1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- K. Plenum-Type, Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (19 x 30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded and plastic jacket.
1. NFPA 70, Type CMP.
  2. Flame Resistance: NFPA 262 Flame Test.
- 2.7 IDENTIFICATION PRODUCTS
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brady Corporation.
  2. HellermannTyton.
  3. Kroy LLC.
  4. PANDUIT CORP.



- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
  
- C. Label all components that comprise the Security System(s) to note individual purpose/function by using one of the following means:
  - 1. Hybrid Cable, Individual Pair and/or Circuit Identification: Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
    - a. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
    - b. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
    - c. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2" (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
  
  - 2. Controller Enclosure, Power Supply and Equipment Panel Identification: Provide the following:
    - a. Clearly identify all controller enclosures by noting the contents and which door locations are controlled by the enclosed equipment.
    - b. Identify Power Supply enclosures by noting the 120V panel and circuit feeding the supply, power supply operating voltage and amperage, battery supply voltage and ampere-hours, and when it was originally installed.
    - c. Use 1 of the following means for identifying all System Enclosures:
    - d. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8" (10 mm).
    - e. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8" (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
    - f. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8" (10 mm).
    - g. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8" (10 mm).

## 2.8 SOURCE QUALITY CONTROL

- A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- B. Factory test UTP cables according to TIA/EIA-568-B.2.
- C. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.





- D. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF HANGERS AND SUPPORTS**

- A. Comply with requirements in Division 27 for installation of supports for conductors and cables.

#### **3.2 WIRING METHOD**

- A. Install wiring in raceways. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4". Low voltage power, control and data transmission wiring shall not share conduit with other building wiring systems.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

#### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-B.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Terminate all conductors; no copper or fiber cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.



4. Cables may not be spliced. Secure and support cables at intervals not exceeding 48 inches and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- D. UTP Cable Installation: Refer to Division 27 Specifications.
- E. Optical Fiber Cable Installation: Refer to Division 27 Specifications.
- F. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend copper cable not in a wireway or pathway a minimum of 8" above ceilings by cable supports not more than 48" apart.
  3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5" (127 mm).
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12" (300 mm).
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24" (600 mm).
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:



- a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2" (64 mm).
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6" (150 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12" (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
- a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3" (75 mm).
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6" (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48" (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5" (127 mm).

### 3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA-569-B, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.5 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

### 3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 27 Section.

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification



- markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  4. Optical Fiber Cable Tests:
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    - b. Link End-to-End Attenuation Tests:
      - 1) Multimode Link Measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
      - 2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 28 0513



SECTION 28 2300 - ELECTRONIC SURVEILLANCE (CCTV)

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Refer to Specification Section "COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY" for project summary and work included information.

1.3 DEFINITIONS

- A. AGC: Automatic gain control.
- B. BNC: Bayonet Neill-Concelman - type of connector.
- C. B/W: Black and white.
- D. CAT 6: Category 6
- E. CCD: Charge-coupled device.
- F. CMOS: Complementary metal-oxide-semiconductor.
- G. FTP: File transfer protocol.
- H. IP: Internet protocol.
- I. LAN: Local area network.
- J. MPEG: Moving picture experts group.
- K. NTSC: National Television System Committee.
- L. PC: Personal computer.
- M. PoE: Power over Ethernet.
- N. PTZ: Pan-tilt-zoom.
- O. RAID: Redundant array of independent disks.



- P. TCP: Transmission control protocol - connects hosts on the Internet.
- Q. UPS: Uninterruptible power supply.
- R. UTP: Unshielded twisted pair.
- S. WAN: Wide area network.

#### 1.4 SUBMITTALS

- A. The Contractor shall meet submittal requirements as listed under General and Supplementary Conditions, Division 28 Section “Common Work Results for Electronic Safety and Security” and as identified herein.
- B. Provide a submittal schedule itemizing the required submissions for approval.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.
- D. Provide the complete Product Data cut sheets, with product specifications, power and control requirements for the products proposed, identifying the following:
  - 1. IP cameras, housings, mounts.
  - 2. CCTV Video Management System (VMS).
  - 3. CCTV workstation/server
  - 4. CCTV monitors.
  - 5. Network switch, patch panels, patch cables.
  - 6. UPS.
  - 7. Cables.
- E. Provide detail shop drawings specific to the proposed system and building layout including the following:
  - 1. All information required under Division 28 Section “Common Work Results for Electronic Safety and Security”, Article 1.13 “Submittals”, including symbols, legends, notes, general information, floor plans showing the locations of all security devices, panels and equipment, network risers, conduit and cable routing, etc.
  - 2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes for power (low voltage and 120 VAC), video and control.



3. CCTV camera schedule, with camera types, lens sizes, housings, views.
  4. Camera mounting details.
  5. Riser diagrams and wiring schematics, including cable types and quantities, for power, signal, and control wiring, and grounding.
  6. Category 6 UTP PoE or PoE+ cable distance table for each proposed CCTV camera location.
  7. Rack layouts.
- F. Prior to project close-out, as required by this section, Division 28 Section “Common Work Results for Electronic Safety and Security” (Article 1.13 “Submittals”) and General and Supplementary Conditions, provide the following:
1. Record contract drawings.
  2. Final updated shop drawings.
  3. Final programming configurations.
  4. Final updated shop drawings.

#### 1.5 SCOPE OF WORK

- A. This Section covers the installation, control and operation of all new cameras, digital video recording, and all other appurtenances comprising the surveillance system for the project.
- B. This surveillance system shall be provided with alarm inputs for interface with other systems to provide integration between those systems.
- C. Disconnect and remove existing CCTV cameras, mounting hardware, cables and exposed raceways. Turn cameras and mounting hardware over to the district.
- D. Disconnect and remove existing CCTV cabinet, power supplies, media converters, video recording equipment, CCTV monitors, mounting brackets, cables and exposed raceway. Turn CCTV video equipment over to the district.
- E. Provide new IP CCTV cameras, lenses, housings, mounts, brackets, boxes, etc., quantities as required for a complete installation of a 100% functional system as outlined below.
- F. Provide 64 channel VMS servers, quantities as show on the drawings or as noted in these specifications, including mounting hardware, patch cables and power cords. Provide new video management system (VMS) software, configuration and programming.
- G. Provide CCTV workstation computers, quantities as show on the drawings or as noted in these specifications, including hardware, software, monitor, keyboard and mouse.



- H. Provide CCTV flat screen monitors, quantities as show on the drawings or as noted in these specifications, including mounting hardware, video patch cables and power cords.
- I. Provide UPS battery backup at all CCTV equipment racks and cabinets.
- J. Provide 24 port Gigabit PoE+ ethernet switches with CAT6 and fiber optic GBIC or SFP modules, quantities as show on the drawings or as noted in these specifications, including mounting hardware, patch cables and power cords.
- K. Provide CAT6 cabling, terminations and patch cables from each individual CCTV camera location homerun to the MDF. Refer to the drawings for specific information.
- L. Provide fiber optic cables, modules, media converters and patch cables for CCTV camera locations which exceed the maximum distance requirements for CAT6 cable.
- M. Cables shall be installed concealed except at the security equipment. Cables installed in walls shall be in conduit or other suitable raceway. Cables installed above accessible ceilings shall be installed in conduit, or flexible metallic conduit.
- N. Conform to the latest School District of Philadelphia (SDP) IT standards.
- O. The system shall be delivered with the most current version of compatible software, firmware and hardware and shall comply with all authorities having jurisdiction.
- P. Clean and adjust all equipment, aim and focus cameras, verify the proper scenes, provide programming and configuration, provide pre-testing and final testing and provide training.

