
PART 1 - GENERAL**1.1 DISCLAIMER**

A. General

- a. THIS DOCUMENT CONTAINS SENSITIVE SECURITY INFORMATION THAT IS CONTROLLED. NO PART OF THIS DOCUMENT MAY BE RELEASED TO ANY PERSON WITHOUT THE WRITTEN PERMISSION OF THE OWNER. UNAUTHORIZED RELEASE BY A CONTRACTOR SHALL RESULT IN THE OWNER AVAILING ITSELF OF ALL LEGAL RIGHTS AND REMEDIES PROVIDED BY LAW OR AVAILABLE UNDER ANY THIRD PARTY CONTRACT.

1.2 RELATED DOCUMENTS

1. General

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division Specification Sections, apply to and are referenced in this Section. These include:
 - 1) Electrical division
 - 2) Telecommunications/grounding BUS systems, as applicable.
 - 3) Door Hardware / door schedule division
 - 4) Elevator division
 - 5) Lighting

1.3 CONTRACTOR'S REPRESENTATION

A. General

1. Each Bidder, by making a bid, represents:
 - a. That they have read and understand the Construction Documents.
 - b. That they have carefully examined all bid documents pertaining to the Project, including documents provided in conjunction with this document.
 - 1) That they have familiarized themselves with the local conditions under which the Work is to be performed including pertinent country, state and local codes, and the conditions of labor and material markets.
 - 2) Affirm they will provide the scope of Work as indicated within this document for a proposed not-to-exceed cost.

1.4 DEFINITIONS

A. General

1. Where required terms are defined herein
 - a. "Owner" – Boston Properties
 - b. "Architect" – Kendall Heaton Architects
 - c. "Project" – Transbay Tower Project
 - d. "Computer Network" – Network
 - e. "Specification" – This document
 - f. "Construction Documents" – Drawings/security drawings, Specification and Owner Requirements
 - g. "Provide" – Furnish and install
 - h. "GUI" – Graphical User Interface
 - i. "Work" – The installation and programming required for a fully functional Security Management System
 - j. "RCP" – Reflected Ceiling Plan
 - k. "Contractor" – Contractor
 - l. "NIC" – Shown for information, refer to other divisions for requirements.
2. "SMS" – Security Management System, which consist of the following:
 - a. "ACMS" – Access Control and Alarm Monitoring System
 - b. "ER" – Equipment Racks
 - c. "NVR" – Networked Video Recorder

- d. "VCS" – Voice Communication Systems
 - 1) General Intercom
 - 2) Video Intercom
 - 3) Intercom – Area of Rescue
 - 4) Intercom Master Station
 - 5) Elevator Intercoms
 - 6) Call-For-Assistance (CFA) Devices
- e. "VMS" – Visitor Management System

1.5 PROJECT DESCRIPTION

A. General

1. The scope of the project is fully defined by the specifications and security systems drawings (Contract Documents). The Contractor shall provide all systems, racks, peripherals in accordance with the construction documents.
2. The Security Management System (SMS) shall consist of the provision of a dedicated fiber-optic computer network. This shall be inclusive of all hubs, fiber routers/switches, transceivers and the provision of a Surveillance System, Networked Video Recorders (NVR), Voice Communication System (VCS), Access Control and Alarm Monitoring Systems (ACMS), Optical Turnstiles, interfaces and other security peripherals identified on the security systems drawings. The following document describes the means, methods, and equipment criteria proposed for the Transbay Tower Project; hereafter referred to as the "Project".
3. All exterior horizontal/vertical and interior vertical cabling (including garage areas) shall be encapsulated in point-to-point conduit. Interior cabling shall be plenum, and stubbed into the ceiling cavity where it will transition to plenum cabling. All cabling/conduit shall be properly supported in accordance with the security system drawings, construction documents, Electrical specifications and Owner requirements. The Contractor shall coordinate cable management, which shall include raceway requirements; cabling shall be neatly dressed and strapped in accordance with this specification.
4. Equipment panels, head-end equipment, turnstiles power supplies, and support equipment shall be installed in accordance with this specification and the drawings. All wall usage for panels and support equipment shall be coordinated with the Owner, Architect, and other contractors trades prior to rough-in.

1.6 REFERENCES

A. General

1. The following codes/guidelines and standards shall be applicable to the Work envisioned and being proposed by the Contractor. It is the Contractors' responsibility to provide a proposal that shall conform to the Owner's standards and, if applicable, the following industry guidelines, standards/codes or regulations. The following information shall only be superseded by the Owner's standards, the Authority Having Jurisdiction (AHJ), applicable federal, state, and local laws, regulations and codes. References include:
 - a. Federal Communications Commission (FCC):
 - 1) FCC Part 15 – Radio Frequency Devices.
 - 2) FCC Part 68 – Connection of Terminal Equipment to the Telephone Network.
 - b. Underwriters Laboratories (UL):
 - 1) UL294 – Access Control System Units.
 - 2) UL1076 – Proprietary Burglar Alarm Units and Systems.
 - 3) UL 969 – Marking and Labeling Systems.
 - c. National Fire Protection Association (NFPA):
 - 1) NFPA70 – National Electrical Code.
 - 2) NFPA 101 – Life Safety Code.
 - d. Electronic Industries Alliance (EIA):
 - 1) RS-485 – Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multi-Point Systems.
 - 2) EIA-568-A, B – Commercial Building Telecommunications Cabling Standard.
 - 3) EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 4) EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
 - 5) EIA TSB-75 – Additional Horizontal Cabling Practices for Open Offices.

- e. National Electrical Manufacturers Association (NEMA):
 - 1) Section 250 Enclosures for Electrical Equipment.
- f. Building Industry Consulting Services International (BICSI):
 - 1) ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
 - 2) NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - 3) ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 - 4) IEEE/ANSI 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 5) UL 467, Electrical Grounding and Bonding Equipment.
 - 6) ANSI JSTD607A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - 7) TIA/EIA598: Optical Fiber Cable Color Coding.
 - 8) TIA/EIA 45521A: Mating Durability for Fiber Optic Interconnecting Devices
 - 9) TIA/EIA 52614A: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - 10) TIA/EIA 5267: Optical Power Loss Measurements of Installed Single mode Fiber Cable Plant
 - 11) UL 910: Tests for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables used in Spaces Transporting Environmental Air.
 - 12) UL1666: Tests for Flame Propagation Height of Electrical and Optical Fiber Cables Installed Vertically in Shafts.
 - 13) Electromagnetic Compatibility (EMC) standards EN55022 for electromagnetic emissions, and EN50082 for immunity.
- 2. Miscellaneous:
 - a. Applicable federal, state, local laws, regulations, and codes.
 - b. The Americans with Disabilities Act of 1990 (ADA).
 - c. ONVIF (Open Standard Compliance)

1.7 GENERAL REQUIREMENTS AND CONDITION

- A. General
 - 1. The Contractor shall configure the system as described and shown on the drawings. The system shall include all connectors, adapters, and terminators necessary to interconnect all equipment.
 - 2. Work areas shall be kept clean and orderly.
 - 3. The Extent of Work: The System shall be installed in accordance with the Construction Documents.
 - 4. Data Entry: The Contractor shall enter all data needed to make the system operational. The Contractor shall identify and request from the Owner, any additional data needed to provide complete and operational Surveillance System, ACMS, VMS and NVR systems.
- B. Cabling shall be encapsulated within conduit and in accordance with the Electrical specifications.
- C. Coordination, which is limited to, but not withstanding to the following must be coordinated, and if applicable subcontracted. This includes:
 - 1. Fire wall penetrations and repair.
 - 2. Masonry penetrations and repair.
 - 3. Riser penetrations/floor coring and repair.
- D. Unless otherwise noted, cabling shall be continuous without splices. If the Contractor does not notify the Owner of required splices for any reason, the cost to provide a connection or a warranty period that is acceptable to the Owner shall be the burden of the Contractor.
- E. The Contractor shall provide surge suppression and grounding equipment, for all equipment required to protect head end security equipment, as well as external systems that may or may not be associated to security equipment.
- F. It shall be the Contractor's burden to prove that any manufacturer or model, other than the ones listed for each product, meet or exceed the requirements stated herein; if submitted.

1.8 SYSTEM MODIFICATIONS

A. General

1. The Contractor may not alter or modify software or firmware without the manufacturer's written approval. Damage to systems, as a result of firmware or software modifications made by the Contractor, shall be their responsibility to correct.

1.9 SYSTEMS NETWORKING

A. General

1. The SMS shall operate entirely on a minimum of a gigabit fiber optic computer network, which shall include all switches, routers, hubs, cabling, patch panels/blocks to support SMS functionality and communication. The exact bandwidth and network environment shall be calculated by the Security Contractor and shall be provided in accordance with the SMS manufacturer requirements.
2. Vertical backbone shall be fiber optic cabling.
3. Exterior horizontal cabling to edge devices/appliances shall be via fiber optic cabling.
4. All cabling shall be installed in accordance with representative manufacturer or industry standards, best practices, or guidelines.

B. Testing

1. All network cabling shall be encapsulated in conduit and shall be tested/certified, prior to Substantial Completion

C. Fiber communications – Exterior Devices

1. All devices installed on the exterior of the building to include, but not limited to: cameras, CFA devices, access control panels, network routers shall be connected to the security network via loose-tube (buffered) fiber optic cabling. For each fiber connection, a minimum of two (2) pairs of fibers shall be pulled to each end device and home-run back to the security equipment room/location.

1.10 QUALITY ASSURANCE

A. General

1. Qualifications: Outside other direction, the company with a minimum of five (5) years system design, engineering supervision, and installation experience in security systems and has been authorized to install the products specified.

B. System Checkout

1. Pre-testing: To a reasonable extent, all components and assemblies of the control unit are to be pre-tested by the Contractor prior to delivery on-site.
2. Burn-In: 1,000 hours at normal operating conditions or equivalency.
3. On-Site Testing: Manufacturer trained and authorized systems Integrator shall functionally test each component in the system after installation to verify proper operation and confirm that the panel wiring and addressing is accurate.
4. Network certification testing shall be provided for all cabling.

1.11 CONTRACTOR QUALIFICATIONS

A. General

1. Unless otherwise specified, the Contractor shall have an office that is staffed with personnel trained in Integrating SMS, such as those envisioned by this specifications. Technicians shall be fully capable of providing instruction, routine, and emergency maintenance service on all SMS sub components, as well as hold all manufacturer licensures and certifications as required by the systems envisioned for the Project.

1.12 WARRANTY

A. General

1. System Components shall be warranted for a period of two (2) years that shall begin at Substantial Completion.

2. The Construction Documents are set forth to detail functions and standards of quality for the SMS, their components, and the methods of installation and operation. These documents do not depict precise connections, cabling, connections, software interfaces, etc. The intent of the Construction Documents is to provide pertinent information to allow the Contractor to bid the labor, supervision, tooling, and miscellaneous consumables to provide a complete SMS.
 3. The drawings included in this package are intended to convey the general concept of the system. The plans are not intended to show complete and accurate details of every aspect of the building or the security systems being provided. The drawings show approximate device locations and relationships which are subject to approval by the Owner. The Contractor is responsible for conducting all coordination and making all field measurements necessary for establishing the exact locations and relationships necessary for the installation of their equipment. All bid proposals will be prepared to reflect the standards of quality specified herein, employing equipment that meets or exceeds the specifications and drawings, hereafter referred to as Construction Documents for the Project.
 4. It is the responsibility of the Contractor to include any and all items required for a complete SMS if not identified in the Construction Documents for the proper and functional operation of the SMS being specified.
 5. The Contractor shall deliver complete and operational SMS to the Owner complete with the interfaces identified in the Construction Drawings. All engineering, labor, materials, delivery, storage of materials, permits, etc. that are necessary to satisfy the contract documents, will be provided by the Contractor as part of their proposal. Installation will be complete from the designated point of electrical power service connection and the final connection of apparatus or pieces of security equipment, unless modified/superseded by the drawings or specifications.
- B. Requirements of Work:
1. Employees: The Contractor shall furnish to the Owner a list of employees, all key personnel and the project representative(s).
 2. Schedule: The Contractor shall prepare and maintain a detailed schedule that shall indicate detailed activities for the projected life of the project. It will also detail manpower usage throughout the project. All shop drawings, change orders, and where applicable, materials must be approved by Owner prior to start of construction.
 3. Change orders: Any change orders must be approved by Owner prior to start of the change order work.
- C. Cutting, Drilling, Patching, etc.: The Contractor shall be responsible for providing any additional cutting, drilling, fitting or patching required, that is not indicated as to complete the Work or to make all parts fit together properly. The Contractor shall also address the following:
1. Submit a Cutting/Drilling/Patching request to the Owner in writing in advance of any alteration that affects:
 - a. Work of Owner or any separate contractor.
 - b. Structural integrity of any element of Work.
 - c. Integrity of weather-exposed or moisture-resistant element.
 - d. Efficiency or maintenance of operational element.
 - e. Visual qualities of sight-exposed elements.
 2. The Cutting/Drilling/Patching Request shall include:
 - a. Identification of Project.
 - b. Location and description of affected Work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work, and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate contractor.
 - g. Date and Time work will be executed.
 3. The Cutting/Drilling/Patching Materials shall be required to match original installation.
- D. Submittals: Contractor shall provide five (5) sets of submittals that consist of the following:
1. Technical Data Package I, II, III, and IV.

1.13 THIRD PARTY DEVICE INTERFACES

A. General

1. The Contractor is responsible for providing interfaces to the following devices:
 - a. Elevator(s)
 - 1) Control/Recall interface to ACMS
 - 2) Service key alarm interface to ACMS
 - b. Fire Alarm Interfaces - Door Unlocking
 - 1) The Contractor shall provide fire interface(s) in accordance with prevailing code. The fire interface upon fire alarm activation shall deactivate locking hardware in accordance with the prevailing code.
 - 2) The Contractor shall coordinate door hardware unlocking with the door hardware supplier for fail safe/fail secure configuration, power type and fire interface.
 - c. Roll-Up Door Operators
 - 1) Remote Operation through ACMS
 - a) Open/Close/Stop
 - d. Vehicle Barrier Systems
 - 1) Remote operation through ACMS
 - a) Open/Close
 - e. Call-for-Assistance
 - 1) Camera integration/call-up
 - f. Accessible Door Activation Buttons (Handicap door operators)
 - g. Integral Request-To-Exit Micro Switches (Within Door Hardware)
 - h. Integration to VMS and ACMS Systems
 - i. ACMS Integration to NVR and Surveillance System

1.14 SUB-CONTRACTOR COORDINATION

A. General

1. It shall be the Contractor's responsibility to coordinate the necessary subcontracted work for the fulfillment of their Work.
 - a. Subcontracting Work can include, but is not limited to: Cable pulling, coring, electrical, telecommunication, civil and conduit work.

B. Electrical work

- a. The Contractor will be responsible for coordinating the locations of horizontal conduit and vertical conduit for their Work, where applicable.
- b. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- c. Coordinate Construction Schedule with the schedule of values, list of subcontracts, submittals schedule, progress reports, payment requests, and other required schedules and reports.
- d. Secure time commitments for performing critical elements of the Work from parties involved.
- e. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.15 SUBMITTALS

A. General

1. Submittals
 - a. Include all subsystems that shall comprise the SMS.
 - b. Manufacturer's Installation Instructions: Indicate methods for integrating and installing devices.
 - c. Any relevant wiring schematics or methods of installation shall be identified.

B. Requirements

1. Provide as part of their overall submittal a bound three-ring binder. Front cover should have adequate space for 7 inches by 7 inches Review Stamp. Each section shall be tabbed to the corresponding specification number and title.
2. Design drawings shall not be re-utilized and resubmitted as shop/as-built drawings.
3. A clear and legible table of contents shall be provided with space below each line item for reviewer comments.
 - a. Identify part number/quantities

4. Technical Data Package I:
 - a. Drawings:
 - 1) Provide detailed system drawings, including location and mounting requirements.
 - 2) Complete and legible legends should be provided for each of the drawings.
 - 3) Provide functional block diagrams.
 - 4) Provide mounting details, indicating mounting, protective housings etc.
 - 5) Provide wiring diagrams and point-wiring schematics to panels, indicating utilized inputs and spare inputs.
 - 6) Details of connections to power sources, including power supplies.
 - 7) Console/Rack installation, block diagrams, and wiring diagrams.
 - 8) Denote main cable pathways or individual home runs.
 - b. Product Data
 - 1) Provide original color product datasheets, describing the specification and technical requirements of the system and each component.
 - a) When multiple products are listed, denote by highlighting/marketing which product they intend to use.
 - 2) Miscellaneous cut sheets for wire, cable, terminal block connector's etc. shall clearly identify model numbers, manufacturer names and miscellaneous engineering data.
 - 3) Provide equipment quantities and model numbers for all equipment being proposed.
 - 4) Provide engineering calculations, such as voltage drop, electrical load calculations, etc. as it relates to devices.
 - 5) Provide Surveillance System power ratings, and submit a report of their calculations. The report should identify the:
 - a) Minimum Electrical Load
 - b) Input Voltage
5. System Description
 - a. Include system descriptions, analyses, and calculations used in sizing equipment specified. Descriptions and calculations shall show how the equipment will operate as a system to meet the performance of this specification.
 - b. Furthermore the description shall identify:
 - 1) Communication speeds and protocol descriptions.
 - 2) Command response time calculations.
 - 3) Start-up operations.
 - 4) Voltage drop calculations.
 - 5) Expansion capability and method of implementation.
6. Certifications
 - a. Specified manufacturer's certifications shall be included with the data package certification.
7. Technical Data Package II:
 - a. Verify that site conditions are in agreement with the design package. The Contractor shall submit a report of "Current Site Conditions" to the Owner documenting changes to the site, or conditions that affect performance of the system to be installed. For those changes or conditions which affect system installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. The Contractor shall not correct any deficiency without written permission from the Owner.
8. Technical Data Package III:
 - a. Prepare test procedures and reports for the performance verification test. The Contractor shall deliver the performance verification test procedure to the Owner for approval. After receipt by the Contractor of written approval of the test procedures, the Contractor may schedule the tests. The Contractor shall provide a report detailing the results of the field test as specified in "Contractor's Field Testing." The final performance verification report shall be delivered after completion of the tests.
 - b. A draft copy of the operation and maintenance manuals, as specified for the Technical Data Package IV, shall be delivered to the Owner prior to beginning the performance verification test for use during site testing.

9. Technical Data Package IV:
 - a. Final copies of each of the manufacturer's commercial manuals arranged as specified bound in hardback, loose-leaf binders shall be delivered to the Owner within five (5) days after completing the performance test. The draft copy used during site testing shall be updated prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and tabbed sheets. Tabbed sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the performance test shall include all modifications made during installation, checkout, and Substantial Completion.
 - b. Three (3) hard copies of each manual and Two (2) electronic copies on Compact Discs (complete with an organized file structure) shall be delivered to the Owner.
 - c. Functional Design Manual
 - 1) The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes.
 - d. Hardware Manual
 - 1) A manual shall describe all equipment furnished, including:
 - a) General hardware description and specifications.
 - b) Installation and checkout procedures.
 - c) Equipment electrical schematics and layout drawings.
 - d) System schematics and wiring lists.
 - e) Alignment and calibration procedures.
 - f) System setup procedures.
 - g) Manufacturer's repair parts list indicating sources of supply.
 - h) Interface definition.
 - e. Operation Manuals
 - 1) Operation manuals shall contain all instructions required for operation of the system.
 - 2) The operator's manual shall explain all procedures and instructions for operation of the system.
 - a) Operator commands.
 - b) Recovery and restart procedures.
 - c) System start-up and shutdown procedures.
 - 3) Concepts and procedure that shall aid in the overall understanding of the system.
 - f. Maintenance Manuals
 - 1) Maintenance manuals shall contain all information required for maintenance of the system.
 - 2) Wiring diagram, details, accurate cable pathway, power schedules, and fold out drawings as well as related information shall be provided.
 - 3) The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
 - g. Manufacturer's Service Manuals
 - 1) Provide warranty letter.
 - h. Record Drawings
 - 1) Provide updated drawings, denoting all changes to the construction documents and the date at which the change took place.
 - 2) Provide updated drawings, which illustrate final field conditions; these drawings shall incorporate all changes to the construction documents.
 - 3) Panel power schedules, denoting circuits dedicated for use.
 - 4) Wire and cable run sheets including cable identification numbers and terminal strip designations.
 - 5) Legends which indicate device types, symbols, abbreviations, and manufacturer's model numbers.
 - 6) Functional block diagrams for all subsystems. Schematic diagrams for all custom circuitry and interfaces to work are not part of the Contractor's scope.
 - 7) Elevations for equipment and/or riser closets, which show the exact configuration and physical installation of related equipment, interface panels, power supplies, junction boxes, and equipment cabinetry.

1.16 SYSTEM SUBSTANTIAL COMPLETION

- A. The system shall be ready for Substantial Completion one (1) week prior to the system "on-line" date established by the Owner. The Contractor shall coordinate and obtain the date from the Owner.
- B. The Contractor shall provide the following for Substantial Completion:
 - 1. All test reports and certification certificate.
 - 2. Warranty certificate.
 - 3. A binder with detailed product data sheets of all products used in the project.
 - 4. The punch-list cleared and completed and signed off from the Owner.
 - 5. Complete schedule of contract invoices and complete schedule of change order invoices.
 - 6. Completed Technical Data Packages I, II, III, and IV.