## 1.6 WARRANTY

- A. Refer to Section 280500 for details.

## PART 2 - PRODUCTS

### 2.1 SYSTEM REQUIREMENTS

- A. Video-signal format shall support H.264 High or Main profiles or MJPEG formats. On-board storage shall be provided.
- B. System shall have seamless integration of all video surveillance and control functions.
- C. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards. Provide all mounting hardware, fasteners and appurtenances for a complete installation.
- D. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.





- E. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.
- F. Provide ground loop isolation and any corrections required by ground loop problems associated with the system.

## 2.2 CAMERAS, LENSES, HOUSINGS AND MOUNTS

- A. Provide cameras/lenses/housings, mounting brackets, wall arms, safety chains, adapters and all appurtenances for a complete system.
- B. Provide pendant mount, wall mount or ceiling-mount housing options for cameras. See drawings for additional information. Final selection of appropriate housing option for each camera location shall be made to provide for the optimum installation.
- C. Provide cameras with automatic exposure balancing by camera preset based on time, event or by manual configuration, with back light compensation and electronic auto-iris.
- D. The system shall have easy controls for cameras with iris and focus. The system shall have image controls to enhance the picture quality (i.e., brightness, contrast, sharpness, etc.).
- E. All cameras shall be required to perform under various and variable lighting conditions. All cameras shall be Day/Night, shall provide high resolution color images and shall automatically switch to high resolution monochrome in low light conditions.

## 2.3 INDOOR FIXED CCTV CAMERAS (1, 2, 3 AND 5 MPx)

- A. Provide network cameras with two simultaneous video streams with up to 5 MPx, 2592 x 1944 resolution, auto iris, and varifocal lens capabilities, with the following characteristics:
  - 1. H.264 High or Main profiles; and MJPEG compression.
  - 2. Dual streaming (two independent IP video streams).
  - 3. Day/night operation with IR cut filter.
  - 4. Wide Dynamic Range (WDR): 75 dB minimum.
  - 5. PoE Class 2, 24 VAC, 12 VDC.
  - 6. Local storage via SD card.
  - 7. Refer to the drawings for Megapixel setting and IR requirements for each individual camera.



B. Imager (CMOS):

<u>MPx</u>	<u>Sensor</u>	<u>Maximum Resolution</u>
5 MPx	1/1.8-inch	2592 x 1944 (5.0MPx)
3 MPx	1/2.8-inch	2048 x 1536 (3.1 MPx)
2 MPx	1/2.8-inch	1920 x 1080 (2.1 MPx)
1 MPx	1/3-inch	1280 x 960 (1.3 MPx)

C. Electronic Shutter Range:

<u>MPx</u>	<u>Range</u>
5 MPx	1/5 – 1/30,000 sec
3 MPx	1/5 – 1/45,000 sec
2 MPx	1/5 – 1/25,000 sec
1 MPx	1/5 – 1/30,000 sec

D. Minimum Illumination (Color):

<u>MPx</u>	<u>Sensitivity</u>
5 MPx	0.30 lux (33 ms, F1.2), 0.03 lux (200 ms, F1.2)
3 MPx	0.25 lux (33 ms, F1.2), 0.03 lux (200 ms, F1.2)
2 MPx	0.25 lux (33 ms, F1.2), 0.03 lux (200 ms, F1.2)
1 MPx	0.05 lux (33 ms, F1.4), 0.03 lux (200 ms, F1.4)

E. Minimum Illumination

(Monochrome): MPx

<u>MPx</u>	<u>Sensitivity</u>
5 MPx	0.10 lux (33 ms, F1.2), 0.02 lux (200 ms, F1.2)
3 MPx	0.10 lux (33 ms, F1.2), 0.02 lux (200 ms, F1.2)
2 MPx	0.10 lux (33 ms, F1.2), 0.02 lux (200 ms, F1.2)
1 MPx	0.10 lux (33 ms, F1.4), 0.02 lux (200 ms, F1.4)

F. Scanning: Progressive

G. Image Control Settings

1. White balance range: 2,000° to 10,000°K
2. Day and night settings
3. Privacy zone definition: up to 8 zones of window blanking
4. 3D noise reduction



H. Lens:

1. Built-in, varifocal
2. Focal Length: F1.4, 3 ~ 10.5 mm
3. Zoom: Remote
4. Auto Iris: DC drive lens
5. Auto Focus: Automatically focuses during runtime operation

I. Video:

1. The network camera system shall support up to 2 simultaneous streams; the secondary stream is variable based on the setup of the primary stream.
2. Compression type: H.264 High or Main profiles; and MJPEG
3. Corridor Mode: Electronic image flip and mirror: 180°, 90° 270° (H.264 only)
4. Service Stream: 640 x 480 or 640 x 352; 2 ips, JPEG

J. Video streams shall support ONVIF profile S.

K. Storage and Recording

1. The network camera system control shall have onboard SD card storage.
  - a. Card type: Micro SD
  - b. Capacity: up to 64 GB
2. The local SD storage shall have the ability to be backed up to alternate media without removal of the SD card from the camera.
3. Local recording on the SD card shall commence upon loss of network connectivity, based on a pre-programmed schedule.
4. The network camera system shall record video continuously in the case of network outage.
5. Alarm recording: The network camera system shall capture selectable 1, 5, or 10 second video clips on camera sabotage, motion detection, or alarm input.
6. Video recording and storage shall support ONVIF profile G.



L. Electrical

1. Power
  - a. Source Options
    - 1) 24 VAC nominal, 18 to 32 VAC range, 12 VDC
    - 2) PoE (Class 2)
2. Connectors:
  - a. Ethernet: RJ-45 connector
  - b. External power: 2-conductor power to terminal block

M. Mechanical and Environmental

1. Construction Material: Plastic body and trim ring, polycarbonate bubble
2. Finish: White, RAL 9003
3. Impact Resistance: IK10 (20J)

N. Certifications:

1. CE – EN 55022 (Class A), EN 50130-4, EN 60950-1
2. FCC (Class A) – 47 CFR Part 15
3. UL and cUL Listed – UL 60950-1, CAN/CSA-C22.2 No. 60950-1-07
4. ICES-003 (Class A)
5. RCM
6. KC
7. ONVIF Profile S, Profile G, and Profile Q conformant

O. Acceptable Manufacturers:

1. Pelco, by Schneider Electric, NextGen Sarix IMP Mini DomeSeries, Part #IMP512-1IS and IMP321-1RS (Basis of Design)
2. Samsung.
3. Bosch.
4. Panasonic.
5. Siemens
6. Or approved equal.



#### 2.4 OUTDOOR 270 DEGREE FIXED CCTV CAMERAS

- A. The IP Panoramic indoor/outdoor multi-sensor camera system shall transparently integrate video across all sensor's in the camera presenting a seamless fully stitched and blended total resolution of 12 megapixel (MPx), 2048 x 1536 x 4. The module shall include a pan function.
- B. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide a slot for a removable, local storage medium (not provided by camera manufacturer) (Micro SD) to capture video clips of varying lengths in accordance with the ONVIF G Profile.
- C. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide advanced low-light capabilities for day/night models with sensitivity down to 0.05 lux in the 270° model while in night mode.
- D. The IP Panoramic indoor/outdoor multi-sensor camera system shall support industry standard Power over Ethernet Plus (PoE+) IEEE 802.3at, Class4 to supply power to the camera over the network.
- E. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide Wide Dynamic Range (WDR) up to 120 dB with dynamic adjustments through the User Interface across the cameras field of view.
- F. The IP Panoramic indoor/outdoor multi-sensor camera system shall have a mechanical IR cut filter mechanism for increased sensitivity in low-light installations. Set points for the IR cut filter feature shall be configurable through an embedded Web browser.
- G. The IP Panoramic indoor/outdoor multi-sensor camera system shall support H.264 High, Main or Base profiles, using constrained variable bit rate (CVBR) as the default, variable bit rate (VBR), or constant bit rate (CBR) with target range. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide a service video stream in addition to and independent of the video streams.
- H. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide 802.1x port security to establish point-to-point access through a wired or wireless port using Extensible Authentication Protocol (EAP).
- I. The IP Panoramic indoor/outdoor multi-sensor camera system shall conform to the ONVIF Profile S and Profile G, and support open architecture best practices with a published API available to third-party network video recording and management systems. The IP Panoramic indoor/outdoor multi-sensor camera system shall support SNMP v2c and v3. The IP Panoramic indoor/outdoor multi-sensor camera system shall support IPv6 configurations in conjunction with IPv4.
- J. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide Auto or Manual exposure settings for adjusting the amount of light detected by the camera sensor. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide user-selectable configurations for day/night auto mode. Transitional levels shall be used to set the desired light level for transitioning to night mode. Transition detect time shall control the length of time that the camera is exposed to a light level before changing to color or monochrome mode.



- K. The IP Panoramic indoor/outdoor multi-sensor camera system shall be factory focused, requiring no manual adjustment of focus in the field.
- L. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide User and Group settings to assign permissions and access levels to the camera.
- M. The IP Panoramic indoor/outdoor multi-sensor camera system shall support standard IT protocols. The IP Panoramic indoor/outdoor multi-sensor camera dome system shall provide a 1000Base-T network interface. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide for a standards-based HTML interface.
- N. The IP Panoramic indoor / outdoor network camera system shall include a camera module, back box, and lower dome. The IP Panoramic indoor/outdoor multi-sensor camera system shall be plenum-rated per NEC article 300.22(C)(2). The IP Panoramic indoor/outdoor multi-sensor camera system shall be vandal and tamper resistant with an impact resistance of IK10 (20 Joules). The IP Panoramic indoor/outdoor multi-sensor camera system shall be NEMA-4X, IP66 rated. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide a 3/4-inch NPT conduit attachment on the side and top of the back box for in-ceiling and surface mounted applications. The IP Panoramic indoor/outdoor multi-sensor camera system shall attach to a standard (1900) 4-inch square box or standard 2-gang electrical box for surface mounted applications. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide a 1.5-inch NPT conduit attachment for pendant mounted applications.
- O. The IP Panoramic indoor/outdoor multi-sensor camera system shall provide Window Blanking Technology for user defined privacy areas.
- P. The IP Panoramic indoor/outdoor multi-sensor camera system shall meet or exceed the following design and performance specifications.
  - 1. Camera Specifications
    - a. Imaging Device 1/3.2-inch
    - b. Imager Type CMOS
    - c. Imager Readout Progressive scan
    - d. Highest Resolution 12 MP, 2048 x 1536 x 4
    - e. Signal-to-Noise Ratio >50 db
    - f. Sensitivity
      - 1) 180° Model f/2.0, 0.3 lux color (33 ms),  
0.14 lux mono (33 ms)
      - 2) 270°, 360° Models f/2.5, 0.5 lux color (33 ms),  
0.2 lux mono (33 ms)
    - g. Day/Night Capabilities Yes
    - h. Mechanical IR Cut Filter Yes, (ON/OFF/AUTO selectable) with different set points
    - i. Wide Dynamic Range 120 dB
  - 2. Lens Specifications
    - a. Length
      - 1) 270° Model f/2.5 ~ 2.7 mm
    - b. Field of View
      - 1) 270° Model 270° horizontal, 73° vertical



- 3. Video Specifications
  - a. Video Streams Set of streams to deliver full resolution views; secondary stream that comprises a lower resolution mosaic of above streams
  - b. Frame Rate(s) User selectable up to 12.5 frames per second (fps)
  - c. Video Encoding H.264 High, Main, or Base profiles; MJPEG (mosaic stream only); Pelco Smart Compression
  - d. Bit Rate Control Default maximum for Constrained Variable Rate (CVBR) at maximum resolution and frame rate

	Maximum Bit Rate	Typical Bit Rate at Recommended Settings
270° Model	25 Mbps	16 Mbps

- f. Network
  - 1) Supported Protocols TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, SSH, SSL, SMTP, FTP, ARP, ICMP, and+ 802.1x(EAP)  
Note: IPv6 supports mixed IPv4 and IPv6 installations, but not IPv6-only deployments
  - 2) Users
    - a) Unicast Up to 20 simultaneous depending on the resolution settings, and frame rate
    - b) Multicast Unlimited H.264
- g. Security Access Password protected
- h. Software Interface Web browser view and setup
- i. Pelco System Integration Pelco VideoXpert, Digital Sentry
- j. Open API Integration Pelco API, Panomersive SDK, ONVIF Profile S and G
- k. Minimum System Requirements
  - 1) Processor Intel® Core™ i3 processor, 2.4 GHz
  - 2) Operating System Microsoft Windows® 10, Windows® 7 (32- and 64-bit), or Windows Vista ®; or Mac® OS X 10.9 (or later)
  - 3) Memory 4 GB RAM
  - 4) Network Interface 100 Mbit (or greater)
  - 5) Monitor Minimum of 1024 x 768 resolution, 16- or 32-bit pixel color resolution
  - 6) Web Browser Internet Explorer® 8.0 (or later); Mozilla® Firefox® 35 (or later); Google® Chrome 40 (or later)



4. Range Guidance

	Requirement	270°
Detection	20 Pix/m (7 Pix/ft)	60 m (172 ft)
Classification	40 Pix/m (13 Pix/ft)	30 m (93 ft)
Recognition	60 Pix/m (20 Pix/ft)	20 m (60 ft)
Identification	150 Pix/m (49 Pix/ft)	8 m (25 ft)