1.17 MAINTENANCE AND SERVICE

- A. Service personnel shall be certified in the maintenance and repair of similar types of equipment and qualified to accomplish work promptly and satisfactorily. The Owner shall be advised in writing of the name of the designated service representative, and of any change in personnel.
- B. The Contractor shall provide all services required and equipment necessary to maintain the entire security system in an operational state as specified for a period of two years upon Substantial Completion, and shall provide all necessary material required for the work. Impacts on facility operations shall be minimized when performing scheduled adjustments or other unscheduled work.
- C. The adjustment and repair of the security system includes signal transmission equipment. Provide the manufacturer's required adjustments and all other work necessary; this shall include the adjustment and repair of the system communications transmission equipment, local processors, sensors, facility interface, and support equipment. Responsibility shall be limited to Contractor installed equipment. The manufacturer's required adjustments and other work as necessary shall also be provided.
- D. Service personnel shall be qualified to accomplish all work promptly and satisfactorily. The Owner shall be advised in writing of the name of the designated service representative, and of any changes in personnel.
- E. The Contractor shall perform two inspections at 6-month intervals or less. This work shall be performed during regular working hours, Monday through Friday, excluding federal holidays. These inspections shall include:
 - 1. Visual checks and operational tests of the provided security system equipment, peripheral equipment, interface panels, electrical and mechanical controls.
 - 2. Run system and correct all diagnosed problems.
 - 3. Resolve any previous outstanding problems.
- F. The Owner will initiate service calls when the security system is not functioning properly. Qualified personnel shall be available to provide service to the complete security system. The Owner shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at the site within 4 hours after receiving a request for service. The security system shall be restored to proper operating condition within 2 calendar days after receiving a request for service.
- G. Performance of scheduled adjustments and repair shall verify operation of the security system as demonstrated by the applicable portions of the performance verification test.
- H. The Contractor shall keep records and logs of each task, and shall organize cumulative records for each major component and for the complete system chronologically. A continuous log shall be maintained for all devices; the log shall contain calibration, repair, and programming data. Complete logs shall be kept and shall be available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the security system.
- I. The Contractor shall perform two (2) minor inspections at six (6) month intervals (or more often if required by the manufacturer), and two (2) major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.
 - 1. Minor Inspections
 - a. Minor inspections shall include visual checks and operational tests of console equipment, peripheral equipment, local processors, sensors, and electrical and mechanical controls. Minor inspections shall also include mechanical adjustments.

2. Major Inspections
 - a. Major inspections shall include work described under paragraph Minor Inspections and the following work:
 - 1) Clean all system equipment and local processors, including interior and exterior surfaces.
 - 2) Perform diagnostics on all equipment.
 - 3) Check, walk test, and calibrate each system component.
 - 4) Run all system software diagnostics and correct all diagnosed problems.
 - 5) Resolve any previous outstanding problems.
3. Scheduled Work
 - a. Scheduled work shall be performed during regular working hours, Monday through Friday, excluding federal holidays.
- J. The Contractor shall separately record each service call request as received. The form shall include the serial number identifying the component involved; its location, date and time the call was received, nature of trouble, names of the service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the materials to be used, the time and date work started, and the time and date of completion. The Contractor shall deliver a record of the work performed within five (5) days after work is completed.
- K. The Contractor shall make any recommendations for system modification in writing to the Owner. System modifications, including operating parameters and control settings, shall be made without prior approval of the Owner. Any modifications made to the systems shall be incorporated into the operations and maintenance manuals, and other documentation affected.
- L. The Contractor shall recommend all software updates to the Owner for approval. Upon Owner approval, updates shall be accomplished in a timely manner, fully coordinated with the security system operators, operation in the system verified, and shall be incorporated into the operations and maintenance manuals, and software documentation.
 1. There shall be at least one scheduled update near the end of the first and second year's warranty period, at which time the Contractor shall install and validate the latest released version of the manufacturer's software for each sub-system of the SMS.

1.18 PROJECT CONDITIONS

- A. Environmental Limitations: System components shall be equipped and rated for the environments where installed.
- B. All exterior devices located in a public setting shall be ruggedized, weatherized and vandal resistant.

1.19 COORDINATION

- A. Coordinate layout and installation of security system equipment and components with other construction that penetrates roofs, facades, risers, masonry, ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Camera device placement is shown for pricing; the Contractor shall coordinate the security systems drawings with the Architectural Reflect Ceiling Plan (RCP) for specific mounting requirements.
 1. In some cases, camera housing pantone colors shall need to be matched to the surface being mounted to. The Contractor shall coordinate the exact pantone color required for these surfaces within the lobby and façade of the building with the Architect, prior to ordering any Surveillance equipment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All SMS system hardware and software components shall be produced by manufacturers regularly engaged in the production of SMS equipment.
 1. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's name and address, and the model and serial number in a conspicuous place. Equipment or software that is known to being "phased out" by the manufacturer shall not be acceptable.

2. The Contractor is required to provide the Owner, in writing, that all equipment is current and shall not be discontinued by the manufacturer within 18-months of the installation completion.
- B. All SMS hardware and software system components shall be produced, or be completely compatible and seamlessly integrated, with a single manufacturer or partnership of manufacturers through a Software Development Kit (SDK), Application Interface (API) or integration of relays/inputs and logical programming. All ACMS equipment shall be current production, and the latest model or version of all equipment shall be utilized.
- C. Although an integrated system is envisioned, the Contractor shall not co-locate multiple SMS licenses and applications on a single computer. Each SMS head-end/workstation shall be specific to each SMS component.
- D. The SMS and sub-component head-end systems shall utilize a thick client interface. Web based interfaces shall not be permitted, other than for off-site monitoring.
- E. The Contractor shall perform pre-delivery testing and adjustment of the completed Surveillance, ACMS, VCS, VMS, NVR, and other components that shall make up the SMS. The Contractor shall provide all personnel, labor, equipment, instrumentation, and supplies necessary to perform all testing. Written notification of planned testing shall be given to the Owner at least 14 days prior to the test and, in no case, shall notice be given until after the Contractor has received written approval of the specific test procedures.

2.2 SECURITY VIDEO MANAGEMENT SYSTEM (SVMS)

- A. General
 1. The Contractor shall provide a digital, TCP/IP based SVMS system, which shall include any and all equipment as required to facilitate the functionality and operation desired. This shall include, but is not limited to decoders, encoders, cabling, networking, patch panels, fiber optic splice bay, enclosures, and other equipment as required for SVMS functionality.
 - a. Where required, and identified on the drawings, analog cameras shall be provided and encoded on to the SVMS. Refer to drawings.
 2. Although an integrated system is envisioned, the Contractor shall not co-locate multiple SMS licenses and applications on a single computer workstation or server. The SVMS shall be a fully contained system, which includes dedicated servers/computers and workstations.
 3. The SVMS head-end and workstations shall utilize a thick client interface. Web based interfaces shall not be permitted in these instances, other than for off-site monitoring.
 4. The Contractor shall provide new high-resolution High-Definition TCP/IP based camera system, which shall provide direct connection from the IP camera to the computer network. The Contractor shall provide certified, pre-tested patch cables for connection from the camera/computer/server to the wall-plate and patch panel/block.
 5. The Contractor shall provide one additional workstation license beyond the number of workstations (Computer hardware) identified in the construction documents. The contractor shall provide all labor and programming for locations where SVMS software shall be installed.
 6. All final connections to the Owner's network, TCP/IP based switch, shall be made by the Contractor.
 7. Certified, pre-tested patch cords provided by the Contractor shall be in conformance with the Owner's IT standards; which include, but is not limited to category, cable color, termination, length, labeling and other requirements. Coordinate with the Owner and Telecommunications Division for exact requirements.
 8. In some cases, camera housing pantone colors shall need to be matched to the surface being mounted to. The Contractor shall coordinate the exact pantone color required for these surfaces with the Architect, prior to ordering any surveillance equipment. Refer to security drawings for exact locations.
 9. Exterior cameras shall be mounted discretely and aesthetically in accordance with the best practices of the trade and shall have the following additional requirements:
 - a. All exterior cameras shall be equipped with heaters and blowers as required by the manufacturer or necessitated by the location where they are being installed.
 - b. Grounding shall be in accordance to the Electrical and Telecommunication divisions. In no instance, shall the Contractor provide additional/supplementary grounding for their camera systems envisioned in this specification. Grounding shall be achieved from a grounding BUS system or a single point of ground. Refer to electrical and telecommunication divisions for additional detail.

- 1) Exterior cameras shall be vandal resistant and have an integral housing; the location of these cameras shall be in accordance with the security drawings and coordinated with Owner, prior to rough-in.
 - 2) With exception to exterior cameras, all cameras shall be powered via Power-Over-Ethernet (POE). As required, the Contractor may be required to furnish a power inserter, which is in accordance with prevailing POE standards.
 - 3) All exterior cameras shall be powered by 110v power for heater/blower functionality. 110v power to be provided by the contractor.
 - a) Exterior cameras shall be isolated from the computer network via fiber optic cable.
10. The Contractor shall provide a SVMS that:
- a. Is fully tested and released with the most recent firmware, if applicable.
 - b. Has a fully functional, tested and reliable Application Program Interface (API), Software Development Kit (SDK) or hold ONVIF compliance to ensure integration between the NVR/ACMS and functional operation.
11. The SVMS system selected shall require one-time licensing per camera. SVMS/NVR/Camera devices that require annuity licensing/costs shall not be acceptable and costs incurred will be the burden of the Contractor if installed.
- B. Video Analytics
1. All equipment shall be located in a central location as identified on the security drawings.
 2. The Contractor shall provide hardware/software/licensures to support video analytics for all exterior cameras, which shall all be provided with video analytic capabilities.
 3. The Contractor shall provide all programming, video analytic training, coordination with the Owner to identify the application for video analytics, fields of view and behaviors associated with each camera.
 4. The video analytic system shall learn behavior patterns of the objects observed within a field of view of all cameras the analytic is required for.
 5. Using advanced video content analysis algorithms, the SVMS shall incorporate software that has the capability for real-time detection and tracking of people and objects within specific fields of view (behaviors). The analytic systems shall consist of software, video processor, which shall accept and process video images from a variety of sources (DVI/network/VGA) and CODECs (MJPEG/H264). At a minimum, the video analytics platform should have the following functionality:
 6. Behavior detection
 - a. The video analytic capability shall be able to detect and alert a human operator on anomalous paths of directional travel in a variety of environments.
 - b. Human/Vehicle Tailgating
 - c. Loitering
 - d. Crowd detection
 - e. Unattended object detection. The video analytic system shall be able to detect within the scene where an object is left unattended. Object examples include, but are not limited to: a duffel bag, shopping cart.
 - f. People counting
 - g. Creation of logical boundaries for the creation of virtual perimeters, which can detect people entering or exiting.
 7. The video analytic system shall incorporate programming, features and logic to learn behaviors, pedestrian patterns with minimal user training.
 8. Video analytics shall be integrated with or be the same manufacturer as the SVMS
- C. Virtual Matrix
1. Additional computer hardware, as required, shall be provided to support the virtual matrix. The Contractor may elect to utilize one computer to support multiple monitors or dedicated computer for monitors. Architecture shall be predicated on the manufacturer selected and their requirements. All additional hardware required, even when not identified herein, shall be provided to support the functionality identified herein.
 - a. The Virtual matrix shall have the capability to output video in HD via a DVI/HDMI cable.
 - 1) The virtual matrix shall support multiplexed images to a single monitor in the following combinations of formats and sizes: Quad, Nine ways, and sixteen ways.
 - b. The Virtual matrix should allow six (6) monitors within the security office.
 - c. Monitors shall be customizable, and multiple monitors shall appear as a single or multiple displays.
 - 1) The SVMS shall support a virtual matrix, which shall have the following capabilities:

- a) Keyboard to monitor access.
- b) Monitor to camera access.
- c) Keyboard to camera access.
- d) Keyboard to speed dome camera access (restricting angles of view).
- 2) Camera to keyboard call up from any keyboard, automatic camera call via external systems, salvo/zoned switching for surrounding camera views during an alarm event. System resident propositioning for integral speed dome(s).
- 3) Ability to run individual monitor and system wide tours.
- 4) The switcher shall be capable of running individual monitor and universal system-wide camera tours with the following capabilities:
 - d. Sixteen (16) universal tours, eighty (80) camera entries per tour, thirty-five (35) programmable times within a week period.
 - e. Control for pan/tilt cameras, as well as, integral speed domes, individual camera dwell times before sequence, auto hold, salvo/zone selection, keyboard lock, and running separate alarm call up patterns.
 - f. The virtual matrix shall provide an on-screen-alphanumeric display for the purpose of camera identification. The character generators will be provided as follows:
 - 1) The virtual matrix shall provide the ability to automatically call cameras to monitors from alarm inputs via an interface through the ACMS.
 - 2) Multiple display modes and clearance methods for system monitors may be programmed simultaneously. The system shall provide the ability to accept one alarm input for each camera input and will have as a minimum five (5) display modes; sequence, hold, sequence and display, block sequence, and block hold, and three (3) clearance methods; acknowledge, auto clear, and instant auto clear.
 - g. Virtual Matrix interface:
 - 1) The Contractor shall provide an interface between the ACMS software and the virtual matrix software being supplied. The interface shall provide point/click control over cameras controllable by the virtual matrix through the ACMS software GUI.

2.3 NETWORK VIDEO RECORDER (NVR)

A. General

1. The Contractor shall provide a Network Video Recording (NVR) that shall route incoming IP video streams directly to an embedded/Windows™ or other operating based network video recorders. The NVR system shall be capable, without additional software or licensing, of supporting the camera quantity denoted on the security riser drawings, with an additional 25% expansion.
2. All computers/server/hardware requirements shall be provided with the NVR system. The NVR shall incorporate encoders for integration to analog cameras; where required.
3. The NVR shall be ONVIF compliant and seamlessly integrate through an API/SDK to the ACMS.
4. All NVR recording devices shall be capable of fifteen (15) frames/images per second, per camera. The system shall maintain all recorded video for a minimum of thirty (30) days. All recorded video shall be stored on hard drive(s) to allow immediate access to viewing during this period and shall be First In, First Out (FIFO).
 - a. Video recording rates (frames per second) shall be selectable by camera, time period, date, or motion detection.
 - 1) The network recorder shall support a recording resolution that is not less than 1280 x 720 (HD), and shall support the following digital resolutions:
 - a) 4CIF 704 x 480
 - b) 2CIF 704 x 240
 - c) VGA 640 x 480
 - 2) The network recoding software shall additionally support a variety of standardized codecs, which must include, at a minimum, the following types of simultaneous video streams:
 - a) MJPEG
 - b) MPEG-4
 - c) MPEG
 - d) H.264
 - b. The NVR shall be sized for the following performance based requirements:
 - 1) The network recorder shall record all camera inputs at a recording rate of a minimum of fifteen (15) frames per second per camera at a resolution not less than 1280x720.

- 2) Motion based recording:
 - a) The systems and codec shall support motion based activity recording. The entire field of view (detection area) shall be selected as the area capable of detecting motion and signaling the recorder to capture images/frames of video.
 - b) No parts of the cameras field of view shall be masked off or otherwise excluded from the motion detection software and detection areas.
 - c) Upon activation of the motion based recording the systems, the NVR shall capture, at a minimum, fifteen (15) frames per second per camera at a resolution of not less than 1280x720 for the duration of the activity/motion being detected.
 - d) Regardless of the detection of motion, the NVR shall force the image refresh/capture for every camera every seven and a half (7.5) seconds regardless if motion is detected.
 - c. Network recorders, servers, and storage arrays, provided by the Contractor, shall be located within a security rack, and shall connect to the network switch.
 - 1) Coordinate location of IP based network recorders in field with Owner.
 - d. The digital recording system shall operate over a local area network (LAN) that shall allow multiple operators simultaneous operation. The unit shall include a TCP/IP address for connection to the network, which shall be coordinated by the Contractor.
 5. The digital recorder shall provide live and instantaneous playback viewing at any viewing station connected to the network without stopping the recording process of any video input.
 6. The digital recorder shall provide full remote control via TCP/IP network protocol and addressing through an RJ-45 LAN port, allowing for the connection to a computer network. The system shall also provide two 6-pin mini-DIN connectors for a PS/2 mouse and keyboard, and a 15-pin D-type port for a PC monitor connection.
 - a. Individual uninterruptible power systems shall be provided for each NVR recorder/server and shall be capable of sustaining power for ten (10) minutes, and initiating a shut-down procedure, in the event of power loss, to maintain data integrity.
 - b. The NVR recorder shall be equipped with a USB or other approved interface to permit the UPS to send a shut-down command, in the event of a power loss.
 - 1) NVRs location shall be provided as shown on the security drawings. NVR quantity shall be based on the specifications and manufacturer requirements.
- B. NVRs shall be the same manufacturer as the SVMS.

2.4 NETWORK VIDEO RECORDER STORAGE UNIT

- A. General
1. The storage unit shall be external to the processing unit and shall utilize SCSI or IDE hard drives in a RAID level 6 array.
 2. The storage unit shall meet or exceed the following design and performance specifications:
 - a. The storage unit shall provide total hard drives, configuration sized, for recording all new cameras, including a 25% system expansion, for thirty (30) days of continuous, 24 hour recording, at 15 fps.
 - b. The storage unit shall provide for multiple storage units to be connected to the processing unit to allow for expansion of the system.
 - c. The storage unit shall be housed in an industrialized casing and mounted in an EIA 19-inch rack.
 - d. The storage unit shall provide for normal operating temperature range of 32° - 104°F (0° - 40°C) and 85% relative humidity, non-condensing.
- B. The Storage Unit shall be 100% compatible with the NVR system being provided.

2.5 NVR SOFTWARE

- A. General
1. The NVR software shall contain all components necessary for transmitting video signals to/from a recorder, monitor or workstation.
 2. All NVR workstation/server licensing is to include, but is not limited to, the operating system, NVR software and camera licensing, shall be provided.
 - a. The NVR software, at a minimum, shall have the following capabilities:
 - 1) Keyboard/Mouse to monitor access.
 - 2) The NVR/SVMS provided shall be capable of routing video to additional monitors, which would either be provided via a video card/decoder or workstation.

- 3) Camera to mouse/keyboard call up from external systems, salvo/zoned switching for surrounding camera views during an alarm event.
 - a) NVR/SVMS shall integrate to the ACMS to provide alarm call-up functionality.
 - 4) Ability to run individual monitor and system wide camera tours.
 - 5) Provide variable speed control for pan/tilt cameras, as well as, integral speed domes, individual camera dwell times before sequence, auto hold, salvo/zone selection, keyboard lock, and running separate alarm call up patterns.
 - 6) The NVR shall provide the ability to automatically call-up cameras to monitors from alarm inputs. Multiple display modes and clearance methods for system monitors may be programmed simultaneously. The system shall provide the ability to accept one alarm input for each camera input and will have as a minimum five (5) display modes; sequence, hold, sequence and display, block sequence, and block hold, and one (1) clearance method; acknowledge.
 - 7) The NVR/SVMS shall allow manual control of Integral speed dome cameras, where required.
 - a) Set the pan/tilt home positions for manual or alarm activation.
 - b) Automatically control the cameras through an alarm trigger.
 - c) Ability to set multiple preset positions.
 - d) Ability to set multiple tours.
 - e) Remotely set and clear the movement limits of the pan/tilt mechanism from the control room, through a telemetry unit at an outdoor camera site.
 - f) Adjust the zoom lens.
 - g) The ability to control the camera menu and setup the camera through the NVR software.
 - h) The system must support NTP (Network Time Protocol) to synchronize the system time of the video to a reference time for time stamping.
 - b. The NVR software shall permit video retrieval for the cameras that are connected to it. Specifically, the systems shall have the following functionality:
 - 1) Displaying multiple cameras, from different NVR's on one display for review.
 - 2) Incorporate encryption hash, water marking to verify video content.
 - 3) Capable of searching video by time, date, camera number, camera name, and motion detection.
 - 4) Outputting recorded video onto a USB, CD-ROM or DVD or Blu-Ray disc for evidentiary purposes.
 - 5) The Contractor shall provide an interface between the ACMS software and the SVMS/NVR being provided. The interface shall provide point/click control over cameras controllable by the SVMS through the ACMS software Graphical User Interface (GUI).
 - c. The NVR software shall provide for user access levels, which shall provide for a minimum of five (5) user levels, which shall be subdivided by the ability to control cameras/monitors, export video and change/configure software settings. User levels shall be password controlled.
 - d. User levels shall be given priority. For instance, if a user was monitoring/controlling a camera, another user with higher priority/access could take control of the camera.
 - e. User rights and access levels shall be coordinated with Owner and provided as part of the SVMS delivery.
- B. NVR management software shall be compatible with the SVMS/NVR recorders being provided.

2.6 DIGITAL ENCODER

A. General

1. The video encoder shall provide a video delivery system capable of streaming data through a computer network with limited image degradation. Video encoders shall be utilized in instances where Ethernet connectivity is not possible due to distance limitations, such as in exterior applications, elevator applications or for other external variables. In these instances, video shall be converted from its analog state into a digital file by means of an approved codec.
2. Video Encoder shall terminate multiple analog NTSC compliant CCTV signals and output a digital signal via a single Ethernet cable for transmission via TCP/IP to the SVMS.
3. The video encoder shall convert analog video signals (NTSC) to digital data. The video encoder shall be a solid state device, requiring embedded software, and shall be capable of rendering a minimum of four (4) selectable and simultaneous NTSC/digital video cameras or in a variety of resolutions, which shall include the following digital resolutions:

- a. Video recording rates (frames per second) shall be selectable by camera input, time period, date, or motion detection.
 - 1) The network recorder shall support a recording resolution that is not less than 4CIF and shall not be less than 704 x 480 pixels and shall support the following digital resolutions – NTSC:
 - a) 4CIF 704 x 480
 - b) 2CIF 704 x 240
 - c) VGA 640 x 480
 - 2) The network recoding software shall additionally support a variety of standardized codecs, which must include, at a minimum, the following types of simultaneous video streams:
 - a) MJPEG
 - b) MPEG-4
 - c) MPEG
 - d) H.264
- 4. Video encoders shall be enclosed within a lockable equipment rack, with an integral tamper switch for connection to the ACMS.
- B. Video encoders shall be fully compatible with the SVMS and NVR systems being provided.
- C. SVMS shall be manufactured by, Panasonic, Milestone, Nice, DvTel, OnSSi or Owner approved equivalent.