5. Electrical Specifications

- a. Network Port
  - RJ-45 connector for 1000Base-T
  - 1 Gigabit/sec Auto MDI/MDI-X PoE+; Class 4
- b. Cabling Type
  - Category 5 or better
- c. Input Power
  - PoE+ (IEEE 802.3at, Class 4)
- d. Local Storage
  - Micro SD, SDHC
- e. Alarm
  - 1) Unsupervised
    - Detects open or closed alarm state
  - 2) Supervised
    - Detects open and short alarm state with external 1-kohm resistor to detect alarm tampering
    - 3.5 VDC maximum, 3.5 mA maximum
  - 3) Input
    - ±32 VDC maximum, 150 mA maximum
- f. Relay Output
- g. Audio
  - 1) Streaming
    - Bidirectional: full or half duplex
  - 2) Input/Output level
    - 600 ohm differential, 1Vp-p max. signal
  - 3) Compression
    - G.711 PCM 8 bit, 8 kHz mono at 64 kbit/s

6. Back box and lower dome specifications

- a. Indoor Vandal, In-Ceiling
  - 1) Installation
    - Single back box for suspended or hard ceiling applications
  - 2) Back Box
    - Plenum rated
  - 3) Cable Entry
    - 0.75-inch NPT or 25 mm conduit
    - side and top of back box
  - 4) Operating Temperatures
    - 10° to 50°C (14° to 122°F)
  - 5) Operating Humidity
    - 15 to 85%, RH non-condensing
  - 6) Impact Resistance
    - IK10
  - 7) Shock and Vibration
    - 60068:2-6
    - MIL810G
    - EN50155 Category 1, Class B; IEC and 2-27, ISTA-2A, Sequence 5,
  - 8) Construction
    - Alodine aluminum



- b. Indoor Vandal, Surface Mount
  - 1) Installation Attaches to standard 4-inch square outlet box and 2-gang electrical box; 0.75-inch NTP or 25 mm conduit attachments on side back box; wire entry through grommet on top of back box
  - 2) Operating Temperatures  $-10^{\circ}$  to  $50^{\circ}\text{C}$  ( $14^{\circ}$  to  $122^{\circ}\text{F}$ )
  - 3) Operating Humidity 15 to 85%, RH non-condensing
  - 4) Impact Resistance IK10
  - 5) Shock and Vibration EN50155 Category 1, Class B; IEC 60068:2-6 and 2-27, ISTA-2A, Sequence 5, MIL810G
  - 6) Construction Alodine aluminum
- c. Indoor Vandal, Pendant
  - 1) Installation 1.5-inch NPT conduit/pipe attachment
  - 2) Operating Temperatures  $-10^{\circ}$  to  $50^{\circ}\text{C}$  ( $14^{\circ}$  to  $122^{\circ}\text{F}$ )
  - 3) Operating Humidity 15 to 85%, RH non-condensing
  - 4) Impact Resistance IK10
  - 5) Shock and Vibration EN50155 Category 1, Class B; IEC 60068:2-6 and 2-27, ISTA-2A, Sequence 5, MIL810G
  - 6) Construction Alodine aluminum
- d. Environmental Vandal, In-Ceiling
  - 1) Installation Single back box for suspended or hard ceiling applications
  - 2) Back Box Plenum rated
  - 3) Cable Entry 0.75-inch NPT or 25 mm conduit attachments on side and top of back box
  - 4) Operating Temperatures  $-40^{\circ}$  to  $50^{\circ}\text{C}$  ( $-40^{\circ}$  to  $122^{\circ}\text{F}$ )
  - 5) Operating Humidity 10 to 95%, RH non-condensing
  - 6) Impact Resistance IK10
  - 7) Shock and Vibration EN50155 Category 1, Class B; IEC 60068:2-6 and 2-27, ISTA-2A, Sequence 5, MIL810G
  - 8) Construction Alodine aluminum
  - 9) Ingress protection IP66
- e. Environmental Vandal, Surface Mount
  - 1) Installation Attaches to standard 4-inch square outlet box and 2-gang electrical box
  - 2) Cable Entry 0.75-inch NPT or 25 mm conduit attachments on side and top of back box. Wire entry through grommet on top of back box
  - 3) Operating Temperatures  $-40^{\circ}$  to  $50^{\circ}\text{C}$  ( $-40^{\circ}$  to  $122^{\circ}\text{F}$ )
  - 4) Operating Humidity 10 to 95%, RH condensing
  - 5) Impact Resistance IK10
  - 6) Shock and Vibration EN50155 Category 1, Class B; IEC 60068:2-6 and 2-27, ISTA-2A, Sequence 5, MIL810G
  - 7) Construction Alodine aluminum
  - 8) Ingress protection IP66



- f. Environmental Vandal, Pendant
  - 1) Installation 1.5-inch NPT thread for use with Pelco wall mounts
  - 2) Operating Temperatures  $-40^{\circ}$  to  $50^{\circ}\text{C}$  ( $-40^{\circ}$  to  $122^{\circ}\text{F}$ )
  - 3) Operating Humidity 10 to 95%, RH condensing
  - 4) Impact Resistance IK10
  - 5) Shock and Vibration 60068:2-6 MIL810G EN50155 Category 1, Class B; IEC and 2-27, ISTA-2A, Sequence 5,
  - 6) Construction Alodine aluminum
  - 7) Ingress protection IP66
  
- 7. Dome System Specifications
  - a. Indoor Vandal, In-Ceiling 5.90 cm (2.32 in) above ceiling, lower dome 9.85 cm (3.88 in) below ceiling, 16.15 cm (6.36 in) diameter
  
  - b. Indoor Vandal, Surface Mount 14.65 cm (5.76 in) overall length (including dome) by 15.93 cm (6.27 in) diameter
  - c. Indoor Vandal, Pendant 17.80 cm (7.00 in) overall length (including dome) by 15.75 cm (6.20 in) diameter
  - d. Environmental Vandal, In-Ceiling 5.90 cm (2.32 in) above ceiling, lower dome 9.85 cm (3.88 in) below ceiling, 16.15 cm (6.36 in) diameter
  - e. Environmental Vandal, Surface 14.65 cm (5.76 in) overall length (including dome) by 15.93 cm (6.27 in) diameter
  - f. Environmental Vandal, Pendant 17.80 cm (7.00 in) overall length (including dome) by 15.75 cm (6.20 in) diameter
  
- 8. Mechanical Specifications
  - a. Dome Attenuation
    - 1) Clear f/0.0 light loss
    - 2) Smoked f/1.0 light loss
  - b. Pan Adjustable (All Models)  $370^{\circ}$
  
- Q. Certifications/Ratings
  - 1. CE, Class A
  - 2. FCC Part 15, Class A
  - 3. UL/cUL Listed
  - 4. ICES-003, Class A
  - 5. KC



6. C-Tick
7. CB Scheme ITE
8. NEMA Type 4X, and IP66 rating (Environmental Vandal)
9. RoHS, Lead Free, REACH
10. NTCIP 1205
11. IEC 62676 image quality measurement

R. Acceptable Manufacturers:

1. Pelco, by Schneider Electric, IMM 12MOP 270 Environmental Pendant, Part #IMM12027- 1EP (Basis of Design)
2. Arecont Vision.
3. Samsung.
4. Or approved equal.

2.5 OUTDOOR 180 DEGREE FIXED CCTV CAMERA

- A. Provide 12 megapixel (MP) IP outdoor video cameras employing one 4072H x 3046V image sensor, capable of providing 180-degree surveillance and seven independent video streams, with no blind spots, with the following minimum characteristics:
1. On-board dewarping software to convert the spherical video image into a continuous flat view and panoramic view.
    - a. Local 3D dewarping providing 4x VCams at max 1MP each including up to 2x panoramic at 5.9 MP each.
  2. H.264 and MJEG compression.
  3. Controllable mechanism IR filter.
  4. 14 fps for maximum resolution, 30 fps for 2MP resolution and below.
  5. Configurable privacy regions and motion detection regions.
  6. Built-in Micro SD Card slot, 256 GB capacity, speed class 10.
  7. Built-in web server.



8. PoE (IEEE standard 802.af) or 12V powered.
9. IP66, IP67, IP68 (2 m, 30 mins) and IP69K.

B. Video:

1. Sensor: 12.4 MP (approximately) 1/2.3" Sony EXMOR R CMOS Sensor
2. Minimum illumination: 0.10 lux (50 IRE, F/2.4)
3. Scanning: Progressive
4. Automatic white balance (AWB): 2,500K to 8,000K (approximately)
5. Privacy zone definition: 10 configurable zones
6. Wide Dynamic Range (WDR): Electronic WDR 60 Db
7. Viewing angle: 187° horizontal, 74° vertical (Panoramic Stream), 187° horizontal, 162° vertical (Fisheye Stream).
8. Compression types: H.264 (12 streams), MJPEG.
9. H.264 Resolutions  
(panoramic): a. 3840 x 1536 (5.9 MP)  
b. 3360 x 1344 (4.52 MP)  
c. 2560 x 1024 (2.62 MP)  
d. 1920 x 768 (1.47 MP)  
e. 1280 x 512 (0.66 MP)  
f. 800 x 320 (0.26 MP)
10. H.264 Resolutions  
(VCAM): a. 1280 x 720 (0.92 MP)  
b. 640 x 480 (0.31 MP)
11. H.264 Resolutions (Fisheye):  
a. 3360 x 3000 (10.1 MP)  
b. 2688 x 2400 (6.45 MP)  
c. 2240 x 2000 (4.48 MP)  
d. 1568 x 1400 (2.20 MP)  
e. 1120 x 1000 (1.12 MP)  
f. 672 x 600 (0.40 MP)



12. MJPEG Resolution:
  - a. 672 x 600 (0.40 MP)
13. Bit Rate: 0.8 Mbps – 10 Mbps (Constant)
14. Frame rate: 0-30 fps
15. Presentation: Video views shall be available in both fisheye and dewarped (flat) views as follows:
  - a. Fisheye views: 3 streams, one of which shall be MJPEG
  - b. Dewarped views: 4 streams of independent VCams, up to two of which can be Panoramic views
  - c. Panoramic views: 2 streams, each capable of displaying a dewarped view of a full 180° panorama:
    - 1) Means shall be provided to correct distortion in the panoramic view introduced when the camera is tilted downwards or upwards between +70 and -70° from horizontal.
    - 2) Means shall be provided to electronically vary the vertical position of the panorama view with respect to the center of the lens image.
16. Onboard Micro SD card storage, 256 GB capacity, speed class 10.
17. Pre-loaded video motion analytic.

C. Network:

1. Connectivity: 1000BASE-TX Ethernet with RJ-45 connector
2. Protocols supported
  - a. Transmission Control Protocol (TCP), Internet Protocol (IP) v4, User Datagram Protocol (UDP)
  - b. Configuration: Dynamic Host Configuration Protocol (DHCP)
  - c. Web services: Hypertext Transfer Protocol (HTTP)
  - d. Network services: Domain Name System (DNS), Network Time Protocol (NTP), Internet Control Message Protocol (ICMP), Universal Plug and Play (UPnP)
  - e. Media: Real-Time Transport Protocol (RTP), Real-Time Streaming Protocol (RTSP)
  - f. Multicast: Internet Group Management Protocol (IGMP)
  - g. Notifications: Simple Mail Transfer Protocol (SMTP)
3. Unicast - The 180-degree camera shall support 20 simultaneous users of independent streams.
4. Multicast - The 180-degree camera shall support multicast for an H.264 main camera stream.
5. Security: The 180-degree camera shall have a user configurable password feature.



D. Electrical, Mechanical and Environmental:

1. 12VDC or PoE (IEEE standard 802.3af) – 48 VDC nominal.
2. Material: Polymer & aluminum
3. Anti-tamper: HEX security locking screw
4. Dimensions: 220 x 160 x 138 mm (8.7" x 6.3" x 5.4")
5. Temperature Operating: -40° C to 55° C (-40° F to 131°F)  
Storage: -40° C to 70° C (-40° F to 158°F)
6. Environmental rating: IP66, IP67, IP68 (2 m for 30 mins), IP69K
7. Impact rating: IK10+
8. Mounting Accessories:
  - a. Pendant
  - b. Pole
  - c. Wall

E. Acceptable Manufacturers:

1. Pelco, by Schneider Electric, EVOLN 180 ENVRMTL SRFMT 12M IPCAM WT Environmental, Part # EVO-180-WED-P (Basis of Design)
2. Arecont Vision.
3. Samsung.
4. Or approved equal.

2.6 CCTV VIDEO MANAGEMENT SYSTEM (VMS)

A. Scalable Microsoft Windows™-based video management and surveillance system in a single server, as follows:

1. A management database server application to maintain the database of cameras and recording devices and to provide a web-based administrative portal to manage the video surveillance system.
2. A stream management application to route video traffic to users as requested and appropriate.
3. A client presentation application to allow users to view and manage live and recorded video.



4. A storage management application to manage the video storage resources on the network.
- B. The IP video management system shall record video and audio streams from IP cameras and video encoders on the network.
    1. Video: MPEG4, MJPEG, H.264, or H.265 in High, Main, or Base Profile streams from both standard resolution and megapixel cameras
    2. Audio: Bidirectional, full or half duplex compressed via G.711 PCM 8 bit, 8khz mono at 64 kbit/s.
  - C. The system shall support recording schedules, including the ability to record based on motion, analytic, and alarm events.
  - D. The IP video management system shall be capable of continuous scheduled alarm/event and motion recording. Pre- and post- alarm recording shall also be available and shall be fully programmable on a per channel basis.
  - E. Recording Time and Storage: 30 days, 24/7 operation, minimum.
  - F. The IP video management system shall have the ability to record and playback audio streams along with associated video.
  - G. The IP Video Management System shall support recording of primary or secondary streams, individually or simultaneously. The server application can be configured to record a stream in unicast or multicast.
  - H. The IP Video Management System shall support video bookmarking, such that users can identify and recall important moments in recorded video based on the bookmark name or notes that are associated with it.
  - I. The IP video management system shall allow the administrator to set minimum and maximum retention periods for recorded video.
  - J. The IP video management system shall support network health and monitoring utilizing third-party SNMP monitoring tools.
  - K. The IP video management system shall indicate system performance and operation status utilizing a variety of reports.
  - L. The system shall be configurable remotely or over a network.
  - M. The system shall allow users to manually add cameras and devices by IP address.
  - N. The system shall allow users with sufficient rights to control cameras (pan, tilt, and/or zoom).