2.7 ANALOG FIXED CAMERA FOR SELECT ELEVATOR USE ONLY

- A. General
 - 1. The Contractor shall provide new high resolution vandal resistant cameras; the location of these cameras shall be located only in elevators; refer to drawings for locations.
 - a. In addition, where required, the Contractor shall coordinate with the Architect the pantone color of the camera housing in relation to where the camera will be mounted.
 - b. All camera locations and field of views shall be approved by the Owner and Architect prior to installation. The Contractor shall assist the Owner in identifying the best field of view through field investigation and testing.
 - c. Elevator cameras shall have the following characteristics:
 - 1) The Camera shall be a half, third or quarter inch format and shall be designed to operate on 24 VAC 60Hz power sources.
 - 2) Color cameras shall be a solid-state design and shall incorporate an intensified, interline CCD, HAD or Hyper HAD chip with a minimum lighting of 1.0 LUX for usable images. The f-stop rating shall be 1.2/1.4 at 70% reflectance. For this section a usable image shall be where object and colors within the cameras view are readably discernible.
 - a) Camera shall transmit a 1-volt peak-to-peak video signal, via the elevator traveling cable, and terminate at 75 ohms with compression or friction connectors only. Cameras shall not require sync and shall be AC line locked with phase adjustment, unless otherwise noted.
 - b) Contractor shall confirm that coaxial cable with the following requirements is provided in the traveler cable. The dielectric of the coaxial cable shall be rated at 75Ω, the center core and shield (braided) shall be 100% copper with or without reversible foil. Cabling with aluminum core or shield either wholly or partially shall not be acceptable.
- B. D-Mark Panel
 - 1. Traveler cable shall connect to a d-mark panel located in the elevator machine room; Contractor shall connect coaxial/UTP cable and connect to an encoder for conversion to TCP/IP for transmission to the SVMS.
 - a) Cameras shall derive their power from the elevator cab. Contractor shall supply step-down 24VAC power, as required to facilitate this.
 - b. In general, auto iris lenses shall be provided for all conditions where variable lighting conditions exist. Electronic shutter shall be utilized in conditions where distortion could occur. Where applicable, cameras shall be equipped with an electronic shutter with selections from 1/50 to 1/100,000.
 - c. The Contractor shall be required to provide a backlight compensating camera, which exceeds the specification. In instances where a backlight condition may exist (a camera looking at an exterior entrance from a dark foreground) the Contractor shall provide the necessary camera that will have the functionality to provide a useable video signal in a variety of altering and ambient lighting conditions.

- d. The Contractor shall coordinate the view of each camera, prior to final rough in. The Contractor shall utilize aspherical varifocal lenses.
 - e. In addition fixed position cameras shall have the following technical characteristics:
 - 1) Horizontal minimum resolution: 540 TVL.
 - 2) Signal-to-noise: 50-dB minimum with automatic gain control off.
 - 3) Camera housings shall be supplied with tamper resistant screws to prevent unauthorized tampering.
 - 4) Camera mounting shall be prepared in accordance to an environment where vandalism could occur. The camera mounting shall be sufficient to prevent the mount from being pried from the mounting surface.
 - f. The Contractor shall supply necessary specialty tools to remove tamper resistant screws to the Owner.
- C. The surveillance cameras shall be Panasonic, Pelco, Bosch, Tyco or Owner approved equivalent.

2.8 TCP/IP FIXED POSITION MEGAPIXEL CAMERAS (DAY/NIGHT OPERATION)

- A. General
1. All camera locations, unless otherwise noted on the drawings, shall be ceiling mounted, and field of views shall be approved by the Owner and Architect prior to installation.
 2. Where required, cameras shall be integrated into light stanchions/light poles. Refer to security drawings for locations.
 3. Security drawings denote general location of cameras only. Refer to the Architectural Reflected Ceiling Plan (RCP) for the exact camera location.
 4. In some cases, camera housing pantone colors shall need to be matched to the surface being mounted to. Prior to ordering any surveillance equipment, the Contractor shall coordinate the exact pantone color required for these surfaces with the Architect. Refer to security drawings for exact locations.
 5. The Contractor shall assist the Owner in identifying the best field-of-view through field investigation and testing. The Contractor shall provide a temporary monitor and camera to establish field of views of each camera for the Owner's review, prior to rough-in.
 6. Cameras shall have the following characteristics:
 - a. All exterior cameras shall be designed for Day/Night/Low Light functionality.
 - b. The camera shall operate as a color camera when sufficient light is present to support useable video, in color mode. When insufficient light is present for useable video the camera shall digitally or mechanically switch to black and white video mode to obtain useable video.
 7. Cameras shall be provided by the Contractor and as shown on the security drawings in coordination with the Owner's approval.
 8. The Camera shall be a half, third, quarter or eighth inch format and shall be Power Over Ethernet (POE) integrated RJ-45 10-base TX (10/100) auto sensing network interface, with the following certifications:
 - a. IEEE 802.3af
 - b. IPv4 (RFC 791)
 - c. IPv6 (RFC 2460)
 - d. QoS – DiffServ (RFC 2475)
 - e. Exterior cameras shall be designed to operate on 24 VAC 60Hz power sources, where required.
 9. The Contractor shall configure computer network requirements such as, but not limited to: ports, IP addresses and network environment shall be established and confirmed by the Owner, prior to rough-in.
 - a. Cameras shall utilize fixed IP addresses/dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server and in accordance to the Owner's network environment.
 10. Camera shall be of a solid-state design and shall incorporate an intensified, interline CCD, CMOS, direct transfer or progressive imaging chip with the following minimum pickup elements: (1280 (H) x 960 (V), and a minimum lighting for usable image of 1.0 LUX. The f-stop rating shall be 1.2/1.4 at 70% reflectance. For this section a usable image shall be where object and colors within the cameras view are readably discernible.
 11. Cameras, where required, shall derive their power from an individually fused power supply; location as shown on the security drawings.
 - a. Camera housings shall be equipped with self-locking terminal switches or screw power terminals, where required, for heater/blower functionality.

12. In general, auto iris lenses shall be provided for all conditions where variable lighting conditions exist. Electronic shutter shall be utilized in conditions where distortion could occur. Where applicable, cameras shall be equipped with an electronic shutter with selections from 1/25 to 1/100,000.
 13. As required, in some conditions (identified in the field), the Contractor shall be required to provide a backlight compensating camera, which exceeds the specification. In instances where a backlight condition may exist (a camera looking at an exterior entrance from a dark foreground) the Contractor shall provide the necessary camera that will have the functionality to provide a useable video signal in a variety of altering and ambient lighting conditions.
 14. The Contractor shall utilize IR corrected, aspherical varifocal lenses.
 15. In addition, fixed position cameras shall have the following technical characteristics:
 - a. Camera shall be ONVIF compliant and support a variety of standardized CODECS, which must include, at a minimum, the following types of simultaneous video streams:
 - 1) MJPEG
 - 2) MPEG-4
 - 3) MPEG
 - 4) H.264
 16. The Contractor shall coordinate network requirements such as, but not limited to: ports, IP addresses and the network environment that shall all be established and confirmed by the Owner, prior to rough-in.
 - a. Camera video resolution outputs shall be selectable
 - 1) Video Resolutions
 - a) All camera(s) shall have a minimum digital resolution capability of 1.2 megapixels.
 - b. Camera housings shall be supplied with tamper resistant screws to prevent unauthorized access.
 17. Camera mounting shall be prepared in accordance to an environment where vandalism could occur. The camera mounting shall be sufficient to prevent the mount from being pried from the mounting surface.
 - a. The Contractor shall supply necessary specialty tools to remove tamper resistant screws to the Owner.
 - b. Weatherized and rated for interior or exterior camera housings shall be provided where applicable.
 18. Security
 - a. All cameras shall be equipped with a method to preclude unauthorized remote access and hacking.
 - b. The Contractor shall coordinate and advise the Owner on additional precautions in writing that could be utilized to preclude unauthorized remote access to TCP/IP cameras. Some precautions include, but are not limited to the provisioning of:
 - 1) Virtual Private Networking (VPN)
 - 2) Port filtering
 - 3) Static IP addressing with MAC filtering
 - 4) Network intrusion detection software
 - 5) Proxy servers
 19. Color fixed IP cameras shall be fully compatible with the SVMS/NVR system being specified. Cameras without manufactured approved Software Development Kits (SDK) and proven, verified Application Program Interfaces (APIs) or that are not ONVIF compliant shall not be allowed.
- B. Stanchion Mounted Cameras
- a. As identified on the security drawings, there are a number of cameras that shall be integrated with lighting stanchions.
- C. Gondola Equipment
- a. The Contractor shall furnish a 1.2 megapixel camera to Gondola Contractor for communication back to the computer network. The intercom substation shall be installed by the Gondola Contractor and communicate wirelessly via an exterior antenna.
 - 1) In no instance may the Contractor alter the Gondola.
- D. TCP/IP Fixed Color cameras shall be manufactured by Sony, AXIS, Pelco or Owner approved equivalent.

2.9 COLOR INTEGRAL SPEED DOME MEGAPIXEL CAMERAS (PTZ)

- A. General
1. All camera locations and field of views shall be approved by the Owner and Architect prior to installation. The Contractor shall assist the Owner in identifying the best field-of-view through field investigation and testing. The Contractor shall provide a temporary monitor and camera to establish field of views of each camera for the Owner's review, prior to rough-in.

- a. Where required, cameras shall be integrated/mounted into/onto light stanchions/light poles. Cameras shall be integrated via a custom mounting arm, which shall be coordinated with the lighting designer.
2. In some cases, camera housing pantone colors shall need to be matched to the surface being mounted to. The Contractor shall coordinate the exact pantone color required for these surfaces with the Architect, prior to ordering any surveillance equipment. Refer to security drawings for exact locations.
3. Cameras shall have the following characteristics:
 - 1) Cameras shall be provided by the Contractor and as shown on the security drawings in coordination with the Owner's approval.
 - 2) The Camera shall be a half, third, quarter or eighth inch format and shall be designed to operate on 24 VAC 60Hz power sources, where required, or shall be Power Over Ethernet (POE) integrated RJ-45 10-base TX (10/100) auto sensing network interface, with the following certifications:
 - a) IEEE 802.3af
 - b) IPv4 (RFC 791)
 - c) IPv6 (RFC 2460)
 - d) QoS – DiffServ (RFC 2475)
4. The Contractor shall coordinate network requirements such as, but not limited to: ports, IP addresses and network environment and shall all be established and confirmed by the Owner, prior to rough-in.
5. Cameras shall utilize fixed IP addresses/dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server and in accordance to the Owner's network environment.
6. Camera(s) shall be of a solid-state design and shall incorporate an intensified, interline CCD, CMOS, direct transfer or progressive imaging chip with the following minimum pickup elements: (1280 (H) x 960 (V), and a minimum lighting for usable image 1.0 LUX. The f-stop rating shall be 1.2/1.4 at 70% reflectance. For this section, a usable image shall be where object and colors within the cameras view are readably discernible.
7. Exterior cameras, where required, shall derive their power from an individually fused power supply; location as shown on the security drawings.
8. Camera housings shall be equipped with self-locking terminal switches or screw power terminals, where required, for heater/blower functionality.
9. In general, auto iris lenses shall be provided for all conditions where variable lighting conditions exist. Electronic shutter shall be utilized in conditions where distortion could occur. Where applicable, cameras shall be equipped with an electronic shutter with selections from 1/25 to 1/100,000.
 - a. As required, in some conditions (identified in the field), the Contractor shall be required to provide a backlight compensating camera, which exceeds the specification. In instances where a backlight condition may exist (a camera looking at an exterior entrance from a dark foreground), the Contractor shall provide the necessary camera that will have the functionality to provide a useable video signal in a variety of altering and ambient lighting conditions.
 - b. The Contractor shall utilize aspherical varifocal lenses.
10. In addition, speed dome cameras shall have the following technical characteristics:
 - a. Camera shall be ONVIF compliant and support a variety of standardized CODECS, which must include at a minimum, the following types of simultaneous video streams:
 - 1) MJPEG
 - 2) MPEG-4
 - 3) MPEG
 - 4) H.264
 - b. Camera video resolution outputs shall be selectable.
 - 1) Video Resolutions
 - a) All cameras shall have a minimum digital resolution capability of 1.2 megapixels.
11. Camera housings shall be supplied with tamper resistant screws to prevent unauthorized tampering.
 - a. Camera mounting shall be prepared in accordance to an environment where vandalism could occur. The camera mounting shall be sufficient to prevent the mount from being pried from the mounting surface.
 - 1) The Contractor shall supply necessary specialty tools to remove tamper resistant screws to the Owner.
 - b. Weatherized and rated for interior or exterior camera housings shall be provided where applicable.
 - 1) Speed domes shall be completely integral units, with exception to mounting hardware. The Contractor shall order speed domes to meet the environmental requirements needed. It is the Contractors responsibility to coordinate this work.

12. Integral Speed Dome Control
 - a. Integral Speed dome controls shall be direct, via TCP/IP network connection, and shall not require additional wiring.
 - b. Maximum pre-positioning pan speeds shall be a minimum of 250 degrees/second and tilt speed minimum of 90 degrees/second. Accuracy for prepositions shall not exceed 10 degrees.
 - c. Speed domes shall incorporate a minimum of a 16X (between 4mm-80mm maximum) optical and 5X digital zoom lens.
 - d. The unit shall have a minimum of sixty (60) auto preset positions with accuracy no greater than 10 degrees from the intended target.
 - e. Integral Color speed dome IP cameras shall be fully compatible with the SVMS/NVR system being specified. Cameras without manufacturer approved SDK and proven, verified APIs shall not be allowed.
 13. Security
 - a. All cameras shall be equipped with a method to preclude unauthorized remote access, hacking, encryption.
 - b. The Contractor shall coordinate and advise the Owner on additional precautions in writing that could be utilized to preclude unauthorized remote access to TCP/IP cameras. Some precautions include, but are not limited to the provisioning of:
 - 1) Virtual Private Networking (VPN)
 - 2) Port filtering
 - 3) Static IP addressing with MAC filtering
 - 4) Network intrusion detection software
 - 5) Proxy servers
 14. Color fixed IP cameras shall be fully compatible with the NVR system being specified. Cameras without manufacturer approved Software Development Kits (SDK) and proven, verified Application Program Interfaces (APIs) or that are not ONVIF compliant shall not be allowed.
- B. Stanchion Mounted Cameras
- a. As identified on the security drawings, there are a number of cameras that shall be integrated with lighting stanchions. Refer to Security details and landscaping details for additional information.
- C. TCP/IP Fixed Color cameras shall be manufactured by Sony, AXIS, Pelco or Owner approved equivalent.

2.10 MEGAPIXEL LENS OPTICS

- A. General
1. Lines per millimeter shall be matched precisely to the type of camera and resolution being provided. As a minimum, the resolution (lines per millimeter (LP/MM) shall be 2.5x that of the sensor for the camera.
 2. Provide high quality camera lenses sized according to the intended area of coverage as shown on the drawings and in accordance with the following minimum specifications:
 - a. Fixed cameras shall be provided with varifocal length lens optics. Lenses provided for fixed cameras will be varifocal length type and shall include provisions for automatic iris adjustment and standard "CS" or "C" mounting, unless integral to the camera. Adapter rings shall be provided for all "C" mount lenses; varifocal lenses will also be compatible with a CCD camera imager. Exact focal lengths of the lenses will be coordinated with the Owner based on the scene to be viewed.
 - b. The Contractor shall supply aspherical, automatic iris lenses at locations where light levels vary. The average video level sampled from the camera will determine automatic iris operation. Iris control signals and operating voltage will be obtained from the camera, and the lens will include a pre-wired (factory assembled) plug assembly compatible with the cameras being provided.
 - c. Lens optics shall be high quality precision ground glass, IR corrected, and be low dispersion.
 - d. All optics shall be fully coated and will be color corrected to provide accurate color scene reproduction.
 - 1) Lenses shall provide uniform resolution from the edge to the center of the field of view for all cameras.
- B. Camera lenses will be integrated with the camera manufacturer, Computar, Fujinon, Panasonic or Owner approve equivalent.

2.11 CAMERA POWER SUPPLIES

- A. General
1. Where applicable, the Contractor shall provide camera power-supplies, when camera POE is not achievable.
 2. This section pertains to cameras that shall be powered from central location(s) and shall operate from a 24VAC-power source unless otherwise specified.
 - a. Camera power supplies shall be distributed and located in rooms designated for security use, as shown on the security drawings.
 - b. Power supplies shall also have these characteristics.
 - c. Support eight (8) individually fused outputs. Fused outputs shall allow the Contractor to conduct maintenance on camera's that are connected to the power supply without dropping power to the remaining seven cameras.
 - d. Power supply components shall be provided in a lockable enclosure constructed for wall mounting and shall be hardwired to a local 110-volt circuit.
 - e. Exact locations for power supplies shall be coordinated in the field with the Owner prior to rough-in.
- B. Power supplies shall be manufactured by Altronix or equal.

2.12 LCD MONITOR

- A. General
1. LCD monitors shall be provided in accordance with the specification and the security drawings. LCD monitors shall have the following characteristics:
 - a. The LCD screen shall have a viewable image size (diagonal) of 20" & 60".
 - b. The LCD screen shall have a VGA compatible interface.
 - c. The LCD screen resolution shall conform to these standards:
 - 1) Maximum 1024 x 768 @ 75Hz
 - 2) Factory Pre-set 640 x 480 @ 60/66.6/75Hz
 - 3) 720 x 400 @ 70Hz
 - 4) 800 x 600 @ 60/75Hz
 - 5) 1024 x 768 @ 60/70/75Hz
 2. The LCD screen power requirements shall conform to the following:
 - a. The Power Source shall be a Universal 100 - 240 VAC, Imbedded AC Unit.
 - b. The Maximum power consumption shall not exceed 65 Watts (max.).
 3. The LCD screen shall, at minimum, have the following front panel controls:
 - a. Brightness
 - b. Contrast
 - c. Power Switch
 - d. Functions Contrast
 - e. Focus
 - f. H-Position
 - g. V-Position
 - h. Reset
 - i. Exit
 4. The LCD screen shall have the following regulatory compliances:
 - a. UL, CSA, FCC, CE, EPA, TCO'92
- B. Commercial grade LCD Screens shall be Mitsubishi, Samsung, or Owner approved equivalent.

2.13 CONTROL KEYBOARD

- A. General
1. The Contractor shall be responsible to provide all cabling and components required to provide a total of six (6) fully functional variable control keyboards and one at the equipment/console.
 2. Keyboards shall also have the following requirements:
 - a. Control keyboards shall be run no longer than distances recommended by manufacturer guidelines.
 - b. Control keyboard daisy chaining is not acceptable. All keyboards shall be configured in a star configuration; connection to a network hub shall not be permissible.
 - c. Control Keyboards shall provide zoom, focus, and 180 degree rotation of speed dome cameras and shall provide spare keys for custom batch program initiation.

- d. The surveillance keyboard shall be provided at waste level within the equipment rack. The surveillance keyboard shall be provided on a sliding tray and shall be pushed in flush with the equipment rack when not used.
- B. Keyboards shall be fully compatible with the video management system being supplied.

2.14 EQUIPMENT RACKS (ER)

A. General

1. System Requirements

- a. Provide Equipment Racks (ER/Racks) in accordance with the following specifications and as shown on the security system drawings. All rack and console equipment, whether specifically stated herein or not, shall be for a complete equipment rack and console system; including bracing, writing surface supports, equipment mounting hardware kits, casters and filler panels. All rack equipment shall be procured from one (1) manufacturer. It is acceptable to use other manufacturer's monitor and equipment rack mounting kits as required.
- b. The racks and consoles shall be of steel construction, and shall be compliant with EIA 19" standard rack mount requirements.
- c. The ER shall have no open spaces. Blank panels as required shall be utilized to fill all empty locations in the equipment rack and console system. When no equipment is required, the Contractor shall provide and install blank 1u trim plates for future equipment installation. All equipment shall be flush mounted into custom trim plates for an aesthetic installation. The Contractor shall provide custom fabricated panels for all equipment requiring a non-standard panel for a complete installation. Custom openings shall be cleared of all sharp edges. Penetrations from the front of the console for keyboards, telephone instruments, etc. shall be routed through rubber grommets.
- d. The Contractor shall provide electrical power and install a 110 volt locking plug and service loop for the equipment rack, where required or applicable, to allow rear servicing of equipment. It is the Contractor's responsibility to insure that rear servicing is practical, convenient, and possible.
- e. Electrical power for all rack mounted equipment shall be provided within the racks by outlet strips designed for the ER enclosures. The Contractor shall provide the final connection of the outlet strips within the racks.
- f. The Contractor shall provide and install all wire, cable, conduit, boxes, sealtight, etc. for complete connection of high and low voltage cabling to the ER enclosure system.
- g. The Contractor shall provide equipment racks with factory applied color finishes in matte black. Factory finishes shall be baked enamel and touch-up in accordance with the manufacturer's recommended process.
- h. The Contractor shall provide an appropriate number of fans within the equipment racks to adequately dissipate heat build-up. Each fan shall have a maximum noise level of 47dB and 260 SCFM. Fans shall be continuous duty or preferably operated by a temperature sensor.
- i. Cabling shall be properly dressed, supported, and labeled within the console. All cable terminations shall be in accordance with the specification and shall be easily serviceable. Cabling shall not interfere with equipment cabling, power cabling, or receptacles.
- j. Cabling within the console and equipment racks shall be bundled and secured with Velcro tie strips or plastic zip strings.

2. Equipment Requirements

- a. The following list represents the major components of the rack system within the equipment room only. The list is not intended to show every detail and is to be utilized as a guide only. It is the Contractor's responsibility to perform all the engineering calculations necessary for the assembly of the racks and hardware required to complete the system and verify rear serviceability. The major components envisioned for each equipment rack shall include:
- b. Quantity Description
 - 1) 3 Equipment rack vertical frame
 - 2) 3 Louvered lockable Lexan / tempered glass door
 - 3) 3 Louvered lockable rear louvered door
 - 4) 2 Left side louvered panel
 - 5) 2 Right side louvered panel
 - 6) 3 Top rack panel
 - 7) LOT Casters / levels
 - 8) LOT Fans

- 9) LOT1u filler panels
 - 10) LOT Miscellaneous connectors, shelves, cable fasteners, etc.
 - 11) LOT Plugmolds
 - 12) LOT 110 Volt locking power plug
 - 13) LOT Power strip(s)
 - 14) LOT Wire Management Strips
- B. Wall mounted equipment racks
1. Wall equipment racks shall include the above requirements and additionally be equipped with a door tamper switch to notify if the cabinet door is breached or propped open. Refer to drawings for wall mounted equipment rack locations.
 2. Wall equipment rack shall be sized as required to accommodate security equipment.
- C. Equipment racks shall be Middle Atlantic, Winsted, APG/Stanton or Owner Approved equivalent.