- O. The system shall support aggregation by a higher-level system, tying multiple servers together in a single, unified environment.
- P. The system shall support third-party cameras using ONVIF profiles S or native drivers.
- Q. The IP VMS shall support Lightweight Directory Access Protocol (LDAP) to authenticate users.
- R. The IP video management system shall allow archival of video data to external network locations or NAS devices over a network connection. The archival schedule shall be either automatic at user-defined intervals or manually executed.
- S. The server shall support semantic grouping and organization of cameras/devices into groups using “tags”.
- T. The system shall allow users to export video on request; exported video shall be stored locally on the server or on another network location selected by the administrator.
- U. The system shall support aggregation by a higher-level environment, allowing the IP video management system to belong to a confederation of servers.
- V. The VMS shall be accessible via a web browser with no software installed for live and playback functionality.
- W. Client application:
  - 1. Shall be Windows-based, providing an environment from which authorized users can watch live and recorded video on a computer in which the application has been installed.
  - 2. Shall be web-based, providing an environment from which authorized users can watch live and recorded video on a computer in which the application has not been installed.
  - 3. Shall be capable of being used only for the application, with no other access provided to other applications or the internet.
  - 4. Shall be capable of being setup as either unicast or multicast.
  - 5. Shall be able to connect with multi-server access (MSA).
- X. Live View and Playback
  - 1. A list of video and audio sources which users are authorized to access shall be displayed.
  - 2. Each video source shall indicate a list of current viewers to a user with appropriate permissions.





3. Each video source that is being viewed shall display whether there are current alarms associated with the source.
4. The client shall indicate when there has been a reduction in video quality for the displayed video sources.
5. The client computer shall be able to connect to an unlimited number of recorders simultaneously to display live and recorded video.
6. The client shall allow video streams to be selectable from a system tree on an individual camera, individual system, client defined local groups, or from pre-defined recorder-based groups.
7. The client shall playback audio associated with video sources for users with the correct permissions.
8. Users shall be able to seamlessly switch between live and recorded video on the fly.
9. Live View
  - a. For live view, all cells will be displayed at the highest quality possible, based on the bandwidth and client hardware. The Client application will use the primary stream from a video source as the default; if the bandwidth or client hardware are approaching the limit, the video quality of as many streams as necessary will then be streamed as secondary or at MJPEG quality.
10. Pan Tilt Zoom (PTZ)
  - a. Digital Zoom - An operator shall be able to digitally zoom in a video stream in live or playback mode.
  - b. Optical Zoom and Pan Tilt Control: Operators shall be able to use a mouse or joystick to control PTZ cameras.
  - c. The Client application shall be able to perform digital de-warping of 180-, 270-, and 360-degree cameras, and should be able to save the de-warped views for replay.
11. Playback
  - a. The Client application shall enable simultaneous playback for up to nine (9) synchronized cameras.
  - b. The Client application shall have the capability to playback non-synchronized cameras at one time in different cells.
  - c. For viewing recorded video, cells 1/4 the size of the tab or larger shall display full-frame rate video, and cells smaller than 1/4 the size of the tab shall playback only I-Frames to conserve bandwidth and processing power.
  - d. When hovering over a recorded video time bar, an operator shall see a thumbnail representing the contents of the video stream at that point in time.

- e. Available playback control functions:
    - 1) date-time selection
    - 2) synchronized playback of selected cells within a tab
    - 3) play video at normal speed
    - 4) pause video and advance one frame
    - 5) pause video and rewind one frame
    - 6) fast forward video at speeds up to 128x
    - 7) rewind video at speeds up to 128x
    - 8) rewinds video 30 seconds and initiates playback
    - 9) forward video to live playback
    - 10) take snapshot of the current frame
  - f. Hovering over a video playback cell with a mouse shall display the playback control menu.
12. The user shall be able to configure a rotating sequence of cameras, allowing the application to cycle through cameras relevant to the operator without intervention.
- a. Using keyboard input alone, the operator can type a camera number, a preset number, or a time (hhmm format) to jump to a selected camera. No mouse input is necessary.
13. The user shall be able to configure a sequence of cameras that appear on alarm, allowing the application to cycle cameras when an event or alarm relevant to the user occurs.
14. The user shall be able to create a sequence of cameras by dragging and dropping camera names in a single user interface.
- Y. Provide VMS from one of the following:
- 1. Pelco VideoXpert Professional (Basis of Design)
  - 2. Milestone XProtect Professional.
  - 3. OnSSI, Inc. Ocularis Professional.

## 2.7 VMS SERVER

- A. Provide rack-mounted or tower servers, quantities as shown on the drawings or as noted in these specifications, for managing up to 64 IP CCTV cameras.
- B. Tower Server Specifications / Minimum System Requirements:
  - 1. Processor: Intel® Core™ i5
  - 2. Operating System: Microsoft® Windows® 10 IoT Enterprise 64-bit (LTSB)



3. OS Drive: SSD 240 GB
  4. RAM: 16 GB DDR4
  5. HDD:
    - a. Maximum Storage Up to 20 TB
    - b. RAID Level: RAID5 / JBOD
  6. Video
    - a. Outputs
      - 1) 4x Mini DisplayPort 1.4
    - b. System NVIDIA Quadro P620 (2 GB memory)
    - c. Maximum Video Resolution Per Output Type
      - 1) mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz
  7. Optical Drive DVD±RW
  8. Networking
    - a. Gigabit Ethernet (1000Base-T) ports: 2x + dedicated iDRAC port
    - b. Throughput: Up to 450 Mbps
    - c. IP Version: IPv4 and IPv6
  9. Browser: Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
  10. Power
    - a. Input: 100 to 240 VAC 50/60 Hz, autoranging
  11. Environmental
    - a. Temperature
      - 1) Operating: 10° to 50°C (32° to 95°F) with no direct sunlight on the equipment 2) Storage: -40° to 65°C (-40° to 149°F)
    - b. Operating Humidity: 10% to 80% with 29°C (84.2°F) max. dew point
    - c. Non-Operating Relative Humidity: 5% to 95% with 33°C (91.4°F) max. dew point, non-condensing
- C. Provide VMS tower server from one of the following:
1. Pelco Model #VXP-F-20-J-S-64 (Basis of Design)
  2. Milestone.
  3. OnSSI, Inc.



D. Rack-Mounted Server Specifications / Minimum System Requirements:

1. Processor: Intel® Xeon Silver 4110
2. Operating System: Microsoft® Windows® 10 IoT Enterprise 64-bit (LTSB)
3. OS Drive: 2x SSD 240 GB (RAID 1)
4. RAM: 16 GB DDR4
5. Video
  - a. Outputs
    - 1) 4x Mini DisplayPort 1.4
  - b. System NVIDIA Quadro P620 (2 GB memory)
  - c. Maximum Video Resolution Per Output Type
    - 1) mDP 1.4 direct connect HDR 5120 x 2880 at 60 Hz
6. Networking
  - a. Gigabit Ethernet (1000Base-T) ports: 2x + dedicated iDRAC port
  - b. Throughput: Up to 450 Mbps
  - c. IP Version: IPv4 and IPv6
7. Browser: Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
8. Power
  - a. Input: 100 to 240 VAC 50/60 Hz, autoranging
9. Environmental
  - a. Temperature
    - 1) Operating: 10° to 50°C (32° to 95°F) with no direct sunlight on the equipment
    - 2) Storage: -40° to 65°C (-40° to 149°F)
  - b. Operating Humidity: 10% to 80% with 29°C (84.2°F) max. dew point
10. Non-Operating Relative Humidity: 5% to 95% with 33°C (91.4°F) max. dew point, non-condensing.

E. Provide VMS tower server from one of the following:

1. Pelco Model #VXP-P2-24-J-D (Basis of Design)
2. Milestone.
3. OnSSI, Inc.



## 2.8 SECURITY WORKSTATION

A. Provide two (2) CCTV workstations.

B. Specifications / Minimum System Requirements:

1. Processor: Intel Core™ i7-6700
2. Operating System: Microsoft Windows 10 IoT Enterprise 64-bit (LTSC)
3. OS Drive: m.2 256 GB
4. RAM: 8 GB DDR4
5. Video
  - a. Outputs:
    - 1) 2X DisplayPort
    - 2) HDMI
  - b. System Intel HD Graphics 530 (shared memory)
  - c. Maximum Video Resolution Per Output
    - Type 1) HDMI 1.4 4096 x 2304 at 24 Hz
    - 2) DP 4096 x 2304 at 60 Hz
  - d. Video Standards
    - 1) NTSC 60 Hz capable
    - 2) PAL 75 Hz capable
6. Audio
  - a. Inputs Universal Audio Jack (front)
  - b. Outputs Universal Audio Jack (front), Line Out (rear), Internal Speaker, DisplayPort Audio, HDMI Audio
  - c. Connector Types 3.5 mm 4 pole (In/Out), 3.5 mm 3 pole (Out), DP cable (Out), HDMI Cable (Out)
7. USB Ports
  - a. USB 2.0 2x front, 2x rear
  - b. USB 3.0 1x front, 4x rear
  - c. USB 3.1 Type-C 1x front
8. Enhanced keyboard:
  - a. The keyboard must be compatible with all distributed, network video management systems.
  - b. The keyboard must support USB 2.0 protocol, and the USB must operate at full-speed.



9. 3D Mouse Controller
  - a. The 3D Mouse must be compatible with all distributed, network video management components.
  - b. Patented six-degrees-of-freedom (6DoF) sensor – Intuitively and precisely navigate digital models or camera positions in 3D space.
  - c. Advanced ergonomic design – The full-size, soft-coated hand rest positions the hand comfortably, and 15 large, soft-touch, function keys allow quick access to frequently used commands.
  - d. QuickView Keys – Fingertip access to 12 views makes it easier to switch cameras.
  - e. Intelligent Function Keys – Easy access to 4 application commands for an optimized workflow.
  - f. On-Screen Display – Provides a visual reminder of function key assignments on your computer screen.
  - g. 3D Space Mouse Modifiers – Fingertip access to Ctrl, Shift, Alt and Esc keys saves time by reducing the need to move your hand between mouse and 3D Mouse.
  - h. Virtual NumPad – Allows direct numerical input into your application using your standard mouse rather than the 3D Mouse.
  - i. The 3D Mouse must be part of an integrated system and shall be configured so any number can be added to the system. When combined with user interfaces (UIs), network storage managers (NSM's), encoders, IP cameras, and video consoles, the 3D Mouse forms an integral part of a complete network-based video control system.
  - j. Hardware
    - 1) Power Supply Input Connector Type: Universal, interchangeable
    - 2) 3D Space Mouse Interface USB 2.0
    - 3) Cable USB
    - 4) Module Specifications
      - a) 3D Space Mouse Keypad
      - b) Joystick: Fully proportional PTZ, variable speed; with zoom, iris, and focus controls.
10. Networking
  - a. Gigabit Ethernet (1000Base-T) ports 1x
  - b. IP Version IPv4 and IPv6
11. Browser: Current version of Google Chrome, Mozilla Firefox, or Microsoft Edge
12. Power
  - a. Input 90 to 264 VAC, 47 to 63 Hz, 3 A/1.5 A
  - b. Supply Internal 180 W (Bronze)
  - c. Consumption 614 BTU/hr maximum (180 W power supply)



13. Environmental
  - a. Temperature
    - 1) Operating 0° to 35°C (32° to 95°F) with no direct sunlight
    - 2) Storage -40° to 65°C (-40° to 149°F)
  - b. Operating Humidity 5% to 95% (non-condensing)
  - c. Non-Operating Relative Humidity 10% to 90% non-condensing
  - d. Operating Altitude 15.2 to 3048 m (-50 to 10,000 ft)
  - e. Operating Vibration 0.66 Grms

C. Pelco Model # VXP-WKS (basis of design).

1. Or approved equal.

## 2.9 SECURITY MONITORS

A. Provide one (1) 19" (minimum) LCD high definition flat screen monitor, cables, power cords and desktop or wall-mount for use by the School Police officer. Coordinate exact mounting method and location in the field.

1. Pelco Model # SMT-1935 (basis of design).
2. Or approved equal.

B. Provide one (1) 43" (minimum) backlit, LCD full high definition flat screen monitor, cables, power cords and desktop or wall-mount for use in the general office. Coordinate exact mounting method and location in the field.

1. Pelco Model # PMCL643 (basis of design).
2. Or approved equal.

## 2.10 EQUIPMENT CABINETS

A. Provide stand-alone EIA compliant 24" wide, 36" deep digital security network enclosure(s), quantities as shown on the drawings or as noted in these specifications.

1. Fully welded construction, UL listed load capacity 1,600 lbs. minimum.
2. Two (2) pairs of fully adjustable steel cage nut rack rail with 6MM mounting hardware in universal EIA spacing, black e-coat finish and numbered rack spaces, front to rear passive cooling.
3. Grounding busbar, mounting brackets, patch panel brackets, equipment brackets, power strip and fan kit.



B. Provide from one of the following:

1. Middle Atlantic Products SNE Series (basis of design).
2. Hubbell.
3. Chatsworth.
4. Or approved equal.

## 2.11 UPS

A. Continuous duty, single-phase static Uninterruptible Power Supply (UPS), with double conversion online topology.

B. 5000VA, 208/240VAC to 120VAC step down with surge protection.

1. Internal bypass and input power factor correction.
2. Input disconnect and filter stage, input PFC power stage, energy storage stage (DC bus capacitor bank), output power (inverter) stage, bypass and a battery charger.
3. Microcontroller based power module and fault detection.
  - a. The input disconnect and filter stage shall contain an input back-feed relay, input filter, transient suppression, and battery select switches (mechanical).
  - b. The input PFC power stage shall contain non-isolated power factor correcting AC/DC converters, capable of full power operation over a very wide input voltage range or from a nominal DC battery voltage.
  - c. The energy storage stage shall be a split DC bus capacitor handling seamless transitions from battery to line and vice versa, as well as the low and high frequency power stages ripple.
  - d. The output power (inverter) stage shall operate directly from the DC bus and produce a configurable AC output voltage of 208 V or 240 V output, as noted or as required. UPS output shall be connected either to the inverter or through a bypass relay, contactor, or static switch to the filtered input line.
  - e. The UPS shall contain a battery charger, which operates from the DC bus. The UPS batteries shall be modular, hot-swappable, and user-replaceable. The UPS shall be able to be restarted immediately after a prolonged power outage without waiting for the battery to be recharged.
4. Flash memory to facilitate firmware upgrades.
5. Provide a graphical LCD display with multicolor backlight with detailed information, with the ability to configure the display locally.