2.15 UNINTERRUPTABLE POWER SUPPLY (UPS) SYSTEM

- A. General
1. Provide UPS systems including, but not limited to, rectifier/charger, battery, continuous duty PWM inverter, protective devices, static bypass transfer switch, integral maintenance isolation bypass switch, and microprocessor controls, as required; this ensures continuity of electric power to the load without interruption upon failure of the normal power source. Emergency electric power to the load shall be maintained for ten minutes.
 2. UPS shall provide an output, which shall be connected to servers, to allow them to shut-down normally, upon activation of UPS.
 - a. Enclosure:
 - 1) Shall provide the hardware necessary to mount in a standard 19-inch (48 cm) equipment rack.
 3. Ventilation:
 - a. Provide as required to ensure that the components operate within their thermal and environmental ratings.
 4. Internal Connections:
 - a. Provide copper bussing and/or cables.
 5. Visual Displays:
 - a. Furnish, as required, the operator with instructions necessary to start or shut down the UPS under both normal and emergency conditions.
 - b. The UPS shall be sized to maintain the required minimum load of connected equipment, plus a 25 percent expansion for ten (10) minutes to allow NVR's and attached servers to shut-down normally.
 6. The following racked equipment shall be connected to the UPS:
 - a. Computer servers
 - b. Network Video Recorders
 - c. Network Storage
 7. Environmental Ratings:
 - a. UPS shall be able to withstand the following environmental conditions without electrical and/or mechanical hindrance in operating capability or damage.
 - b. Operating Temperature Range: -18 degrees F to 104 degrees F.
 - c. Relative Humidity: 0 to 95 percent, non-condensing.
 8. UPS Storage Battery
 - a. Provide system with storage battery to supply the UPS in an emergency mode. Provide battery assembly in the Equipment Rack.
 9. Rating:
 - a. Provide battery with sufficient ampere hour rating to maintain system at full kW output for minimum of ten minutes.
 10. Construction:
 - a. Sealed cell, non-gassing, low maintenance type with a life expectancy of 10 years pro-rated. Minimum final discharge voltage per cell shall not be less than 1.65 volts.
 11. Battery Disconnect:
 - a. Provide disconnect to permit positive means of isolating battery from rest of system.
 - b. The UPS storage batteries shall be completely compatible with the UPS.
- B. UPS shall be manufactured by APC, Triplite, or Equal.

2.16 LCD CONSOLE KVM SWITCH

- A. A single LCD console drawer with built-in KVM switch controls up to eight (8) computers directly.
 - 1. An 8 port KVM switch, keyboard, 17" LCD display, and touchpad all combined into a neatly arranged 1U high rack-mountable drawer that will be located in the equipment rack.
 - 2. Switching between KVM ports shall be completed through hardware interface, utilizing buttons on the face of the monitor or conveniently located on the keyboard.
 - 3. Two level password security up to four authorized users and an administrator view and control the computers, with separate profiles for each.
 - 4. Two level logout - manual and timed
 - a. PS/2 keyboard and mouse emulation allows computers to boot even when they are not selected
 - b. 17" RGB analog LCD display supporting high XGA resolutions of up to 1024 x 768 with 250cd/m(sq.) brightness
 - c. Firmware upgradeable through flash ROM
 - d. 110-220V auto-sensing power supply
 - 5. LCD Console KVM Switch shall be manufactured by Altusen, Raloy, Belkin or Owner approved.

2.17 SECURITY CONSOLE(S)

- A. General
 - 1. The Contractor shall provide security consoles to be installed within the Security Office. The security console shall be semi-custom, including the following features:
 - a. Console Working Surfaces
 - 1) The main writing surface shall be at minimum 48" Wide by 30" Deep; at minimum 24" of the surface's depth shall be preserved as dedicated writing and work surface.
 - 2) The security console shall have two side work surfaces that shall be at minimum 36" Wide by 24" Deep. This surface shall be utilized for additional writing surface or storage.
 - b. Workstation (PC) Storage
 - 1) The security console shall have storage trays/shelves to accommodate workstations for both security and other systems monitoring equipment.
 - a) The Contractor shall coordinate workstation quantities with Owner, prior to ordering.
 - 2) PC Storage shall be constructed of non-conducting material and shall raise the PC off of the finished floor surface.
 - 3) PC storage shall allow for adequate ventilation at front and back of the workstation PCs.
 - 4) PC Storage shall allow for convenient access to the workstation PCs for service, loading of media, or connection of wiring/peripherals.
 - c. Keyboard Shelf
 - 1) The security console shall be equipped with a keyboard/mouse shelf to support a standard PC keyboard and mouse.
 - d. Power Management
 - 1) The security console shall have an integral power strip with at least 10 spaced power outlets.
 - e. Finishes
 - 1) Finishes shall be coordinated with the Owner and Architect but shall include several available options for color and wood grain type/stain.
 - f. The security console and all accessories/equipment shall be ordered through a single manufacturer.
 - g. Storage
 - 1) The security console shall have storage below the writing surface for office supplies, binders, and other general storage requirements.
 - h. Ergonomics
 - 1) Consoles shall be ergonomic, and placed to allow ergonomic viewing of wall mounted LCD monitors.
- B. The security console shall be manufactured by Winsted, Middle Atlantic, APG/Stanton, or Owner approved equivalent.

2.18 ACCESS CONTROL AND ALARM MONITORING SYSTEM (ACMS)

A. General

1. ACMS software shall be menu driven and on-screen icons shall be controlled via a graphical user interface. Various system functions and sub-programs shall be selectable from a hierarchy of logically organized menu displays (may be pull down, pop-up type) or on-screen control icons. A specific function within a menu display shall be launched via shortcut key(s) entered at the workstation keyboard or by selecting a command control button on the dialogue box on screen with a mouse or other pointing devices. Alternatively, double clicking on a selected icon with a mouse can launch specific system operations.
2. The Contractor shall provide one additional workstation license beyond the number of workstations (Computer hardware) identified in the construction documents. The contractor shall provide all labor and programming for locations where ACMS software shall be installed.

B. Card Holder Database:

1. The ACMS security panel capabilities shall hold up to 10,000 unique card records and manage 25,000 alarm events, and have a means to assigning rights to each badge.
2. The ACMS shall support a minimum of the number of readers and inputs identified on the security drawings with an additional 25% expansion.
3. Security panels shall be addressable from the network and shall support full diagnostic capabilities as well as three-state supervision with the use of end of line resistors.
4. Levels of access shall be assigned that dictate a time and locations where a particular access card can be used. The system shall allow exclusions to this requirement in which a card holder may be assigned group rights, yet have additional right as required.
5. Each cardholder name, input name, and alarm designations shall be a minimum of sixteen (16) characters long in field length.
6. Access level shall define a user's specific access rights. Access levels are defined according to time, location (door), and the level of access required. Multiple access grouping shall be assignable to an individual cardholder.
7. Activation/Deactivation dates shall define when an access card was issued and how long it is valid for. Access cards that exceed their issued validity time shall be self-expiring. Typically, this function is utilized for temporary employees.
8. Digital image shall be provided to compare the physical attributes of a person requesting access with the stored image of the employee the access control card was issued to. Acceptable digital formats shall be JPEG (.jpg) and GIF (.gif). Storing images as Bitmaps (.bmp) or equivalent shall not be acceptable.
9. The ACMS shall support image ghosting, where a transparent image is overlaid on top of another image, preventing duplication and ISO bar code labeling.
10. Previous Activity - A continuously and automatically updated field, which indicates the most recent, access activities by an individual cardholder. The information shall include reader, date and time.
11. A badge status shall denote the card status. Statuses shall be described as lost, stolen, valid, invalid, and any other Owner desired statuses.
12. Optional Card Holder Data Fields - In addition to the fields as defined above, a minimum of four (4) user customizable alpha-numeric information fields shall be provided.
13. Card Reader Database:
14. The initial ACMS card reader database shall serve to define the unique attributes, which are associated with up to 5,000 individual card readers. At a minimum, the following fields shall be provided to define each system card reader:
 - a. A reader ID, similar to a card ID shall uniquely identify and address an individual reader. Additionally, associated to a reader ID, a reader name shall have a minimum of sixteen (16) characters and be specified for rapid identification of an area or door the reader is associated to. Additional fields shall be provided to specifically identify a particular reader.
15. The ACMS shall utilize Wiegand compatible proximity access control readers.
16. Inputs associated to access control doors shall serve to denote the position of the door; open, closed, or propped. Additionally, a shunt time shall be specified for each door that shall have second and minute time increment customizability.

17. Readers shall also have anti-pass back selection, in which a user must present his/her access card to enter and exit the facility. If a user presents an access card for access but does not egress, or vice versa, than upon the next occurrence the user presents a card, either he/she shall be disallowed access and a report shall be generated at the ACMS, or they shall be allowed access and a report shall be generated for further review.
- C. ACMS Operation:
1. Access Authorized: Upon confirmation that a request for access is valid, a "door open" command shall be generated by the security panel and shall subsequently cause release of the associated electric locking mechanism for a predetermined interval and shall shunt the associated monitor devices for an Owner/user defined period of time. All information pertaining to valid access transactions shall be stored on the ACMS hard disk.
 2. Access Denied: In the event that an access request is not valid, no "door open" command shall be transmitted and the alarm monitor and door position devices shall not be shunted. All information pertaining to invalid access requests shall be stored on the ACMS hard disk and break through alarm, additionally; an audible alarm shall sound at the selected operator workstations.
 3. Reader Override: The ACMS software shall provide for override of card reader operations and door unlock via manually initiated keyboard commands at an operator workstation, or by an automatically executed time schedule which has been pre-programmed by the user in the ACMS database. All such override events shall be stored on the ACMS hard disk.
- D. Breakthrough Alarms:
1. The ACMS software shall provide for the display of "breakthrough" alarm messages or graphics at selected operator workstations such that operators will be alerted to an active alarm condition during periods when other than the standard ACMS display is presented on the operator workstations. Breakthrough alarms shall cause activation of the audible sounder and for the on screen icon to illuminate to graphically depict where the alarm is occurring at the selected operator workstations.
 2. Alarm annunciation shall be user configurable on an individually input point basis to display an alarm window, automatically call-up associated maps to select workstations or group of workstations, requiring operator acknowledgment, generate reports, and/or send to CCTV for alarm call-up.
 3. For alarm events requiring operator acknowledgement, a data input dialogue window containing user programmable information, list box, and data input screen shall be provided for the operator to acknowledge record actions taken or enter comments.
 4. The protection function shall also provide for alarm handling such that alarm transactions can be vectored to one, several, or all operator workstations. This function shall be assignable on a point-by-point basis.
- E. Graphical User Interface (GUI):
1. The ACMS software shall provide a graphical map software module for the design and display of graphic alarm maps using graphical objects and icon buttons. The graphics shall be user programmable without additional software or hardware at a workstation. The software shall provide for a minimum of two (2) graphic screen or floor plans per alarm device. The alarm graphics shall operate automatically, such that the initiation of an alarm shall cause the appropriate graphic screen with embedded icon objects and description to appear without user intervention. Activation of the graphic alarm screen function shall be programmable on a point-by-point basis. Alarm graphics shall be based on architectural background computer aided design files and shall incorporate the following characteristics:
 2. Capability to import a .DWF or .DWG file to produce a current site drawing overlay on the system. The Contractor shall provide the latest drawing for incorporation into the system.
 3. The system shall support system icons that shall be a direct link to the event.
 4. Alarms and access-controlled door shall both be depicted by icons overlaid on the .DWF(x) or .DWG site drawing and shall be selectable.
 5. The GUI shall be interfaced to the SVMS and shall incorporate on screen programming to facilitate emulated camera operation and alarm/video-call up.
 6. The Contractor shall provide either the manufacturers or third party software to provide a full functional graphical user interface (GUI).

- F. Report Management:
1. The ACMS software shall provide for the generation of standard or user defined reports which consist of either ACMS database information/database reports, system log, or historical data/journal reports. The report manager shall provide for routing of reports to any of the printers in the security system. Operator access to the report manager shall be password controlled and shall be initiated at the operator workstations.
 2. The ACMS software shall allow operators to request reports from a series of pre-configured templates which can be further sorted or customized. The report generated can be displayed, printed, or saved to files for later review for printing.
 3. The ACMS software shall allow operators to create custom reports, lists and labels using selected data from the ACMS database. The user shall be able to define selection criteria, sorting orders and manipulate the data and display based on user defined rules, logics and/or formulas.
 4. The ACMS software shall provide for an audit trail feature which is designed to record all changes or modifications to the ACMS database. The time at which a record was last changed and which system operator made the change shall be recorded. Audit trail information shall be automatically stored on the ACMS hard disk. Additionally, all additions, deletions or modifications to the ACMS database shall be routed to a workstation printer in order to provide a permanent record of such changes.
 5. Operator access to various functions and operations related to the intrusion detection sub-system shall be password controlled.
 6. The ACMS software shall support an independent database which is specifically designed to define the various attributes associated with intrusion detection devices.
- G. Video Capture Badge Station
1. Provide a separate networked computer to support an integrated ACMS video capture workstation. Location of workstation shall be coordinated with Owner.
 2. Video badge station shall be dedicated to video badge functions.
 - a. The Contractor shall coordinate with the Owner the badge layout and develop three sample badges for the Owner to approve.
 - b. The Contractor shall provide a computer to support the badge station software and hardware. Computer hardware shall comply with this specification.
 - c. The badge station shall be compatible with the ACMS host/server and shall be from the same manufacturer.
 3. The Badge station shall communicate to a badge printer via a USB/Ethernet cable for higher data throughputs. The software shall be compatible with the operating system and the badging software as well as the ACMS system.
 4. Stand-alone badge station software shall not be acceptable.
 5. The badging station shall support ISO bar code imprinting, image ghosting, and holographic overlays.
 6. Digital camera, tripod, backdrop and any and all miscellaneous software and/or firmware shall be provided to facilitate complete badging system operation.
- H. Interfaces
1. Elevator Interface
 - a. The ACMS shall include provisions for elevator access control as shown on the security device drawings and specifications as well as requirements denoted in the elevator specification.
 - b. Access Control Panels (ACPs), associated to elevator control, shall be dedicated and shall not be commingled with other functions, such as door access control and alarm monitoring not related specifically to elevator control.
 - c. The Contractor shall be responsible for providing a hardwired interface from the ACMS through the Owner's/Project's approved Elevator Contractor to provide elevator access control within designated elevator cabs and hall calls as shown on the security drawings.
 - 1) Where applicable, it shall be the Contractors responsibility to furnish the card reader for installation by the Elevator Contractor within the elevator cab. All associated parts, directed and subcontracted labor shall be provided to support elevator access control functionality. This includes, but is not limited to, the card reader in the elevators, hardware, software, and connections/interfaces to the elevator equipment for a completely operational elevator access control subsystem from the ACMS.

- 2) The exact location of the card reader in the elevator cabs and at the elevator lobbies shall be coordinated with the architect and Owner prior to rough-in. Elevator control equipment, and any required programming of the elevator system and wiring from the card readers in the elevator cab and at the elevator lobbies to the elevator machine room will be furnished to the elevator contractor for installation. Others shall not alter, install, or make modification to the elevator return panel or interior finished areas within the elevator cab.
 - 3) The Contractor shall be responsible for extending the cabling for the card readers in the elevator machine room to the ACMS access control panels, which shall be mounted in the elevator machine rooms.
 - 4) The Contractor shall provide an interface between the ACMS and the elevator control panels in each of the elevator machine rooms. The Contractor shall be responsible for providing all direct or indirect labor, wire, conduit, and other equipment as required to complete the interface.
 - 5) D-Mark Panel
 - a) A break out box with terminal strip, in the elevator machine room, shall be provided by the elevator contractor. The Contractor shall furnish a connection to provide access control functionality in select elevator cabs within this break out box. The break out box shall be alarmed via tamper switch and key lockable.
 - 6) The interface between the elevator system and the ACMS shall be designed such that during the elevator recall mode, the elevator system takes complete control of all elevator operations, thereby disengaging ACMS control.
2. Elevator Access Control Operation – Within Elevator Cab
- a. The ACMS operation shall be coordinated with the Owner. The Contractor shall configure a manual or automatic initiation of secure and non-secure mode of operation for all elevator cabs equipped with access control readers.
 - b. Card readers within the elevator cab shall be wired to the associated ACP(s) associated to that elevator bank, which shall be dedicated and not be commingled with other functions, such as door access control and alarm monitoring not related specifically to elevator control.
 - c. If the card reader is in non-secure mode, an access card shall not be required to select a floor button. An individual entering the elevator cab shall be able to select the desired floor by pressing the appropriate button. All floor buttons shall be unlit until the floor is selected, at which point the selected button would become lit.
 - d. If the card reader is active mode, the cardholder shall present their access card at the card reader inside the elevator cab. Once the security system verifies the authorization level of the cardholder, the security system will then initiate the elevator control system to enable and illuminate a floor selection button or group of buttons, when depressed, as directed by the Owner, for the floors accessible to the cardholder.
 - e. If within a definable time period, to be coordinated with the Owner, none of the floor buttons are selected, the security system shall reset and deactivate all buttons until the next valid card read. Once the desired floor has been selected, the elevator system shall illuminate only the floor selected. The ACMS and elevator system shall not allow more than one floor selection per access control card presentation to the reader inside the cab.
 - 1) The Contractor shall coordinate the access desired, but it is envisioned that all floors shall have separate access levels.
 - f. A key operated switch, which is connected to the elevator control system, shall be in each car operating panel in order to place the car into and out of service. Once this switch is activated, access control shall be de-activated allowing any floor selection without presentation of an access control card. The Contractor shall provide an output to the ACMS system, to denote when this switch is activated. This input shall annunciate on the existing ACMS server as an alarm input for the elevator that was placed into service.
3. Elevator Access Control Operation – Hall Call
- a. Upon the presentation of a valid access control card at the elevator lobby reader during a period that the elevator control programming is active, the ACMS access records shall be queried to designate or reject access. Upon a valid access, the ACMS shall recall an unoccupied elevator to the floor the elevator card reader is associated to.
 - b. The Contractor shall not modify or install any access control device within the elevators for any reason. Work associated to the elevators shall be subcontracted by this Contractor to the elevator Contractor.

4. Visitor Management System (VMS) Interface
 - a. The ACMS shall have the ability to directly interface with the Visitor Management System and shall allow for full functionality of the requirements of the VMS, as noted within the VMS specification.
 - b. The hardwired interface between the ACMS and VMS shall be provided through a direct TCP/IP or other manufacturer approved connection.
 - c. The software interface shall be via software Application Program Interface (API) which shall be approved, tested, and released from the VMS and ACMS manufacturers. The interface shall query, and as required, update the database with the access right for temporary users.
 - d. The VMS shall enroll visitors into the ACMS database. The ACMS database shall assign pre-defined rights and an expiration period for access to a select group of entry portals/turnstiles that are equipped with barcode readers Refer to security details for information.
 - e. The visitor interface shall functions as follows:
 - 1) A visitor shall approach the reception desk and will present a valid credential (photo ID, business card, etc.) for validating the visitor request. The credential shall be optically scanned, and Optical Character Recognition (OCR) shall be performed on the credential.
 - f. The visitor management systems shall transmit/display the person's legal name. Exact information to be captured/stored and transmitted shall be coordinated with the Owner. The following information is presented as an example regarding the information to be potentially captured, printed, transmitted or stored at the VMS or ACMS respectively.
 - 1) Visitor name and person visiting (First initial last name only).
 - 2) Time of enrollment
 - 3) Expiration date
 - 4) Floor employee/individual resides on
 - 5) Expiration date
 - g. Information to be transmitted to the ACMS
 - 1) Access group, level or time zone information (to be coordinated with Owner)
 - 2) The VMS shall print the Barcode equivalent of a Wiegand protocol that was assigned and printed to the visitor for use and display.
 - 3) The ACMS shall automatically deactivate the visitor badge after a pre-determined time or after initial usage or set expiration date/time to be coordinated with Owner
 - 4) The ACMS panel shall populate visitor credential within fifteen seconds (15) from enrollment.
 - 5) An alarm/notification shall be provided at the VMS workstation for visitors not found in the VMS or identified on internal "watch-lists"
 - 6) The ACMS shall correlate all visitor management data in easy to read fields. Visitors shall appear in the ACMS as card holders.
5. Fire Alarm Interface:
 - a. All power supplies shall be capable of receiving a relay input from the fire alarm system, per the prevailing code requirements.
 - b. Fire alarm output modules shall be provided by the fire alarm contractor via the Signaling Line Circuit (SLC). The Contractor shall provide these fire alarm modules to provide the following functionality:
 - 1) Stairwell unlocking in accordance with the local code upon initiation of a:
 - a) Fire-alarm notification.
 - b) Fire command override switch.
 - 2) Deactivation (unlocking) of access controlled doors within a path of egress upon initiating signal from the fire alarm system
 - 3) The Contractor shall verify all portals requiring automatic fire alarm system unlocking.
 - a) The Contractor shall extend cabling to provide a fire interface for conditions where power supplies are located in close proximity to doors equipped with access control readers.
- I. Third Party Device Interface(s):
 1. The Contractor shall be responsible for providing interfaces as required to provide control, monitoring, and functionality of the following devices:
 - a. Request-to-Exit Devices (Within Door Hardware):
 - 1) The Contractor shall be required to interface to third party or separate request-to-exit device functionality. The Contractor shall not modify or alter, in any way, the third party device, other than the termination of cabling/wiring.