6. Provide an imbedded integrated UPS Network Management Card 2 with Environmental Monitoring.
7. The UPS shall provide early-warning fault analysis on batteries and shall project battery replacement dates.
8. Shall comply with ENERGY STAR (USA), FCC Part 15 Class A, UL 1778.
9. Battery shall be maintenance-free sealed lead-acid battery with suspended electrolyte, leak proof, 960 VAH.

C. Provide UPS from one of the following:

1. APC by Schneider Electric Model #SRT5KXLT-5KTF (Basis of Design)
2. Liebert.
3. Or approved equal.

2.12 NETWORK SWITCH(ES)

- A. Provide 24-port or 54-port Gigabit PoE+ network switches, with mounting hardware, sizes and quantities as shown on the drawings or noted in the specifications, with patch cables and power cords.
- B. 24-port switch Characteristics:
  1. Data Transfer Rate: 2000 Mbps (full duplex)
  2. Data RAM Buffer: 512 KB
  3. Switch Fabric: 48 Gbps.
  4. PoE budget: 370W
  5. Overcurrent and circuit sorting protection.



- C. 54-port switch Characteristics:
  - 1. Data Transfer Rate: 2000 Mbps (full duplex)
  - 2. Data RAM Buffer: 12Mbits
  - 3. Switch fabric: 104 Gbps
  - 4. PoE budget: 740W
  - 5. Overcurrent and circuit sorting protection.

D. Provide rack mounting kit and power cord.

E. Provide network switches from the following:

- 1. 24 port: TRENDnet Model # TPE-TG240G; 54-port: TRENDnet Model # TPE-5048WS (basis of design).
- 2. Or approved equal.

## 2.13 CABLE MANAGEMENT, PATCH PANELS, PATCH CORDS AND FIBER TERMINATION HARDWARE

A. Refer to Specification Section 27 1000 for requirements.

## 2.14 FIBER MEDIA CONVERTERS

A. Provide rack-mountable and stand-alone media converters for CCTV camera locations exceeding 90 meters cable distance from the CCTV network switch.

B. Provide 12-slot media converter racks, with internal universal power supply, hot-swappable converters, mounting brackets, power cord and mounting hardware, quantities as shown on the drawings, as noted in these specifications, or as required based on field conditions.

- 1. PROVIDE Gigabit Ethernet media converter modules, Standards-based 1000Base-T to 1000Base-SX/LX, Layer 1, hot-swappable.

C. Provide stand-alone 2-port 10/100/1000 copper to fiber media converter with IEEE 802.3at PoE+ on the copper port and external 120VAC/56VDC power supply.



D. Provide fiber media converters and racks from the following:

1. Transition Networks (basis of design).
2. Omnitron.
3. Black Box
4. Or approved equal.

#### 2.15 CCTV CABLES

A. Refer to Specification Sections 27 1000 and 28 0513 for cable requirements.

### **PART 3 - EXECUTION**

#### 3.1 GENERAL

A. The Contractor shall provide all surveillance equipment being furnished under the contract, unless otherwise noted. Equipment shall be installed in accordance with the manufacturers' recommendations. This information shall be provided to the Owner and the Engineer at the time catalog cuts and shop drawings are submitted for approval. The Contractor shall perform all setting, adjustment, and programming required for a complete and operational surveillance system as directed by the Owner and the Engineer.

#### 3.2 CAMERAS, LENSES, HOUSINGS, MOUNTS

- A. All prepackaged cameras/housings shall be painted or otherwise made to blend into the environment.
- B. Prepackaged cameras/housings shall be mounted in an unobtrusive manner. Final approval of the installation shall be by the Owner, Architect and Engineer.
- C. Prepackaged cameras/housings installed in suspended acoustical tile ceilings shall be supported independently of the ceiling grid by wires or other approved supporting means.
- D. All prepackaged cameras/housings shall be properly grounded with a Number 6AWG (minimum) copper insulated cable.
- E. Provide additional cables or equipment as required for proper synchronization.



### 3.3 CABLING

- A. All distribution cables installed exterior to the building shall be installed in rigid galvanized steel (RGS) or IMC conduit, minimum size 3/4 inch. Liquidtight flexible metal conduit, minimum size 3/4 inch, in lengths not exceeding three (3) feet and with approved fittings, shall be permitted for final connections to weatherproof cameras.
- B. All distribution cables installed in interior locations where exposed or subject to damage or where installed in walls or non-accessible ceilings shall be installed in EMT. Flexible metal conduit, minimum size 3/4 inch, shall be permitted (in interior locations and where permitted by the NEC) for final connections to outlet boxes installed in suspended acoustical tile ceilings.
- C. All distribution cables installed above accessible suspended acoustical tile ceilings shall be installed in EMT conduit or flexible metallic conduit.
- D. No cable shall be exposed to any physical damage. Cables shall be protected from point of termination to point of termination. No cables shall be visible once installed.
- E. Refer to Division 26 Specifications for raceway and sleeve requirements. Refer to Division 07 Specifications for fireproofing requirements.

### 3.4 LABELING

- A. All components shall follow the labeling plan as directed by the Owner and the Engineer and must be updated for an as-built submittal. This will include all cables, conduits, patch panels, jumper cords and equipment.
- B. The Contractor shall label all components following this plan, using permanent/legible typed or machine engraved labels.
- C. Handwritten labels are not acceptable.
- D. Plastic embossing tape is not acceptable.
- E. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or type written onto adhesive labels. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the width of the tape shall not exceed 3/8 inch, and the font color shall contrast with the background, or as detailed on drawings.
- F. All components shall be labeled with: component name or number and port assignment. Labeling plan to include nearest room number, end-user name, etc.
- G. A schematic plan clearly labeled with all component names and numbers shall be included in the as-built drawings. All labels shall correspond to labeling plan, component informational matrix, and with final test reports.



### 3.5 CONFIGURATION AND PROGRAMMING

- A. Configure all CCTV equipment for proper operation. Properly set all dipswitches, assign camera names, aim cameras, verify proper scenes, set up recording sequences and adjust all equipment as needed until the District is satisfied with the operation of the camera system.
- B. Set up workstations, load all software, set up viewing and administrative privileges. Configure viewing, recording, alarm and report screens. Set up hot keys.
- C. Set up monitors and configure multi-camera views.
- D. Coordinate with the District and provide configuration for all IP addresses and for CCTV system reporting to the district central monitoring site.

### 3.6 TESTING

- A. Contractor shall test each and every component installed to ensure proper configuration and operation. The Owner reserves the right to have a representative present during any portion or all of the testing process. The Owner and the Engineer shall be notified two (2) weeks prior to any testing so testing can be witnessed.
- B. Contractor shall provide testing documentation as per the Submittal Section of Specification Section 280500.
- C. Before conducting a final inspection, the Contractor shall perform a series of system installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for component testing.
- D. Refer to Specification 280500, paragraph 3.4 for additional requirements.

### 3.7 TRAINING

- A. Refer to Specification 280500, paragraph 3.5.

END OF SECTION 28 2300