- b. Automated Roll-Up Doors/Vehicle Barriers:
 - 1) The Contractor shall interface with automated roll-up doors as shown on the drawings. The control of these doors shall provide a direct interface with the ACMS card holder database, allowing authorized card holders to activate the roll-up doors through the use of a card reader. The ACMS shall also have the capability of opening, holding, and closing the roll-up doors through on-screen commands via the use of the ACMS system. The automated roll-up door controls provided through the ACMS shall preserve all safety features of the roll-up door operator, and shall not interfere with the safety or operation of the roll-up door.
- c. ADA Accessible Door Operators:
 - 1) The Contractor shall provide an interface for controlling doors equipped with accessible door operators (handicapped door opening buttons), provided by Contractor. The following conditions must be met and shall be provided by the Contractor.
 - a) Accessible door operators, equipped with access control, shall not be functional until the presentation of an approved access control card. The access control card shall enable and energize the door operator automatically.
 - b) Following a pre-set time period, to be coordinated with the Owner the automatic door opening device shall shut close and the door shall re-lock.
 - 2. Doors equipped with electrified panic hardware and electrified magnetic locks shall be coordinated properly. This coordination includes: lock coordination, lock de-energization, door operator activation, door leaf coordination and any other requirement, which may affect the function, control and access for doors equipped with the aforementioned devices.
- J. The ACMS shall be manufactured by AMAG, Honeywell, Software House, or Owner approved equivalent.

2.19 BADGE PRINTER

- 1. General
 - a. Provide a badge printer. Printer resolution shall be no less than 300 dpi; the printer shall produce up to 16.7 million/256 shades per pixel, edge to edge, and print one single sided card within forty (40) seconds.
 - b. The Contractor shall be responsible to provide one (1) color dye sublimation printer; coordinate location with Owner. The dye sublimation printers shall have the following characteristics:
 - 1) The printer shall have a card width range of 2.125" a card length range of 3.375" and shall accept cards .03"-.06" in thickness.
 - 2) Printer shall support Universal Serial Bus (USB) for faster data throughputs.
 - 3) The printer shall accept PVC cards and support a four panel ribbon with integrated resin panels.
 - 4) The software drivers shall be compatible with Windows XP/2000.
 - 5) The printer shall support holographic and clear overlay varnishes.
- B. Badge printer shall be compatible with the access control system and shall be manufactured by Zebra/Eltron, Fargo, or Owner approved equivalent.

2.20 ACCESS CONTROL PANEL (ACP)

- A. General
 - 1. ACPs shall serve to gather data generated by multiple field devices and shall meet UL requirements. Communication from the panel shall be transmitted to the ACMS server via a TCP/IP connection. ACPs shall include control circuitry required to energize or de-energize power circuits to electric door locking devices.
 - 2. ACPs associated to elevator control shall be dedicated to elevator control and shall not be commingled with other functions.
 - 3. ACP locations are generally depicted on the security drawings. The Contractor shall provide the exact number of ACP panels, allowing for an additional 25% expansion capacity for inputs and card readers.
 - a. ACP shall receive and execute output functions according to commands which are automatically generated by the existing host server or manually initiated at an operator client workstation. ACPs shall incorporate memory and logic as required to insure uninterrupted operation of field installed devices in the event that communications with the existing host server is interrupted.

- b. ACPs shall incorporate provisions for uninterrupted standby battery power as required to insure continued operation in the event of power failure. Power supplies used shall be designed to send a signal to the ACMS in the event of a power loss, low battery, or short. Battery back-up shall be maintained in the event of a power loss for no less than eight (8) hours.
 - c. ACPs shall utilize a distributed intelligence, modular design allowing normal access decisions to be handled locally without communication with the existing host server. Database uploading/downloading to the ACP shall be accomplished automatically by the ACMS server on a time and day schedule, which shall be coordinated with the Owner.
 - 1) The ACPs shall be a 32 bit microprocessor based device that shall use flash memory technology to enable remote firmware upgrade from the ACMS server.
- B. Firmware
- a. The Contractor may not alter or modify software or firmware without the manufacturer's written approval. Damage to systems as a result of firmware or software modifications made by the Contractor shall be their responsibility to correct.
 - b. The ACPs shall conduct an internal error checksum on all uploaded firmware to a secondary bank of memory, prior to the panel update. The error checksum shall ensure that the firmware is free from corruption.
 - c. Each ACP shall be provided with the most current version of firmware. Firmware shall be flashable. Field replaceable firmware shall not be acceptable.
 - d. The Contractor, as part of their Work, shall update the firmware to the most current (non-beta) release, prior to the warranty anniversary. The firmware update shall be part of the Contractor's work and at no cost to the Owner.
 - e. The ACPs shall be fully autonomous and shall not require communication to the existing host server in the event of an off-line state. An off-line state will be when the panel communication has been severed between the ACMS server.
 - f. While in this off-line state, the ACPs shall make access granted/denied decisions and maintain a log of the events, including alarms that occur. Events shall be stored in local memory and uploaded to the system software after communication is restored.
 - g. The security panel shall pull and push data including, but not limited to, card records, time, and event alarm monitoring.
 - h. Events shall be transmitted to the existing host server, which shall maintain all databases and perform automatic polling of systems and devices connected to it.
 - i. The existing host server shall continuously poll security panels connected to it; frequency of polls shall be selectable by the Owner.
 - j. An alarm shall be generated to the ACMS server and associated client servers when a panel has stopped communicating with the existing host server.
2. The Contractor shall be responsible for their Contractor's installation of all transceivers and miscellaneous communication devices as required for connection to the existing host server.
- a. Installed memory
 - 1) ACPs shall buffer a minimum of 3,000 transactions at the panel when communication with the existing host/server is interrupted and shall support locally, a minimum of 10,000 card holders per ACP.
 - b. Functionality
 - 1) ACP response time to activate a lock device after presentation of a valid access credential shall not exceed one (1) second regardless of system activity level.
 - 2) Two (2) seconds shall be acceptable only when the panel must communicate to its existing host server and query rights associated with the cardholder.
 - 3) Alarm signals generated from ACP alarm inputs shall appear at the ACMS workstations within a maximum of two (2) seconds regardless of the system activity level.
 - 4) Each ACP shall support up to a minimum of combined eight (8) inputs or output boards connected in any combination.
 - 5) The ACPs shall be enclosed within key lockable housing with hinged door complete with a tamper switch. The housing shall be of steel construction and shall be designed for surface installation.
 - 6) The ACPs shall provide cabinet tamper circuitry such that access to the ACP circuitry, power supplies, and peripherals are continuously monitored.
 - 7) ACP tamper alarms

- a) Shorts, battery, and communication failures shall be uniquely identified as an alarm in the ACMS database and shall cause unique annunciation at operator workstations when activated.
 - c. All power connection to the ACPs shall be via conduit. All connections shall be hard-wired. Plug in transformers shall not be acceptable.
 - d. ACP operating power shall be via low voltage step down transformers and connected to emergency generator power circuits, if applicable. Low voltage transformers shall be enclosed within ACP cabinets or suitable auxiliary housing.
 - e. Each ACP shall be sized as required. However, at a minimum, each ACP shall provide for a minimum of sixteen (16) alarm devices via 2-wire, current supervised circuits and sixteen (16) controlled relay outputs.
 - f. End-of-line resistors shall not be located within the ACP.
3. ACP Communication
- a. Communication to/from the ACPs shall be via TCP/IP and the computer network being provided by the contractor.
- C. Access Control Panels shall be manufactured by the same manufacturer the ACMS is.

2.21 ACCESS CONTROL READER

- A. General
1. Access control readers shall be multi-technology type, capable of function with proximity (125KHz) and smart (15.56MHz) access control cards.
 2. Access control readers shall be provided as shown on the security drawings. Mullion mounted readers shall not be allowed unless otherwise indicated.
 3. When entering a door equipped with an access control reader, a card shall be presented and the unique ID code associated to the card shall be compared and analyzed from a security panel or database, which shall associate the rights to an individual. Upon access granted, the security panel shall temporarily shunt or activate power to the electrified hardware, as well as internally shunt the associated door position switch or switches for a predetermined amount of time.
 4. The reader shall output industry standard Wiegand outputs or equivalent.
 5. Card readers shall be a sealed, single package, weatherproof unit and shall be constructed of high impact ABS plastic. The color of the card readers shall be coordinated with the Owner prior to ordering.
 6. Access control readers shall derive their power from the security panel; therefore, the Contractor shall adhere to the manufacturer's guidelines for maximum distance from the reader to the security panel.
 7. Access control readers shall incorporate a dual means of notification of door operation. Specifically, the access control reader shall supply an audible tone for access granted, access denied, out of service, and door propped conditions. Additionally, the reader shall also supply a visual means of notification for the above events. Each of these notifications shall be selectable by the host ACMS system.
 - a. Card readers shall be UL-294 certified for indoor and outdoor applications, with an operating frequency of 125 KHz for proximity and 13.56 MHz.
 - b. Accidental or intentional transmission of radio frequency signals into the reader shall not compromise the system.
 - c. Standard card readers and mullion card readers shall provide for read ranges not less than 2.5 inches for both 125 KHz and 13.36 MHz card technologies.
 - d. Access control readers shall be equipped with an optical tamper switch to indicate if the faceplate has been removed from the card reader.
 - e. Typical access control readers shall be provided on a single gang backbox in accordance with the manufacturer guidelines. The Contractor shall take care in mounting the access control reader providing necessary spacers to prevent radio interference. Standard card readers requiring a special back box shall not be acceptable.
- B. Typical single-gang access control readers shall be manufactured by HID, or Owner approved equivalent.

2.22 ACCESS CONTROL CARDS

- A. General
1. The Contractor shall be responsible for the initial set-up and design of six (6) types of visitor badge templates. The Contractor shall also provide training to the Owner on how to create visitor badges, and modify existing templates.

2. Provide badging for up to 6000 credentials
 - a. The contractor shall utilize their own badge printers, and will not use the badge printer being provided on this project for badge reproduction.
 3. Access Control card shall have the following requirements:
 - a. 125KHz, 13.56 MHz Credential
 - b. The Contractor shall provide 6800 13.56 MHz Contact-less Smart Card and 125 kHz proximity access control cards to the Owner.
 4. Card shall be equipped with memory, which shall be purchased with the following capacities:
 - a. Card will be pre-ordered with an anti-forgery holographic overlay, which shall be coordinated with Owner.
 - b. Access control cards shall be a format compatible with the card readers being provided and shall be utilized in conjunction with a security panel to associate the access level associated to the user of the card.
 - c. Proximity cards shall be compatible with the badge printer being supplied.
 - d. Proximity access control cards shall also allow either a horizontal or vertical punch slot. Coordinate the punch slot with the Owner.
 5. Each access card shall be uniquely encoded by the card manufacturer and shall transmit a compatible format output to the card readers.
- B. Proximity access control cards shall be manufactured by HID Corporation or Owner approved equivalent.

2.23 DOOR POSITION SWITCH

- A. General
1. Standard door position switches and high-security types (triple biased) shall be provided as shown on the security drawings, and will indicate the position of the associated door, either open, closed, held or forced open.
 - a. Surface mounted door position switches shall be provided in instances that recessed mounting is not practical or possible (I.e. loading dock doors).
 - b. The Contractor shall supply necessary equipment for preventing a voltage surge to prevent damage to any panels or to the device itself.
 - c. Surface mounted door position switch(s) shall be supplied with armored cabling, properly supported to a junction box above 8', then run open cable back to the nearest security panel.
 - d. Door position switches shall be concealed/flush mounted whenever possible. The Contractor shall coordinate with the Owner and the hollow metal contractor of their exact needs whenever possible.
 - e. Door position switch shall consist of a two part hermetically sealed assembly and will be designed for either metal or wood frame installations.
 - f. Door positions switches shall be a single pole double throw (SPDT) type. The Contractor shall be responsible for providing end of line resistors, wire, mounting hardware and necessary field modifications to hollow or metal frame doors. Resistors for end of line supervision shall be provided at the end of line device location. Resistors placed at the panel in lieu of at the device shall not be accepted.
 - g. Door position switches shall be made from rugged construction, self-locking, if applicable. Switches shall be designed so that separation of the door from the frame shall be no more than $\frac{3}{4}$ " in which it shall cause the door position switch to change state and signal an alarm.
 - h. The Contractor shall coordinate with the hollow frame contractor to determine the location for dust boxes in fire labeled doors. Under no circumstance may the Contractor modify a fire rated/ labeled door. It is the Contractor's responsibility to verify that either cable pulls by them or other contractors are properly fire stopped where required.
 - i. Each door position switch shall be a logical point unless otherwise noted on the drawings, assigning multiple doors in series shall not be permissible.
 - j. The Contractor shall supply only magnetic types of door monitoring. Mechanical types of door monitoring shall not be acceptable.
 - k. Door position switches shall be provided in accordance with the drawings, details, and specifications.
 2. Door position switches shall be manufactured by Sentrol or Owner approved equivalent.

2.24 REMOTE DRY-CONTACT INTERFACE TRANSCEIVERS

- A. General
 - 1. The Contractor shall provide a remote dry-contact interface to signal the activation of an alarm condition outside the SMS to a third-party receiver.
 - a. The SMS shall transmit alarm conditions via the transceiver. The contractor shall provide programming, relays and hardware as required facilitating eight (8) supervised remote alarm dry contact closures.
 - b. Transceivers shall be optically based, transmitting on either multi-mode or single mode fiber optic cable.
- B. Requirements:
 - 1. The Remote dry-contact device shall be supervised and communicated via a fiber optic connection.
 - 2. The dry-contact Input supervision will detect an open connection and a shorted connection as an alarm. Remote dry-contact devices shall be located in a key locked panel with integral tamper switch.
 - 3. Power is loss to the transceiver, shall create an alarm state.
 - 4. The transceiver shall use supervised contacts, series/open circuit operation.
- C. Remote Dry-Contact devices shall be manufactured by Comnet, American Fibertek Inc., or Owner approved equivalent.

2.25 PASSIVE INFRARED (PIR) REQUEST-TO-EXIT DEVICES

- A. PIR request-to-exit devices shall be provided at specific doors, as indicated, based on hardware type shown in the door hardware schedule, and will be designed to signal the access control alarm panel which shall shunt the door position switches and energize or de-energize electrified hardware associated to the access control door allowing egress.
 - 1. PIR request-to-exit devices will be passive infrared motion detectors that are designed to activate when someone enters the detection zone and again when they exit. The output from the device will be a Form C SPDT relay designed for momentary action. Surface mounted request-to-exit devices will have an adjustable detection pattern that shall not extend more than 4" from the threshold of the door.
 - a. PIR detectors shall be mounted on the door frames or the wall above the door.
 - b. PIR devices shall be utilized when integral request-to-exit micro switches cannot be utilized.
- B. PIR request-to-exit devices will be Kantech Systems Inc. T-REX, Bosch, or Owner approved equivalent. Exterior applications shall be weather rated.

2.26 REQUEST-TO-EXIT PUSH BUTTON (RE)

- A. General
 - 1. Surface mounted request-to-exit devices will be provided at controlled doors as indicated on the drawings and will be designed to locally interrupt power and energize or de-energize electrified hardware associated to the access control door allowing egress.
 - 2. Door position switches, associated to doors equipped with request to exit buttons shall not be shunted upon request-to-exit button activation.
 - 3. Surface mounted request-to-exit devices will be designed to create an output from the device when it is depressed; the output will be a Form C SPDT relay designed for momentary action.
 - 4. Surface mounted request-to-exit devices will be mounted on the door frames or the wall as shown on the drawing details.
- B. Surface mounted request-to-exit devices shall be manufactured by Locknetics or Owner approved equivalent.

2.27 LOCAL ALARM (LA)

- A. General
 - 1. Local alarm (LA) devices shall serve as an audible deterrent to staff and visitors to discourage unauthorized use of an "Emergency Only" exit door.
 - a. The LA will provide local indication of a door that has been popped open or that an unauthorized exit condition has occurred at locations indicated on the security drawings. LA units will be reset locally by a key switch mounted in close proximity to the door.

- b. Alarms will be rated at 94 decibels (dB) from a distance of three (3) feet and will signal via a SPDT door position switch from the associated door.
 - c. The LA will be a flush mounted ceiling, flush mounted wall or a surface mounted wall unit. The Contractor will determine the mounting condition in the field. The Contractor will provide all appropriate mounting equipment. In the event field conditions require a ceiling mounted unit, a safety chain will be utilized to prevent injury in the event that the unit falls. In the event field conditions require a ceiling mounted unit, the Contractor will provide an easily reachable (ADA accessible) (wall mounted) key switch for alarm override.
 - d. The Contractor will coordinate with the vendor for a single key, for bypass/reset of all LAs.
 - e. Local alarms shall be capable of being supervised and shall be equipped with tamper resistant screws as well as a tamper alarm.
 - f. Multiple inputs to a common local annunciator device shall not be permitted, unless denoted otherwise.
 - g. Door monitoring shall be wired independently from the access control system and the local alarm device. In every instance one lead of wires shall annunciate an alarm at the access control system and a second lead shall simultaneously annunciate at the local alarm device.
 - h. The door position switches associated with local alarms (LA) shall be DPDT. Other door position switches shall be SPDT. One pole shall be connected to the local alarm and a secondary pole shall be connected to the ACMS
- B. The LA shall be Designed Security, or Owner approved equivalent.

2.28 DURESS BUTTON (DB) – DESK MOUNTED

- A. Duress buttons shall be provided as shown on the drawings to indicate a potential emergency to the security panel by depressing a button or switch.
- B. Location of duress buttons shall be coordinated in field with the furniture placement and with the Architect/Owner.
 - 1. Duress buttons shall be fully supervised and shall be double-pole, double-throw type. Further, the Contractor shall install duress buttons with care avoiding areas where the button could be depressed accidentally.
 - 2. Duress buttons shall be a latching output and shall require a special tool or key to bypass once activated and shall be tamper proof.
- C. Duress buttons shall be mounted to the underside of the desk in a discreet, yet functional location to be coordinated with Owner.
 - 1. Duress buttons shall require two separate actions for activation.
 - a. Duress buttons shall be wired back independently to the ACMS.
- D. Duress alarm buttons shall be United Security Products, Inc., HUB-2 Series or Sentrol 3040 series, or Owner approved equivalent.

2.29 VISITOR MANAGEMENT SYSTEM (VMS)

- A. General
 - 1. The Visitor Management System (VMS) shall allow the user to track visitors and employees as they enter the project from the lobbies through an enrollment workstation.
 - 2. Although an integrated system is envisioned, the Contractor shall not co-locate multiple SMS licenses and applications on a single computer. The VMS shall be a fully contained system, which includes dedicated servers/computers and workstations.
 - 3. The VMS head-end and workstations shall utilize a thick client interface. Web based interfaces for tenant data entry, intra-LAN or via external messaging shall be permitted.
 - 4. The Contractor shall provide one additional workstation license beyond the number of workstations (Computer hardware) identified in the construction documents. The contractor shall provide all labor and programming for locations where SVMS software shall be installed.
 - 5. The VMS system shall consist of workstations and a master server where databases and software interfaces shall reside. The VMS server and computer workstations shall be coordinated and provided by the Contractor. Refer to Computer Hardware for additional information. Software programs and licensing and scanning equipment shall be provided as shown on the security drawings and described in this specification. The contractor shall be responsible for providing a complete and operable VMS even if not explicitly described herein.

6. The VMS shall interface to:
 - a. ACMS
 7. The system shall support printing of custom designed visitor passes with expiration date; visiting area, and person/tenant to be visited.
 8. The Contractor shall be responsible for the initial set-up and design of three (3) types of visitor badge templates. The Contractor shall also provide training to the Owner on how to create visitor badges, and modify existing templates.
 9. The VMS shall support visitor pre-registration to include security level and access areas, length of stay, and maximum entries. Pre-registration shall be accomplished from Microsoft Outlook® or Lotus Notes® Calendar Simple Mail Transfer Protocol (SMTP) or through Web-based pre-registration.
 10. The VMS shall support TCP/IP data and internet connectivity to support the pre-registration process.
 11. The system shall support various hardware devices in order to capture visitor information, including but not limited to scanning business cards, scanning driver licenses, capturing visitor signature, and 2D/3D barcode scanning of driver licenses, and capturing card-holder name from a credit card magnetic strip.
 12. The VMS shall support the recall of returning visitor information.
 - a. If photographs are cached on the VMS PC during the scanning process, these images shall not be stored within a permanent file directory. Cached images shall be erased immediately after the OCR process.
 13. The VMS shall provide individualized badging, and allow for printing of individualized visitor badges containing: name, picture, expiration date, and valid access areas. The VMS shall support customized badge templates for:
 - a. Visitors, VIPs, Contractors and any other types of visitors. The VMS must have the ability to print unique barcodes formats, including code 128.
 14. The VMS shall provide the necessary tools to perform security and compliance audits including:
 - a. Secure database
 - b. Audit log
 - c. Tamper proof visitor records
 - d. Audit reports
 - e. Backup and restore capabilities
 15. The VMS shall support tailored badge templates, notification rules, and security policies for each visitor category.
 16. The VMS shall provide customization of what data is being tracked for each visitor category and customized report templates.
 17. The System shall support configurable User Interface including, but not limited to data views, actions, field names / types / default values, custom categories, visit types, required or read-only fields.
 18. The VMS shall be fully compatible with the ACMS and allow for the use of all necessary access control devices, including barcode scanners, to provide a complete VMS/ACMS integrated access solution.
 19. The Contractor shall load software on stand-alone VMS workstations. The VMS workstation shall be located at the lobby desks at grade.
 - a. The VMS workstation shall be in accordance with the specifications stated herein.
- B. The Visitor Management System (VMS) shall be Honeywell, Easy-Lobby, Stop-ware or Owner approved equivalent.

2.30 IDENTIFICATION SCANNER

- A. General
1. The Contractor shall be responsible for supplying an identification (ID) scanner for use with the VMS workstations as shown on the security drawings. The ID scanner shall be connected to the VMS PC at the lobby desk and at the security officer desk within each of the lobbies for use in enrollment and identification of visitors to the building.
 - a. The ID scanner shall be capable of scanning the following forms of ID:
 - 1) Driver's Licenses
 - 2) ID Cards
 - 3) Business Cards
 - b. The ID scanner shall use Optical Character Recognition (OCR) technology to extract primary information from the driver's license, State ID, or business card to include:
 - 1) Name (First and Last)
 - 2) Address
 - 3) The ID scanner shall not store protected/private information from scanned IDs to include:

- a) Phone Numbers
 - b) Social Security Numbers
 - c) Driver's License Numbers
 - d) Address information
 - e) Other personal information not required for verification.
 - c. If photographs are cached on the VMS PC during the OCR process, these images shall not be stored within a permanent file directory. Cached images shall be erased immediately following the OCR process.
 - d. The ID scanner shall be connected to the PC with a USB 2.0 or 3.0 connection. This connection shall power the device.
 - e. The ID Scanner shall support a minimum scanning resolution of 300 dots per inch (DPI).
 - f. Scanning time shall not exceed 3 seconds per ID, including OCR processing.
 - g. The ID scanner shall be fully compatible with the VMS software and shall not require any other software to provide scanning, OCR, or other processes.
- B. ID Scanner shall be compatible with the VMS and shall be manufactured by Card Scanning Solutions, or Owner approved equivalent.

2.31 VISITOR BADGE PRINTER

- A. General
- 1. The Contractor shall supply a visitor badge printer for use with the VMS for printing of disposable/temporary visitor badges at registration desks, which are shown on the security drawings at the lobby desk.
 - 2. The badge printer shall print upon specifically designed cardstock for use as visitor badging. This material shall be compatible with the visitor badge printer and shall be available with, and without an adhesive backing.
 - 3. The badge printer shall:
 - a. Print utilizing direct thermal printing technology.
 - b. Not utilize ink or any other type of consumable printing material.
 - c. Print a minimum of 300 dots per inch.
- B. Shall be manufactured by Dymo, Zebra, or Owner approved equivalent.

2.32 OPTICAL TURNSTILES

- A. General
- B. Optical turnstiles shall be integrated into the elevator shear wall, and shall be interfaced to a remote/manual turnstile interface at the reception desk.
 - C. The Contractor shall provide optical turnstiles, as shown on the security drawings and security details. Each turnstile will be equipped with an entry bound bar code reader that will be interfaced to the ACMS. Each lane shall be equipped an entry bound proximity access control reader for staff use.
 - D. The Contractor shall provide any and all interfaces and media converters to read printed barcode information and convert the barcode to a Wiegand signal.
 - 1. Optical Turnstile performance requirements:
 - a. Capabilities:
 - 1) Detect unauthorized persons from entering into the protected area without a valid credential.
 - 2) Detect unauthorized persons more than 1/4 inch (1/2 cm) at waist height, "tailgating/piggybacking" behind any authorized person.
 - 3) Verify entry into the protected area following card presentation.
 - 4) Provide alarm outputs on detection of a violation by means of:
 - a) Local sounder annunciation at the turnstile where the violation occurred.
 - b) Remote sounder output via the ACMS.
 - c) Interface to the SVMS system for alarm call-up
 - b. Visual notification:
 - 1) Allow bidirectional or single direction movement. Notification of direction of travel shall be through on-unit LED displays denoting:

- a) Stop = Red
- b) Proceed = Green
- c. Detecting and signaling capabilities within a two-stage audio/visual system:
 - 1) Entry with an authorized card.
 - 2) Entry that is unauthorized.
 - 3) Authorized card being read by the system but no entry or exit taking place.
 - 4) Unauthorized card being presented.
 - 5) Card presented for entry but exit occurring.
 - 6) Card presented for exit but entry occurring.
 - 7) Obstruction of an infrared beam path.
 - 8) Unauthorized person following an authorized person through the beam path at least 1/4 inch distance apart at waist height, via "tailgating or piggybacking."
 - 9) Turnstiles shall ensure a fast throughput, approximately one person per second, subject to access control system manufacturer selected and credentialing processing speeds.
 - a) Turnstiles shall be capable of buffering (counting) multiple inputs from an access control system to maximize throughput.
 - 10) At minimum, one passage lane shall be ADA accessible and allow for free movement for wheelchair users.
- d. Optics:
 - 1) Environmentally hardened to avoid sunlight interference.
- e. Sounder:
 - 1) Single Tone: Card authorization.
 - 2) Multi-Tone Variable Volume Sounder: Alarm condition.
- f. Infrared Beams:
 - 1) Beams controlled by intelligent analytics shall be capable of differentiating between relatively smaller inanimate objects and human targets, for example, a hand carried umbrella and a person, wheelchair, briefcase, etc.
 - 2) An adjustable potentiometer on the main CPU shall be provided to reduce or increase turnstile sensitivity to inanimate/animate objects.
- 2. Lane Configuration:
 - a. Lane configuration shall be provided as shown on the Architectural drawings and security drawings. Detection and bi-directional travel (in and/or out) shall be capable between all devices.
 - b. Lanes as identified shall be configured with an access control/bar code reader
 - c. Lanes shall support accessibility and will be equipped with a barcode reader, which will authorize access through the turnstile. Refer to drawings for exact locations.
- 3. Lane Width:
 - a. Lane width shall be determined in the field, however, Minimum ADA compliance shall be provided as required for ADA lanes.
- 4. Power Requirements:
 - a. Power, provided by Contractor shall be provided for each bank of turnstiles, to allow serviceability of one lane, without de-energizing the remaining lanes within adjacent elevator vestibules.
- 5. Card Readers:
 - a. Card reader/bar code reader mounting: At pedestal ends, barcode/reader shall be preferably surface mounted on top face supplied by Contractor, coordinated with requirements provided by the Architect.
 - b. Card reader/bar code reader mounting on shear wall, where required.
 - c. The turnstile must be provided with a slot-loading barcode scanner, which will require a user to "slide or dip" a barcode credential into the slot for authorization. Barcode scanner shall have the following features:
 - 1) Barcode readers shall be mounted within ADA requirements.
 - 2) The slot provided within the turnstile shall be sufficiently sized to accommodate various sized cardstock, up to 4.25 inches wide. The specific width of the slot shall be in accordance with the selected printing media and printer.
 - 3) Card readers and barcode scanners shall come installed in a turn-key fashion, including required customization to the turnstile exterior as necessary.

- d. Turnstile finish:
 - 1) End Pieces: To be coordinated with Architect
 - 2) Side Panels: To be coordinated with Architect
 - 3) Top: Brushed To be coordinated with Architect
 - 4) Encasement: To be coordinated with Architect
 - 5) Base: To be coordinated with Architect.
- E. Optical Turnstiles shall be Gunnebo or Owner approved equivalent.

2.33 VOICE COMMUNICATION SYSTEM (VCS)

A. General

1. Call For Assistance (CFA) system
 - a. Provide a complete microprocessor controlled, "duplex" voice communication system described herein and shown on the security system drawings.
 - b. The VCS system(s) shall be rated for the environment they are being installed at and shall be vandal resistant and ADA-compliant, hands-free speakerphone communications device with a stainless steel faceplate and metal buttons.
 - c. The VCS system shall communicate over the network, and shall include required communication hubs/routers/cablings and/or exchanges, as required. In addition, all necessary boards, power supplies, master control stations, substations, receptacles, special mounting boxes, stanchions, beacons, loudspeakers, terminal boards, cable, connectors, and accessories for a complete operational communication system shall be provided.
 - d. For the purpose of this specification and coordination with drawings, VCS devices shall include both Call for Assistance and Intercom devices.
 - e. All VCS power and data cabling shall be encapsulated in conduit. All raceways, pull boxes, standard boxes, (and special boxes provided by the VCS manufacturer), shall be provided. All VCS devices installed on the exterior of the building shall be connected via fiber optic cable.
 - f. In some instances, analog phone cabling shall be required. In these instances, the contractor shall provide interfaces, as required for converting this to a signal compatible (digital/TCP/IP) with the network and the VCS.
 - g. Installation of the communication systems shall be coordinated with functional interfaces provided for SVMS camera call-up and NVR functionality, including ACMS incident logging and ACMS GUI presentation.
2. Operation
 - a. When the call button is pressed, the VCS station that initiates the call, through the VCS communications interface, shall ring the security desk master station(s); ring-down to be coordinated with Owner. The system shall be capable of initiating calls with more than one master station, either simultaneously, or through a ring-down feature. Notification through the ACMS shall be achieved via the ACMS GUI as an on-screen icon and an audible tone from the master station(s).
 3. The purpose of the VCS system shall be to provide duplex communication as required to provide intercommunication for staff, patrons, and visitors.
 4. Each VCS station will have an individual connection to the VCS communication exchange. Multiple initiating stations connected in series shall not be permitted, unless utilized for an elevator function. Provide cabling, as required by the manufacturer from each VCS station to the VCS Exchange, if applicable.
 5. The system shall be capable of automatic duplex, hands-free operation, without the use of handsets at the initiating station. The VCS systems shall interface to third party SMS peripherals via a TCP/IP, RS-232, RS-485 or RS-422 data interface or dry contact closure to denote the activated VCS initiating device. This interface shall be utilized to provide at minimum:
 - a. Camera preset call-up.
 - b. Monitor Call-up of camera presets.
 - c. Event logging within the ACMS.
- B. System capacity shall support the number of VCS devices shown on the associated security drawings, two (2) speech channels and two master stations located at the main lobby desk and security office. The VCS system shall be expandable by adding plug-in boards and modules to handle two-hundred (200) stations.
 1. Initiating stations shall comply with ADA requirements, including mounting height. Stations shall be provided with a 2-1/4" Braille plaque for ADA compliance.

2. The initiating station shall also be equipped with the following:
 - a. A call received light.
 - b. One, 1.5 inch piezoelectric button labeled "PUSH FOR ASSISTANCE,"
 - c. One, 3/8 inch diameter red light emitting diode (LED) labeled "Call Received,"
 - d. The Contractor shall provide signage and as indicated below:
 - 1) CFA devices shall have the following graphics:
 - 2) Colors and Wording are to be:
 - 3) Body: Glossy white finish
 - 4) Letters (wording): "Emergency"
 - 5) Lettering Color: Blue
 - e. Initiating stations shall be wall, recessed or stanchion mounted. Installation details shall be coordinated with the Architect and security drawings, prior to rough-in.
 - f. The VCS system shall support self-diagnostics. The systems shall be capable of testing each station, wire cable, circuitry, microphone and speaker functionality at each unit based on a set time of day schedule.
 - g. The volume of each station shall be adjustable by programming the appropriate subscriber board in the exchange, either from the station or from PC programming. In addition, each master shall have an adjustable slide-switch volume control.
 - h. The VCS system shall comply with Electromagnetic Compatibility (EMC) standards EN55022 for electromagnetic emissions, and EN50082 for immunity.
- C. VCS Station(s)
 1. VCS initiating stations shall include video intercom/intercom, Call For Assistance (CFA) devices, and intercom station interfaced into the elevator return panel.
 2. Initiating stations shall be constructed of either high impact plastic or a metal enclosure and weatherized where required. Conduit penetrations shall be made from the bottom of the enclosure. Devices shall be recessed into the mounting surface or stanchion. The Contractor shall coordinate installation of the VCS station prior to rough-in with the Owner and Architect.
 3. Letter shall be constructed of cast metal with lettering and Braille raised approximately 3/32" for ADA compliance.
 4. Push button shall be hardened and provide for a minimum of 100,000 uses, prior to replacement. The speaker and microphone shall be vandal resistant.
 5. Internal PC boards shall withstand corrosion and corrosive environments and shall be designed to operate in the following environmental conditions without supplementary heating:
 - a. 30°C to +65°C
 - b. 95% relative humidity at 49°C
 6. Environmental conditions
 - a. Where required, the Contractor shall provide heater, blower, and ventilation for CFA devices that shall be mounted in an exterior environment. This requirement shall be coordinated with the manufacturer's requirements and provided where applicable.
 7. The Contractor shall coordinate mounting requirements with the Owner, prior to rough-in. Refer to security drawings for VCS initiating station mounting and location.
 8. Initiating stations shall be:
 - a. Wall mounted
 - b. Integrated into an elevator cab or where indicated on the security drawings
 - c. Installed in free-standing stanchions, to be provide the Contractor
 - d. Designed for use in CFA systems
 9. Sound output shall be customizable and calibrated in the field at separate times during the day. The Contractor shall identify any background noises that may interfere with the voice communication system initiating station.
 10. The Contractor shall provide any PC computers, and software, required for maintaining self-diagnostic testing of the initiating VCS device.
 - a. Initiating station addressing shall be accomplished via non-volatile memory. The loss of power shall not affect the initiating station program. The initiating station shall support full diagnostics of speaker, microphone, and communication cable back to the master station. VCS systems shall be self-testing and all self-test alarms shall be forwarded to the ACMS as a "VCS initiating station failure".
 11. Initiating stations and the point of presence shall be adequately protected/isolated against lightning strikes and sneaker currents.
 - a. Exterior VCS initiating stations shall be transmitted back to the security office via fiber optic cable.

D. Stanchion

1. The Contractor shall provide a free-standing CFA stanchion tower, which shall be vandal-resistant. The tower shall integrate an ADA-compliant, line-powered VCS initiating device, strobe and camera, where applicable, and as indicated on the security drawings.
2. The unit shall be powder coated. Pantone color to be coordinated with Architect, prior to ordering. A multi-coat, rust-inhibitive coating shall be applied at the factory in order to withstand prolonged exposure to harsh environments.
3. The contractor shall provide signage as indicated below:
 - a. CFA devices shall have the following way-finding/graphics:
 - b. Colors and Wording are to be:
 - 1) Body: Glossy white finish
 - 2) Letters (wording): "Emergency"
 - 3) Lettering Color: Blue
4. The top of the unit shall accommodate a high efficiency compact LED light. Upon activation the unit shall provide 1.5 million candlepower and flash greater than 50 times per minute when the initiating communication device is activated, and continue flashing until the call has been completed.
 - a. The polycarbonate refractor/housing shall have a prismatic pattern to increase visibility at greater distances.
5. Strobe/Beacon
 - a. When required, VCS CFA imitating stations shall be equipped with a separate/integrated one million candle power blue light strobe(s), refer to drawings for location of CFA devices equipped with strobes. When the CFA device is not in use, the blue light shall remain lit and visible from a multitude of sightlines. When the button is pressed, the strobe shall flash with a higher level of intensity and continue to flash for the duration of the communication.
 - b. Lights shall be mounted where they will be most visible in accordance with the environment they are being installed in.
 - c. One million candle power strobes shall operate on 120V emergency circuit to be provided by the Contractor.
 - d. Upon activation, strobes shall change state from a constant blue to a flashing state.
 - e. The stanchion shall be securely mounted to a concrete footing provided by others. 24 inch J-bolts for mounting into a 24" x 24" concrete foundation, depth to vary according to local regulations and other site-specific considerations. J-bolts shall protrude approximately 5 inches from surface of foundation for stanchion mounting in accordance to manufacturer requirements.

E. Video Intercom

1. As required on the security drawings, the Contractor shall provide a networked video intercom, which shall have the following characteristics/functionality:
 - a. The video Intercom shall consist of an integrated voice/video intercom capable of providing voice communication and color video through the VCS.
 - b. The video intercom shall interface to the ACMS/SVMS, so that an alarm condition can be created upon activation, allowing for ACMS GUI notification and SVMS/NVR recording.
2. The video intercom subsystem shall have the following capabilities:
 - a. Video intercoms shall be equipped with IR LED'S to capture B/W video when lighting is not sufficient to render color video.

F. Gondola Equipment

1. The Contractor shall furnish an intercom for communication back to the computer network. The intercom substation shall be installed by the Gondola Contractor and communicate wirelessly via an exterior antenna.
 - a. In no instance may the Contractor alter the Gondola.

G. D-Mark Panel

1. Traveler cable shall connect to a d-mark panel located in the elevator machine room; Contractor shall connect coaxial/UTP cable and connect to an encoder for conversion to TCP/IP for transmission to the VCS.

H. Intercom Master

1. The Contractor shall provide an intercom master/substation arrangement that supports the following:
 - a. The intercom communication system shall be provided as indicated on the riser and plan diagrams and as specified herein.

- b. The intercom communication system consists of a stand-alone intercom substation that provides voice communication between the master station and the sub-station master stations or vice versa.
- c. The Master Station shall have the following features:
 - 1) Up to 3 door stations can be operated from any master.
 - a) Three (3) simultaneous duplex speech paths, one video path.
 - b) Shall have the capability to roll calls to another master station.
 - 2) Phone handset at master.
2. Connections and low voltage wiring shall be designed and provided by the Contractor in compliance with the specifications and manufacturer's recommendations.
3. The intercom system shall provide for the following functions:
 - a. Initiate a call from the intercom substation to the master intercom station through depression of the associated call button at the substation.
 - b. The intercom substation shall be flush wall mounted units at the outside of secured door locations as shown on the drawings. The Contractor shall provide the appropriate back box for installation.
 - c. The Contractor shall verify on site and coordinate with the Architect to determine appropriate installation locations of all low voltage power supply units.
 - d. Support caller-direction to supplementary master stations in the event that the designated master station is in use.
 - 1) The Master Monitor shall be a compact desk top unit with a video display and a handset for voice/video communication
 - 2) Built-in speaker/handset for hands free communication, back light control button for call selection, call button(s),
4. Master stations include:
 - a. Indicate locations on the security drawings.
- I. VCS and sub components shall be manufactured by Zenitel USA, Commend, Code Blue, Talk-a-phone or Owner approved equivalent.

2.34 FIBER OPTIC TRANSMITTERS/RECEIVERS (TRANSCEIVERS)

- A. General
 1. The Contractor will provide single mode/multi-mode fiber optic cabling and associated fiber optic transceivers for all exterior peripherals.
 - a. The Contractor shall be responsible for the connection to power being provided, as required, supporting the video transceivers.
 - b. Fiber optic transceivers shall be mounted within a key lockable enclosure.
 - c. Integral Speed dome video/control fiber transmitters shall be used in conjunction with all exterior camera installations. Fiber optic transceivers, where required, shall transmit data, voice or video back to the security room.
 - d. Mini transmitters, if utilized, shall derive their power from the cameras power source.
 - e. Where proprietary data connectivity is apparent and must be utilized, the Contractor shall provide and install the necessary converter or fiber optic receiver required.
 - f. The Contractor shall provide and install a rack mounted fiber optic receiver distribution card frame within the Central Command Center.
- B. Video transceivers shall be IFS, Fiber Options, or Owner equivalent.

2.35 COMPUTER HARDWARE

- A. General
 1. Workstation
 - a. Computer workstations and associated licenses for ACMS, VMS and SVMS shall be provided as indicated on the security drawings.
 - b. Computer hardware shall include workstations. Computer workstations shall be configured and specified by the manufacturer, but shall include the following minimum requirements:
 - 1) 3.6 GHz multi core processor with 4GB of RAM;
 - 2) Operating System shall be Windows based;
 - 3) Four (4) USB 2.0 ports;
 - 4) 100MBPS Ethernet Network Interface Card;
 - 5) RAID Controller Single Channel
 - a) Two mirrored 500 GB Hard Drive(s);

- 6) Mouse;
 - 7) Full function keyboard;
 - 8) Audio sound card and speakers;
 - 9) License agreement for all applicable software;
 - 10) Laser Report Text & Image Printer;
 - 11) Equipped with CD/DVD ROM drive;
 - 12) Video Card with multiple video output;
 - 13) Minimum of two (2) DVI/HDMI
 - a) 800+ MHz processor
 - b) Texture Fill Rate:187.5GT/s
 - c) Memory 6Gb
 - d) 280 GB/s Memory Bandwidth
 - e) Bus Type: PCI-E 3.0
 - f) Interface; DVI-I, DVI-D, HDMI, Display-Port
 - g) Resolution & Refresh:
 - h) 240Hz Max Refresh Rate
 - i) Analog: 2048x1536
 - j) Digital: 4096x2160
 - k) Keyboard/Mouse;
 - l) A 20" LCD Monitor, as required.
 - 14) SVMS/VMS/ACMS (consisting of workstation and server)/NVR computer hardware, workstations/servers shall be provided by the Contractor.
 - 15) All software licensing for all required cameras and computer(s), which shall include proprietary VMS, ACMS, SVMS and operating system licensures shall be provided.
 - 16) The Contractor shall provide all labor to install, configure, program and provide functional operation for provided computers/servers.
 - 17) The Contractor shall provide the following minimum computer hardware specifications:
 - 18) Any computer/server, which shall house a database, configuration files, custom script, code or other essential data for operation of the SMS shall be equipped with a Redundant Array of Independent Disks (RAID). This RAID shall have the following characteristics:
 - a) The Contractor shall provide a level 6 SCSI RAID as a minimum (unless superseded by Manufacturer requirements), hot swappable, equal to the data being stored with an additional 300% capacity more than what is required. The RAID unit shall provide data striping at the byte level and also stripe error correction information with excellent performance and good fault tolerance. The Contractor shall supply hard drives, where required, via SCSI format.
 - b) The system shall support a redundant array of multiple independent hard disk drives RAID that provide high performance and fault tolerance. The RAID array shall appear to the host computer as a single storage unit.
 - c) RAID level 5 includes disk striping at the block level and parity. The administrator shall be able to replace the failed drive without taking the security system down. The array software shall rebuild the lost data from parity information stored on the other drives in the array.
 - d) Provide RAID management software for physical and logical supervision of the RAID Subsystem. The RAID management software shall, at a minimum, report: Logical disk errors, Physical disk errors, Power supply failures, over temperature, SCSI interface failure.
 - 19) All software, computing requirements and hardware for a functioning workstation shall be provided. Failure to provide a functioning workstation shall be the responsibility of the Contractor to repair.
 - 20) Computer hardware shall be manufactured by Dell, Gateway, Lenovo, or Owner approved equivalent.
2. Workstation
- a. Servers shall meet the minimum operating requirement for manufacturer selected. The contractor shall provide hardware requirements, as required for the respective SMS subsystem being provided.

3. Badge Station:
 - a. 1.8 GHz Dual core processor with 1 GB of RAM
 - b. Four (4) USB 2.0 ports
 - c. 100MBPS Ethernet Network Interface Card
 - d. One-hundred and twenty (120) GB hard disk
 - e. CD-ROM drive
 - f. 20" LCD monitor
 - g. Mouse
 - h. Full function keyboard
 - i. 1Gb video card
 - j. Audio sound card and speakers
4. License agreement for all applicable software.
5. Laser Report Text & Image Printer.

2.36 RACEWAY

A. General

1. The Contractor shall provide horizontal and vertical conduit stubs for all security management system device and future devices, identified on the security drawings and details. At a minimum, conduit shall extend from the device 1'-0" into the ceiling cavity, where it shall continue in conduit or plenum cabling back to the nearest electrical room. Exclusions include:
 - a. Cabling/conduit shall be concealed. In instances where conduit cannot be concealed, the Contractor shall paint the conduit to match the surface that the conduit is affixed to.
 - 1) Cabling shall not be painted.
 - b. All exterior and garage cabling shall be encapsulated in conduit. Plenum cable shall not be used within garage spaces.
 - c. All exterior/buried cabling shall be encapsulated in conduit until entry is made into the interior of the building. Cabling from this point shall continue via open, plenum rated cable back to the nearest electrical room.
 - 1) Contractor shall coordinate routing with other trades, such as, but not limited to: irrigation, landscaping, civil, etc.
 - d. Contractor will determine the routing, size, and termination points from the security device for all horizontal and vertical conduit runs. The Contractor will also be responsible for providing all specialty junction boxes for security devices and performing all work necessary, such that at the completion of his/her work all space is restored to the original existing condition prior to the commencement of work.
 - e. Conduit sizing requirements shall be pursuant to standards such as BICSI, NEC, and others as applicable.
 - f. The Contractor shall provide a cable ring or J-hook cable management system to properly support plenum rated SMS related cable from the device back to the cable tray, in increments of five feet (5') if required.
 - g. All horizontal and vertical cable runs between wire troughs/electrical/security equipment rooms shall be encapsulated in conduit, sized as required.
2. Cabling management, if required, shall be coordinated with the Owner, prior to installation.
3. The Contractor shall not damage the shield, cable or outer jacket. Cables shall be pulled in accordance with manufacturer guidelines to prevent damage to cable.
4. J-hook fill capacities shall be per manufacturer's recommendations and shall consider diameter of cable type(s) being installed.
 - a. J-hook fill capacities shall be based on initially installed quantity of cable plus 50%.
 - b. Follow manufacturer's recommendations for allowable fill capacity for each size cable rings / J-hooks cable support.
5. Low voltage signal cable shall not be run near light ballasts.

2.37 COMPUTER NETWORK

A. General

1. The Contractor shall provide a complete and dedicated commercial network for the purposes of interconnectivity and functional operation of the SMS. The Network shall be complete will all grounding/Bus-bars, patch panels/blocks/ports, fiber splice trays, and any other requirement to provide network connectivity for SMS head-end systems and security edge peripherals (surveillance cameras).

- a. As required, and annotated on the security drawings, the Contractor shall provide network connectivity for future workstations and security equipment. Refer to security drawings for additional information.
 2. Only SMS equipment shall be connected to the network, other equipment shall not be allowed.
 3. The computer network bandwidth requirements shall be identified and accommodated by the contractor. However, the network shall not be less than a gigabit backbone/ core switching as required to facilitate SMS connectivity for workstations and other security peripherals.
 4. The network shall utilize a fiber-optic backbone. Horizontal cable, excluding cable that exits the premise, shall be copper. Cabling that exits the building premise shall be fiber-optic.
 5. The Contractor shall provide commercial grade equipment. Noncommercial equipment, such as Linksys and similar, shall not be permissible/allowed.
 - a. The computer network shall utilize a distributed architecture, which shall include core, distributed and edge communication switches/routers.
 6. The network bandwidth shall be sized as required; however, the network shall not be less than 10/100 to edge devices and a gigabit backbone between switches/routers.
 7. The network shall provide LAN connectivity, outside communications through a DSL modem or external network shall not be connected to the SMS network. However, the contractor shall provide equipment to support this functionality.
 8. Contractor is responsible for the provision, installation, and configuration and testing of all switches/routers and hubs.
 9. Contractor must include the all equipment, software, licenses and services required to install a system, deploy data network, configure stations, test with service providers and perform all other work to provide Owner with a working system.
 10. Rack-mounted Main Core Network equipment will reside project security equipment room. The network equipment will be sized with 1GB interfaces to interconnect with each of the distributed SMS locations above.
- B. Data Router/Firewall
1. a) Function:
 - 1) Provide protection/isolation and a logical boundary between the LAN/WAN and wireless communication for the Gondola.
 2. b) Performance Requirement:
 - 1) Web Browser based configuration
 - 2) Internet Access restriction via IP Address and Time/Date
 - 3) Website Access Restriction using URL Keywords and Service Types
 - 4) Port Filter TCP/UDP Port filter Source / destination ports, established connections (TCP only), SYN flood protection.
 - 5) TCP/IP Protocol – filter on the following IP protocols: TCP (RFC 793), UDP (RFC 768), ICMP (RFC 792), GRE (RFC 2784), IPIP, IPsec, SKIP, L2TP (RFC 2661), OSPF (RFC 1583, RFC 2328) or filter on any IP protocol by its protocol number.
 - 6) ICMP filter – filter as a minimum on following ICMP message types: Echo Request, Echo Reply, Destination Unreachable, Source Quenching, Redirect, Time Exceeded, and Parameter Problem.
 - b. Feature Denial of Service (DoS) Protection, Network Address Translation (NAT), Static Address Translation, (SAT) and Stateful Packet Inspection (SPI)
 - c. Real-time e-mail alert when attack/unauthorized Internet activity occurs, Static and Dynamic Routing
 - d. Support DMZ servers and Virtual Servers (Port Forwarding)
 - e. Address Resolution Protocol (ARP) RFC 826 compliant, Static ARP entries, Published IP addresses, Published Ethernet addressee, Proxy ARPs
 - f. Support Dynamic DNS
 - g. Support VPN (IPSec and PPTP) Pass-Through
 - h. VLAN Ethernet IEEE 802.1g VLAN compliant
 - i. Remote Management with HTTP & SMTP (from LAN, WAN, or both)
 - j. Advanced log data analyzer and query tool, common syslog logging, real-time log viewer
 - k. Flash memory for firmware upgrade and save/restore router configuration
- C. Network Switches
1. Network switches, sized as required, shall be provided for SMS connectivity. Network switches shall accommodate bandwidth and will be approved by SMS/SVMS equipment manufacturers.

2. Network switches shall be designed to operate seamlessly with SVMS manufacturers to limit jitter, latency.
3. Network shall be based on SVMS manufacturer requirements, and shall be designed to operate in environments such as multi-cast or unicast.
4. Core Switches
 - a. Function:
 - 1) Provide connectivity between the LAN router/distribution network switches and servers.
 - b. System Functional Requirements:
 - 1) The core switch shall be rack mountable
 - 2) 100mb/s connectivity to the incoming service router
 - 3) Configured with the requisite number of 10/100 Fast Ethernet ports Gigabit blades to provide distribution switching to backbone data connections/distribution switches.
 - 4) Software to provide network enabled configuration, monitoring and management of the network equipment.
 - a) U.L. listed
 - b) Meet IEEE 802.3 standards
 - c) Supports at least 256 VLANS
 - d) Transparent to higher layer protocols
 - e) Contain SNMP and RMON 2 to the station level
 - f) Flash PROM for software upgrades
 - g) Minimum 100,000 hours MTBF
 - h) Minimum 20,000 pps per port forwarding rate
 - i) High speed, minimum 10 Gb/s, flexible backplane
 - j) Fully redundant power supplies
 - k) Core switches shall be equipped with 100mb/s copper connectivity to the incoming service router.
5. Data Switches
 - a. Function
 - 1) The access switches will provide connectivity between the edge devices and network backbone.
 - 2) Data switches shall be rack mounted.
 - b. Requirements:
 - 1) POE enabled
 - 2) WPA2 native compatibility with wireless networks.
 - a) Provide Power over Ethernet and be compliant with: 802.3af-2003 and the updated IEEE 802.3at-2009
 - 3) The access switch shall offer stackable resiliency architecture and shall be rack mountable.
 - 4) Shall be shelf-managing and self-configuring. When switches are added or removed, the master switch automatically loads the software to the new switch, loads the global configuration parameters, and updates all the routing tables to reflect changes.
 - 5) Auto-configuration of new stack units eliminates reconfiguration.
 - 6) Dynamic Host Configuration Protocol (DHCP) auto-configuration of multiple switches through a boot server eases switch deployment.
 - 7) Automatic software version checking and updating.
 - a) Master configuration management helps ensure that all switches are automatically upgraded when the master switch receives a new software version.
 - 8) Autosensing on each non-SFP port detects the speed of the attached device and automatically configures the port for 10, 100, or 1000Mbps operation.
 - 9) Auto-negotiating on all ports automatically selects half or full duplex transmission mode to optimize bandwidth.
 - 10) Dynamic Trunking Protocol (DTP) facilitates dynamic trunk configuration across all switch ports.
 - 11) Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channeling with devices that conform to IEEE 802.3ad.

- 12) IEEE 802.3z compliant 1000BASE SX, 1000BASE LX/LH, 1000BASE ZX, 1000BASE-T, and CWDM physical interface.
 - a) Flash PROM for software upgrades
 - b) Minimum 100,000 hours MTBF
 - c) Minimum 20,000 pps per port forwarding rate
 - d) High speed, flexible backplane
 - e) Fully redundant power supplies
 - c. Traffic logging
 - 1) The Network switch shall log data on the traffic carried by the switching equipment.
 6. Wireless-point-to-point 802.11x antenna/receiver
 - 1) Contractor shall furnish to gondola installer a surveillance camera and wireless antenna for transmitting surveillance images back to the SMS network.
 - 2) Antenna shall have the following characteristics:
 - a) Wireless Standard: 802.11n (w/ 802.11b/g);
 - b) Capability to disable SSID broadcast;
 - c) WE;
 - d) Frequency Band: 2.4 GHz;
 - e) Wireless Amplifier Power: 600 mW;
 - f) Selectable gain;
 - g) Wireless Sensitivity: -95 dBm;
 - h) Wireless Security: WEP, WPA, WPA2, WPA Mixed, WPS;
 - i) Ports: AP: 2 x RJ-45 Ports (PoE, LAN);
 - j) PoE Adapter;
 - k) And weatherized.
 - 3) Gondola Wireless Antenna
 - a) The Contractor shall furnish a wireless antenna for communication back to the Computer Network. The wireless antenna shall be located outside the Gondola and shall be installed by the Gondola Contractor.
 - b) In no instance may the Contractor alter the Gondola.
- D. Network equipment shall be manufactured by Cisco, Juniper Extreme or Owner approved equivalent.

2.38 CONNECTORS/CABLE

- A. General
 1. Where required, by any prevailing code or standard the Contractor shall adhere to the rules governing their portion of work and installation methodologies.
 2. Conductors provided shall exceed or meet manufacturer guidelines/standards.
 3. The Contractor shall adequately, within enclosures, support and neatly strap and label all cabling with a code that shall be reflected in the Security shop and As-built drawings. The code shall refer to the end of line device as well as the type and gauge.
 4. Firewall penetrations/cores shall be accomplished by a sleeved piece of conduit sized 100% larger than what is required to meet future cabling requirements. Conduit shall be properly fire stopped according to local guidelines, where required.
 5. In all instances where low voltage power shall be supplied, the Contractor shall ensure that their engineering and voltage drop calculations shall not exceed or fall below minimum requirements for the operation of the equipment being provided.
 6. In vertical riser conditions, the Contractor shall pull cable to a common wire trough, coiling the cable at each wire trough one (1) full revolution before continuing up to the next wire trough, unless otherwise directed by manufacturer or applicable code. This shall allow the cable to displace the weight of the cable between pull points, preventing the cable from pulling apart under its own weight.
 7. All cabling with exception to the following shall be provided for the systems envisioned for the SMS including:
 - a. Point-to-point TCP/IP based Ethernet Category 6A cabling for SMS systems.
- B. Mechanical Splices:
 1. Mechanical splices or terminal blocks shall be made for all wire terminations. The Contractor may not use twist caps as an acceptable means of connecting two wires together. Terminal blocks, if used shall be housed in a NEMA or Hoffman lockable enclosure with a tamper switch connected to the access control system.

2. Low Voltage Wiring:
 - a. Cables utilized for low voltage circuits shall incorporate conductors that shall not be less than 18 AWG. Conductors sizing shall be increased where required.
 - b. Interior Camera cabling shall be provided in accordance with Owner guidelines/requirements.
 - 1) The Contractor shall provide certified, pre-tested patch cords in accordance with the Owner's IT standards.
- C. Acceptable manufacturers for low voltage based cabling shall be Belden, West Penn, Berk-Tek, Draka, or equivalent.
- D. Category 6A Network Cabling
 1. Horizontal and Vertical Network Cabling
 - a. The Intra-building Copper UTP Backbone cable shall be designed for use in riser shafts, where a fire retardant sheath is necessary to meet the local code low flame requirements.
 - b. Cable shall be a paired multi-conductor, thermoplastic insulated, copper cable.
 - c. The cable shall meet or exceed the transmission performance requirements of EIA/TIA Category 6A.
 - d. Individual pairs shall not be shielded.
 - e. Conductors shall be identified by insulation color.
 - f. Color code shall follow industry standard of 10 distinctive colors to identify 25 pairs.
 - g. Marking of each mate of the primary conductor in pair with color of that primary conductor is optional.
 - h. When cables of larger than 25 pairs are required, cable core shall be assembled into 25 pair sub-units.
 - i. Wrap super units with solid color thread that follows primary color scheme of white, red, black, yellow and violet.
 - j. Jacket Type: Grey color.
 - k. Cable Rating: NEC Article 800 Type CMR, UL listed.
 - l. Category 6A cabling shall be provided for each security peripherals required for SMS network and SMS operability. Category 6 will be point-to-point cable from the panels to the modular jack/patch port.
 - m. All category 6A cabling performance shall be tested and certified, prior to Substantial Completion.
 - n. The 4pair Copper UTP cables shall be constructed of four (4) unshielded twisted pairs with 23AWG insulated solid copper conductors.
 - 1) The cable shall not incorporate an overall shield.
 - 2) Cable shall meet or exceed TIA Category 6A performance criteria as defined by the referenced TIA/EIA documents.
 - 3) Outer jacket shall be as required to meet flammability requirements for cable type.
 - 4) Cable outside diameter for any 4 pair UTP Cable shall not exceed 8.1 mm (0.32 inch) (UTP).
 - 5) Maximum Pulling Load shall not be less than 25 lbs. (11.34 kg).
 - 6) Pairs of all 4pair cables shall be identified by a banded color code in which conductor insulation is marked with a dominant color and banded with a contrasting color.
- E. Category 6A Modular Jack(s)/Patch Port
 1. Modular jacks/patch port shall be provided at each security peripheral identified in the contract documents or specifications. Modular jacks/patch ports shall provide point-to-point cabling to patch ports and the patch panel/block allowing independent testing of cable. One modular jack/patch port shall be provided for each security peripheral connection. Unless otherwise specified or identified in the construction documents. Where multiple peripherals, such as, but not limited to: workstations or ACP's exist, multiple modular point-to-point jacks/patch port shall be utilized for connectivity.
 2. Modular jacks/patch port shall be used exclusively for the SMS network; other peripherals shall not be permitted to utilize the network.
 - a. Jacks shall be designed for 100Ohm UTP cable termination.
 - b. Jacks shall meet or exceed the transmission requirements of TIA Category 6A.
 - c. Jacks shall be: CENELEC EN 50173 compliant; UL VERIFIED for performance; UL LISTED 1863 and CSA certified.
 - d. Each jack shall be an individually constructed unit and shall snap-mount in an industry standard keystone opening (.760" x 580").
 - e. Jacks shall terminate 22/26 AWG stranded or solid conductors.

- f. The interface between jack and station cable shall be insulation displacement type contact.
- g. Jacks shall be compatible with standard single conductor impact termination tools.
- h. Jacks shall be supplied with wire retention caps.
3. Jacks shall be pinned per TIA pinning standards
 - a. Jacks shall have an attached color-coded wiring instruction label as an aid to the installer.
 - b. Jacks shall be available in a variety of colors for identification or designation of applications at the workstation or closet.
 - c. Jack color shall be coordinated with Owner unless specified otherwise.
 - d. Jacks shall have a designation indicating performance (e.g. "Category 6A", "Cat 6A" or "C6A") on the nose, which can be plainly seen from the front of the faceplate.
 - e. Jacks shall be compatible with EIA/TIA 606 color code labeling and accept snap on icons for identification or designation of applications.
 - f. Jacks shall be supplied with installed dust covers to protect the jack opening and internal elements during installation until the jack is in use.
4. Communications Outlet – Work Area
 - a. Shall comply with requirements identified above.
 - b. Flush Faceplates shall accommodate the installation of wall mounted or surface raceway mounted communication Outlets.
 - 1) Modular Jacks/patch port, fiber optic couplings, and coaxial connectors shall snap into the faceplate.
 - 2) Faceplates shall be UL Listed and CSA Certified.
 - 3) Faceplate shall be configured to accommodate the number of modular jacks/patch ports as required by the location and number of security peripherals required. Refer to security details for faceplate configuration.
 - c. Faceplates shall be available in Office white, Telco Ivory, White, Beige, and shall be paintable.
 - 1) The contractor shall remove modular jacks when painting the faceplate.
 - 2) Faceplate shall be configured to mount on standard, single gang outlet box when wall mounted.
 - 3) Faceplates shall provide for TIA/EIA 606 compliant station labeling.
 - d. Faceplates shall have plastic covers over the mounting screws that can be replaced with a clear plastic window over a printable paper insert.
- F. Patch Panel/Block – Category 6A
 1. Patch panels/block shall provide for the termination of Horizontal cables within the electrical room or the security equipment room.
 2. Contractor shall coordinate patch panel/block quantity based on communication cable required for SMS operation.
 3. The Panels shall incorporate 8 position, 8conductor (8P8C) non-keyed Modular Jacks/patch ports.
 - a. Panels shall accommodate 48 port keystone jacks.
 - b. The Panels shall be designed for 100Ohm UTP cable termination.
 - c. The Panels shall meet or exceed the transmission requirements of TIA and ISO Category 6A.
 - d. The Panels shall be: CENELEC EN 50173 compliant; UL VERIFIED for performance; UL LISTED 1863 and CSA certified File # LR80837. ISO 11801 CLASS EA compliant.
 - e. Panels shall be rack mountable in standard AIA 483 mm (19") equipment rack.
 - f. Panels shall be made of black anodized 23 mm (.090 inch) aluminum.
 - g. Panels shall be terminated in the same wiring scheme as modular jacks/patch ports.
 - h. Panels shall be equipped with an IDC-type termination made of fire retardant UL 94V0 rated thermoplastic and tin, lead solder plated IDC.
 - i. Panels shall terminate 22/26 AWG solid conductors, maximum insulated conductors.
 - j. Panels shall provide wiring identification & color code and maintain a paired punch down sequence that does not require the overlapping of cable pairs.
 - k. Panel circuit boards shall be fully enclosed front and rear for physical protection.
 - l. Panels shall have port identification numbers on both the front and rear of the panel.
 - 1) Panels shall have rear cable support bar for strain relief, which shall clip to the rear of the patch panel/block.
 - a) The Panel and cable support hardware shall insure that the minimum bend radius requirements of the horizontal cabling are satisfied.
 - m. The port identification numbers on the panel front shall be located so as to minimize obstruction by patch cords.
 - n. The panel front shall have two raised panel identification label fields to accept 1/2" label inserts.

- o. Panels shall have self-adhesive, clear label holders, and white designation labels provided with the panel for each 8 port adapter.

2.39 OPTICAL FIBER CABLE

A. General

1. When optical fiber is utilized, two (2) pairs (four fibers) must be pulled for connectivity at each location This will provide a back-up cable in the event of damage to the fiber optic filament.
 - a. Cable shall meet or exceed TIA568C.3 (ISO 11801 OM3) performance criteria as defined by the referenced TIA/EIA documents.
2. All Fiber optic cable shall meet the following requirements:
 - a. Be dielectric materials (no conductive materials).
 - b. Incorporate water-blocking tape.
 - c. Be suitable for outdoor installation in underground conduit and in inner-duct.
 - d. Outdoor fiber optic cable shall be
 - 1) Buffer Type: Loose Tube gel-filled buffer.
 - 2) Jacket Material: PVC
 - 3) Jacket Color: Orange
 - 4) Cable Rating: OFNR
 - 5) Strength Member: Aramid Yarn, fiberglass
 - 6) Operating and Storage Temperature: -40° to +70°C (no irreversible change in attenuation)
 - 7) Humidity Range: 0 to 100%
 - 8) Maximum Tensile Loading: During Installation - 2700 N (no irreversible change in attenuation)
 - 9) Bending Radius: During Installation - 20 times cable diameter

B. Intra-Building Fiber Optic Backbone Cable

1. Cables installed along a path requiring a "Riser" rating, shall be listed as being suitable for use in vertical run in shaft or from floor to floor and shall be listed as having fire-resistant characteristics.
2. The Intra-building Fiber Optic Backbone Cable shall be multi-fiber cables utilizing 900micron coated tight-buffered optical fibers surrounded by dielectric strength members with a flame retardant jacket.
 - a. All cables shall be suitable for installation in the environment defined and shall meet a Riser (OFNR) rating (or permitted substitute as defined by the local code).
 - b. Strand Count, as required. A minimum of one pair shall be provided for redundancy/additional expansion in addition to the base requirements.
 - c. Where both multimode and single mode fibers are called for in a cable path, hybrid cables containing both types shall be used where applicable.
3. Optical Fiber General
 - a. Fibers utilized in installed cable shall be traceable to manufacturer.
 - b. Fiber Type: doped silica core surrounded by concentric glass cladding.
 - c. All optical fibers shall:
 - 1) Be sufficiently free of surface imperfections and occlusions to meet optical, mechanical, and environmental requirements of this specification,
 - 2) Be splice free (factory optical fiber splices are not allowed).
 - d. Coatings shall be mechanically strippable without damaging optical fiber.
 - e. Individual fiber buffers shall be color coded in accordance with the reference documents.
4. Flexible Non-Metallic Innerduct
 - a. Size innerduct for maximum 40% fill (cable vs. innerduct I.D.). Minimum innerduct duct size shall be 31.75mm (1 1/4") (I.D.) unless otherwise noted on drawings.
 - b. Indoor Innerduct shall be:
 - 1) Corrugated.
 - 2) Rated
 - a) Riser where installed in a vertical path defined as a "Riser" by applicable Codes
 - b) Plenum where installed in a return air plenum
 - c) Flame-retardant where installed in all other areas.
 - 3) Innerduct color shall be as follows:
 - a) Flame-retardant: ORANGE
 - b) Riser: ORANGE
 - c) Plenum: ORANGE

5. When tested in accordance with FOTP3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components", average change in attenuation over rated temperature range of cable shall not exceed 0.50 dB/km with 80% of measured fibers not exceeding 0.25 dB/km.
- C. Acceptable manufacturers of optical fiber shall be Corning, Belden, West Penn, Draka, Optical Cable Corporation, Alcatel-Lucent or Owner equivalent.
- D. Fiber Optic Connectors
 1. Connectors shall be LC-type.
 2. The optical fiber within the connector ferrule shall be mechanically secured, and index matching gel shall be included in connector.
 3. Connector shall incorporate a fiber stub that is fully bonded into the ferrule. The other end of each assembly shall be precisely cleaved and placed into an appropriate alignment mechanism to support a mechanical splice.
 4. Mechanical Specifications
 - a. The connector's performance (measured in a two plug plus an alignment sleeve configuration), shall be as follows:
 - a) Insertion loss (average) per FOTP171;
 - b) Cable Retention per FOTP6;
 - c) Durability per FOTP21;
 - d) Impact per FOTP2;
 - e) Thermal Shock per FOTP3;
 - f) And Humidity per FOTP5.
 - 2) LC-type Connector Body color shall be as follows:
 - a) Multimode BEIGE, BLACK or CLEAR; with an AQUA Boot
 - b) Single-mode BLUE
 5. Fiber optic connector type shall be coordinated in the field and shall serve to minimize optical loss measured in dB. Generally, optical connectors shall have a maximum loss per connector of 1 dB and shall be classified as high performance. Additionally, connectors shall hold these requirements:
 - a. Physically small of rugged construction and with good thermal characteristics.
 - b. Qualified experienced technicians shall install fiber optic connectors. The Contractor shall guard against the following, which is not limited to:
 - 1) Lateral displacement.
 - 2) End separation.
 - 3) Angular misalignment.
 - 4) Surface roughness.
 - 5) Connectors
 - 6) Strain Relief
 - 7) Connector assembly shall include a rubber or plastic boot from strain relief.
 - 8) Insertion Loss
 - 9) Connector insertion loss shall not exceed 0.4dB for single mode and 0.5dB for multi-mode fibers.
 - 10) Environmental Protection
 - 11) Connector assembly shall protect against dust, sand and dirt and permit cleaning when disconnected.
 - 12) Repeatability
 6. Connector attenuation shall not exceed 0.2dB of change for 1000 reconnections.
 7. Strength:
 - a. The pull out strength shall be greater than 25 pounds.
 - b. Termination
 8. Fiber connectors shall be terminated using fusing or similar techniques for the least amount of decibel loss or equivalent.
 9. Fiber Optic Couplings/connectors
 - a. Couplings shall be duplex LC-type.
 - b. Coupling materials shall be plastic.
 - c. Alignment sleeve material shall be as follows:
 - 1) Multimode Phosphor Bronze or Ceramic

10. Single mode Ceramic
 - a. LC-type Connector Coupling color shall be as follows:
 - 1) Multimode AQUA
 - 2) Single mode BLUE
- E. Fiber Optic Patch/Splice Panels shall:
 1. Be enclosed assemblies
 2. Incorporate hinged or retractable front cover; key lockable
 - a. Be rack mountable on standard TIA/EIA 483 mm (19") equipment racks
 - b. Provide for strain relief of incoming cables
 - c. Incorporate radius control mechanisms to limit bending of fiber to manufacturer's recommended minimums of 30 mm (1.2"), whichever is larger
 - d. Provide protection to both "facilities" and "user" sides of couplings
 - e. Be configured to require only front access when patching
 - f. Panels shall include provisions for permanent labeling of fiber optic cables
 - g. Labeling shall be accessible from front of patch panel/block and shall not require disassembly of patch panel/block enclosure or removal of front cover
 - h. Connector couplings shall be mounted on assembly that snaps into patch panel/block enclosure.
 - i. This assembly shall be designed to accept variety of coupler types including, LC, duplex LC and high-density mini-connectors
 - j. Access to inside of panel enclosure during installation shall be from front and rear
 - k. Panels that require any disassembly of cabinet to gain entry will not be accepted
 - l. Incoming cables shall not be accessible from patching area of panel
 - m. The panel enclosure shall provide physical barrier to access of such cables

2.40 ELECTRIFIED HARDWARE-POWER SUPPLIES

- A. General
 1. The Contractor shall be responsible for the provision and connection of 24 VAC power supplies and associated circuitry/cabling as required for operation of electric locking devices.
 2. Electric locking devices shall be designed for 24 VAC continuous duty silent operation and shall be fail safe.
 3. Power supplies shall be provided as required to support operation of electric locking devices provided by others at all card reader controlled doors.
 4. Power supply capacities shall be sufficient to support 120% of the current requirements for associated electric locking devices.
 5. Power supplies shall be mounted within a metal enclosure designed for wall mounting. Enclosures shall include a hinged, key lockable door and equipped with a tamper switch.
 6. Fire interfaces as required to de-energize locking hardware shall be provided by the Contractor.
- B. Electrified Hardware Power Supply shall be Altronix or Owner approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General
 1. Install all SMS system components and appurtenances in accordance with the manufacturer's instructions, standards as shown, and shall provide all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
 2. Visit the site and verify that site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Owner in a report as defined in "Technical Data Package II". The Contractor shall not take any corrective action without written permission from the Owner.
 3. The Contractor shall perform a field survey, and provide a report to the Owner as part of the site survey report as defined in "Technical Data Package II". The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Owner equipment.
 4. Verify that all surfaces and areas are ready to receive work.
 5. Verify field measurements as shown on drawings and as instructed by manufacturer.
 6. Verify that required utilities are available, in proper location, and ready for use.

3.2 INSTALLATION

A. General

1. Enclosure Penetrations: All enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer and in such a manner that the cable is not damaged.
 - a. Install the security systems related equipment as specified by the manufacturer and as shown; provide mounting hardware sized appropriately to secure each device for conditions encountered at the site; connect signal lines and AC power to equipment interfaces.
 - b. Install system in accordance with manufacturer's recommendations. This includes, but is not limited to the following:
 - 1) Wiring within racks shall be routed horizontally and vertically in neatly tied bundles. Point-to-point wiring shall not be used.
 - 2) Cable bundles shall cross from one rack to the next at the top, center, or bottom only, leaving sufficient working room within the rack.
 - 3) Wiring for shall SMS equipment shall be tie-wrapped so that all connectors in a bundle can be removed and re-installed without the possibility of cross connecting.
 - 4) Where wiring is routed through sheet metal or over frame members, the metal edges shall be covered with flexible grommet or edge dressing (such as automobile door edge trim).
 - 5) Double-sided foam tape shall not be used to secure any terminal boxes, relay bases or circuit boards, etc. All device mounting shall be of a permanent nature.
 - 6) All excess length AC cords are to be tie-wrapped out of the way, and new plugs installed.
 - a) All cable shall be in conduit, present a professional appearance, and maintain the esthetics of the installation area.
 - c. Provide all panel wiring required, including temporary wiring. Install wiring in accordance with NEC and NFPA regulations (as applicable), local building codes and ordinances, and all Owner wiring standards. Contractor shall be responsible for obtaining and adhering to applicable regulations, codes, ordinances, and standards.
 - d. Label conductors at each end with legible, write-on type, self-laminating vinyl labels.
 - e. Ensure that:
 - 1) All applicable statutes, ordinances, regulations, license requirements and codes are fully complied with.
 - 2) All required permits are obtained.
 - 3) All required inspections are conducted.
 - 4) All necessary certificates are issued, obtained, and delivered to the Owner.
 - 5) All equipment installations and mounting are in strict accordance with requirements for applicable seismic classification.
 - f. Arrange all components to be mounted in the consoles, equipment rack(s), or on a wall in accordance with Owner coordination. Design shall provide a neat appearance and accessibility for servicing equipment.
 - g. Perform complete programming, training of the SMS system, peripherals and equipment in coordination with the Owner.

B. Category 6 Cable installation

1. Provide cabling and communication patch panels/blocks, modular jacks/patch ports and wall outlets as required to facilitate SMS operability and function.
2. No station cable shall exceed 295feet in length. The furthest modular jack/patch port, patch panel/blocks, network equipment shall not exceed 250 feet, in order to account for cable slack, rises, and drops.
3. The Contractor is responsible for installing station cable to avoid unnecessarily long runs.
4. Any area that cannot be reached within above constraints shall be identified and reported to the Owner or Engineer prior to installation.
5. Horizontal cables shall be terminated at both ends. One (1) 4pair UTP cable shall be terminated per 8P8C Modular Jack and at the patch panel/blocks.
 - a. Contractor shall provide a service loop for every horizontal cable which shall be stored near the outlet/modular jack/patch port.
 - 1) Loop length shall be 10ft.

- a) The loop shall be placed in the ceiling at the last support (J-Hook) before the cables enter conduit, surface raceway or box.
 - b) The loop shall be coiled in a figure 8 configuration.
 - c) Loop radius (minimum) shall be 4X the minimum bend radius for the cable.
6. During installation, the minimum bend radius shall be eight times the outside diameter of UTP cables and 20 times the outside diameter of fiber cables.
 7. At the point of termination, the minimum bend radius shall be four times the outside diameter of UTP cables and 10 times the outside diameter of fiber cables.
 - a. EMI/RFI installation
 - 1) UTP cables to be run a minimum of 51mm (2 in.) from AC power distribution cables unless in separate steel channels.
 - 2) A minimum separation of 305mm (12 in.) should be maintained between UTP communication cables and fluorescent light ballasts.
 - 3) All power and communication cables are to cross perpendicularly.

3.3 LIGHTNING AND POWER SURGES

A. General

1. Control Line Surge Protection: Cables and conductors, except fiber optic cables, which serve as communication, control, or signal lines shall be protected against surges and shall have surge protection installed at each end. Protection shall be provided at the equipment and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within three (3) feet of the building cable entrance. Fuses shall not be used for surge suppression.

3.4 GROUNDING

1. General

- a. Grounding shall be in accordance with Construction Documents, Telecommunication/Electrical specifications, prevailing standards, local code and Owner requirements.

3.5 CABLE LABELING AND CHARTS

A. General

1. The Contractor shall generate all labeling (no labels will be provided by the Owner).
2. Labels shall be developed and printed using a software program.
3. Software program and all inputs shall be turned over to the Owner at the end of the project.
4. All label material shall be:
 - a. Vinyl cloth for Pathway Labeling
 - b. Semi-Rigid Polyester/Polycarbonate or Self-Laminating Vinyl for Cable Labeling
 - c. Polyolefin for Termination Hardware
5. All labels shall have an adhesive backing for permanent attachment.
6. All labels shall be of sufficient size.
7. All labels materials shall pass all hazardous environment legibility and adhesion requirements of UL969.
8. Labeling practices for all infrastructure elements shall be consistent across the entire installation.
9. Elements shall be labeled in ways that are easy to see.

B. Installation

1. All labels shall be installed straight.
2. Install labels at locations as follows:
 - a. Port at rear of panel.
 - b. Port on front of panel.
 - c. Individual cables at rear of patch panel.
 - d. Riser cables whenever exposed on minimum 10' intervals.
 - e. Riser cable at point of termination.
 - f. Ends of any coiled or spare cable put in place that is not terminated.
 - g. On front of racks, cabinets, and frames.

C. Label Holders

1. Labels attached to riser cable bundles shall be installed on a label holder of sufficient size. Label holder to be self-laminating and have tie-wrapping provisions.

- D. Temporary Labels
 - 1. Vinyl labels, hand written, with permanent marker.
- E. Charts
 - 1. Provide printed charts containing cross-connect information. The chart shall contain Device No., Panel No., Termination No., and Cable No.; charts to be computer generated. File information shall be turned over to Owner in an ASCII format prior to Substantial Completion.
- F. Color Coding
 - 1. In addition to the requirements for marking or labeling infrastructure elements, with relevant information, color coding these marks or labels shall be as follows:
 - a. Termination labels identifying the two ends of the same cable shall be of the same color.
 - b. Cross-connections are generally made between termination fields (groups of termination labels) of two different colors.
- G. Temporary Labels
 - 1. Provide temporary labels on all outlet cable as it is roughed-in.
- H. Text Size and Information
 - 1. Text size should be as large and as bold as possible.
 - 2. Exact text required, information is shown on the drawings.
 - 3. All riser cables labels shall contain:
 - a. Designation number.
 - b. "To" and "From" information.
 - c. Room numbers.
 - d. Floor numbers.

3.6 START-UP AND TESTING

- A. General
 - 1. Manufacturer's technical representative shall start-up, test, and set all parameters as directed by the system integrator. Manufacturer's technical representative shall demonstrate compliance with all requirements herein. All damaged or malfunctioning devices shall be replaced.

3.7 CABLE TESTING

- A. General
 - 1. All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, the cable and the associated termination(s) shall be replaced by the contractor. The applicable tests shall then be repeated for replaced cable.
 - 2. All cables and termination hardware shall be 100% tested for defects in the installation and the materials used in order to verify performance under installed conditions. All conductors of each installed cable and system component shall be verified usable by the Contractor.
 - a. On horizontal/vertical cables; bad cables are not acceptable.
 - 3. System Substantial Completion
 - a. Prior to Substantial Completion, any defect in the installation of the security system shall be repaired or replaced. This shall include, but is not limited to the following:
 - 1) Raceways;
 - 2) Routing;
 - 3) Terminations;
 - 4) Cable;
 - a) Copper.
 - 5) Connectors;
 - 6) Jacks;
 - 7) Wire management panels;
 - 8) And connector blocks.
 - 4. Cable Testing
 - a. All cables shall be tested in accordance with this document, and the best industry standard practices. If any of these are in conflict, the Contractor shall be responsible to bring any discrepancies to the attention of the Owner for clarification and/or resolution.
 - 1) All cables shall be tested for acceptable signal strength and passage.

- 2) All test results shall be well documented and the documentation given to the Owner for proper distribution.
- b. Cross-connections and testing of the entire channel with the cross-connections in place shall be the responsibility of the Owner.
- c. Fiber Optic Cable Testing
 - 1) Contractor shall detail a proposed test plan for each cable type, including equipment to be used, test frequencies and wavelengths, etc.
 - 2) Backbone fiber optic cabling test results shall include a record of test wavelengths, cable type, fiber and cable I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
 - a) Test results shall include record of wavelength, fiber type, fiber and cabling number, measurement direction, test equipment and model number, date reference setup and operator.
 - 3) Prior to installation:
 - a) Visually inspect reels and packaging for damage.
 - b) Review cable manufacturer's test report for each reel of cable provided to confirm performance.
 - c) Perform testing at contractor option to verify performance and cable condition.
 - 4) Post-installation Testing shall include:
 - a) Attenuation (Insertion Loss) Testing
 - b) OTDR
 - c) End-to-End Optical Attenuation Insertion Loss
 - d) Measure Optical Attenuation per TIA/EIA 52614A (Multimode) and TIA/EIA 5267 (Single mode)
 - e) Test multimode fibers at $850 \pm 30\text{nm}$ and $1300 \pm 20\text{nm}$ wavelengths.
 - f) Test single mode fibers at $1310 \pm 10\text{nm}$ wavelength.
 - g) Test shall be performed in both transmission directions.
 - h) Fiber lengths less than or equal to 300 ft. shall test to < 2.0 dB loss.
 - i) Fiber lengths greater than 300 feet shall test to loss value less than link loss budget for installed connectors and fibers.
- d. Optical Time Domain Reflectometer (OTDR)
 - 1) Test multimode fibers at $850 \pm 30\text{nm}$ wavelength.
 - 2) Test single mode fibers at $1310 \pm 10\text{nm}$ wavelength.
 - 3) Traces shall be examined for continuity and anomalies.
 - 4) Launch cord shall be minimum 100 ft. long, or as noted by test equipment manufacturer.
 - 5) The OTDR(s) shall incorporate high-resolution optics optimized for viewing of short cable sections.
 - 6) Access Jumpers of adequate length to allow viewing of the entire length of the cable, including the connectors at the launch and receive end, shall be used.
 - 7) OTDR traces revealing a point discontinuity greater than 0.2dB in a Multimode fiber, or 0.1dB in a Single mode fiber (if applicable) at any of the tested wavelengths, or any discontinuity showing a reflection at that point shall be a valid basis for rejection of that fiber.
- e. Category 6A copper cabling Testing
 - 1) Copper cabling test results shall include a record of test frequencies, cable type, conductor pair (if applicable) and cable I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s). All cables shall be tested using Wire Test Instrument to:
 - a) Testing shall be from the modular jack/patch port to the patch panel/block on which the cables are terminated for that location.
 - b) Testing shall be per TIA/EIA568 (B1.1 through -B3.1) Permanent Link test configurations.
 - c) All cables shall be free of shorts within the pairs, and be verified for Continuity, Pair Validity and Polarity, and Wire Map (Conductor Position on the Modular Jack/patch port).
 - d) Any defective, split pairs must be identified and corrected.
 - e) Locate breaks/faults/incorrect terminations
 - f) Verify length
 - g) Verify impedance
 - h) Verify Return Loss (to 1GHz)
 - 2) Report
 - 3) All cables shall include a testing report

- a) Performance Testing shall be performed on all cables. Testing of the Transmission Performance shall include the following: Length Attenuation Pair to Pair NEXT Loss (new limits) PSNEXT Loss Return Loss Pair to Pair ELFEXT Loss (Equal Level Far End Crosstalk) PSEFEXT Loss Propagation Delay, Delay Skew.
- b) Cables shall be tested to the maximum frequency defined by the standards covering the specified performance category.
- c) Transmission Performance Testing shall be performed using a test instrument designed for testing the specified frequencies.
- 4) Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.
 - a) The Net Propagation Velocity (NPV) used for the cable type under test shall be traceable to manufacturer's product data.
 - b) Test results obtained using an incorrect NPV will be rejected.
- 5) Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
- 6) Information added by the Contractor to Record Drawings relating to Horizontal Cabling shall include cable routes, outlet locations, numbering and other details necessary to document the cable installation.

3.8 SYSTEM STARTUP

A. General

1. Do not apply power to the security system until the following items have been completed:
 - a. SMS systems described herein shall be set up in accordance with manufacturer's instructions.
 - b. A visual inspection of the security systems has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
 - c. System wiring has been tested and verified as correctly connected as indicated.
 - d. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.
 - e. Power supplies to be connected to the security systems have been verified as the correct voltage, phasing, and frequency as indicated.
 - f. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

3.9 FIELD QUALITY CONTROL

A. General

1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification. Written permission shall be obtained from the Owner before proceeding with the next phase of testing. Original copies of all data produced during performance verification shall be turned over to the Owner at the conclusion of each phase of testing prior to Owner approval of the test.
2. Contractor's Field Testing
 - a. The Contractor shall calibrate and test all equipment described herein and place the systems in service, and test the overall system. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations. This shall include written certification to the Owner that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.
 - 1) If any conditions or other conditions exist that cause degradation or interfere with any security device, the Contractor shall inform the Owner.
 - 2) The field testing shall as a minimum include:
 - a) Verification that the any signal or control cabling have been installed, tested, and approved as specified.
 - b) When the system includes remote control/monitoring stations or remote switch panels, verification that the remote devices are functional, communicate with the center, and perform all functions as specified.

- c) Verification that all system devices are fully functional and that applicable software has been programmed as needed for the site configuration.
 - 3) Operation of all electrical and mechanical controls and verification that the control performs the designed function.
 - 4) Verification that all cables are terminated properly.
- b. Deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Owner that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.
- 3. Performance Verification Test
 - a. Demonstrate that the completed security system(s) comply with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The performance verification test, as specified, shall not be started until receipt by the Contractor of written permission from the Owner, based on the Contractor's written report. This shall include certification of successful completion of Contractor Field Testing as specified herein and upon successful completion of training as specified. The Owner may terminate testing at any time when the system fails to perform as specified. Upon termination of testing by the Owner or by the Contractor, the Contractor shall submit a report outlining the required repairs to the Owner then commence system repairs upon direction by the Owner. Upon successful completion of the performance verification test, the Contractor shall deliver test reports and other documentation as specified to the Owner.

3.10 CLEANING AND ADJUSTING

A. General

- 1. Clean installed items using methods and materials recommended by manufacturer.

3.11 DEMONSTRATION AND SUBSTANTIAL COMPLETION

1. General

- a. Conduct post-performance verification test inspection with Owner appointed representative, and system Owner to ensure that punch list items have been remedied and that systems are functioning as designed.

3.12 TRAINING

A. General

- 1. Training shall be supplied as part of the Contractors work. Specifically, an authorized individual familiar with the systems provided and related subsystems as specified herein shall conduct the training.
- 2. Training shall provide information regarding the setup, configuration and operation of the systems, diagnostics, as well as any other aspects required to provide a knowledge base to manage the SMS system being provided.
- 3. Security System Operator Training:
 - a. The Contractor shall coordinate three (3) separate training sessions at least two weeks (2) prior to system turnover for a class no more than six (6) people. Classes shall be coordinated to include all shifts for all operators, if required classes will be split up to accommodate the Owner.
 - b. Session 1 and 2 shall be orientated towards familiarizing operators with basic commands.
 - c. Session 2 and 3 shall be an all-day session dedicated to the administration of the overall security system, which shall include, but not limited to replacing system diagnostics, troubleshooting configurations as well as any other item necessary to conduct the administration of the overall security system.
 - d. Session 4 shall be performed one (1) week prior to system turnover and shall be an all-day session that shall cover administration and basic operator training as described in Session 1 through 3.
 - e. Session 5 shall be the last and final training and shall be an all-day session that shall recap all administration, basic operator commands and shall be completed at a time to be coordinated with the Owner. This session shall cover both administration and basic operator commands and also allows the Owner to comment on the system.

3.13 ON-SITE ASSISTANCE

A. General

1. Occupancy Adjustments: When requested by Owner within one year of date of Substantial Completion, provide on-site assistance in tuning and adjusting the system to suit actual occupied conditions and to optimize performance. Provide up to twenty-four (24) hours of time by a qualified technician, on site, for adjustments of the system without additional cost.

3.14 SCHEDULES

A. General

1. See drawings for location (Drawings are to be utilized as a guide; actual locations may vary to provide operation as specified).

END OF SECTION